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(54) **INTEGRATED PORTABLE MEDICAL DIAGNOSTIC SYSTEM**

(52) **U.S. Cl.**
CPC **A61B 5/02055** (2013.01); **A61B 5/68** (2013.01)

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(57) **ABSTRACT**

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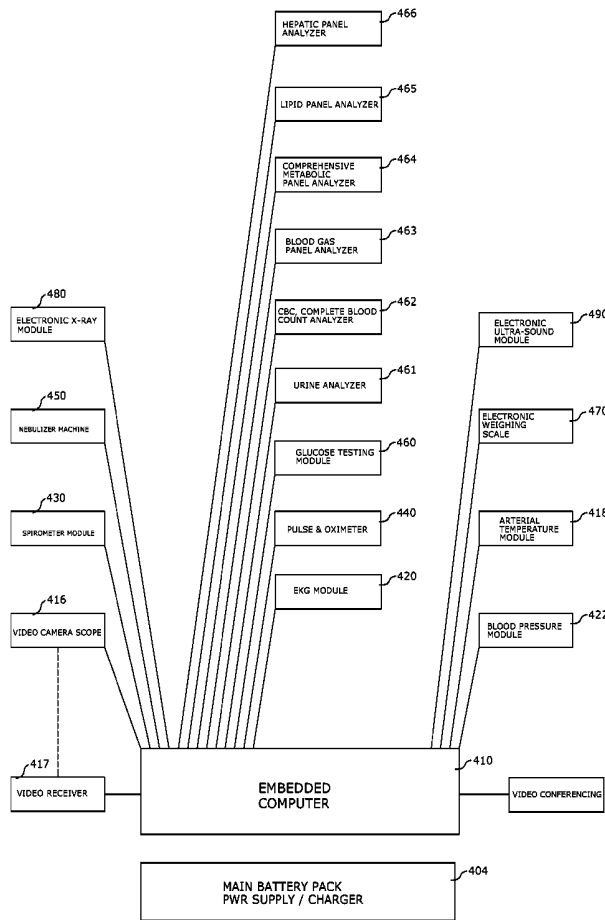
Related U.S. Application Data

(60) Provisional application No. 61/572,643, filed on Jul. 20, 2011.

Publication Classification

(51) **Int. Cl.**
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A portable integrated self-contained rechargeable (100) with AC-DC direct current battery system mounted within an instrument case 99 for housing a foldable keyboard (119), a display (112) and plurality of medical test and treatment modules. It optionally includes a suitable DC to AC inverter to supply AC power. The system includes at least one USB port (154) for adding external test and treatment modules on ad hoc basis. It also includes full duplex data and information input, processing (216), output and communications interface to and from sensors, transducers, networks and other data/information generation or consumption modules, devices and subsystems. It is also known by its three trademark names "Hospital-in-a-Box", RK Ruskat (Stylized) and SCOMET.



DATA SYSTEM BLOCK DIAGRAM

400

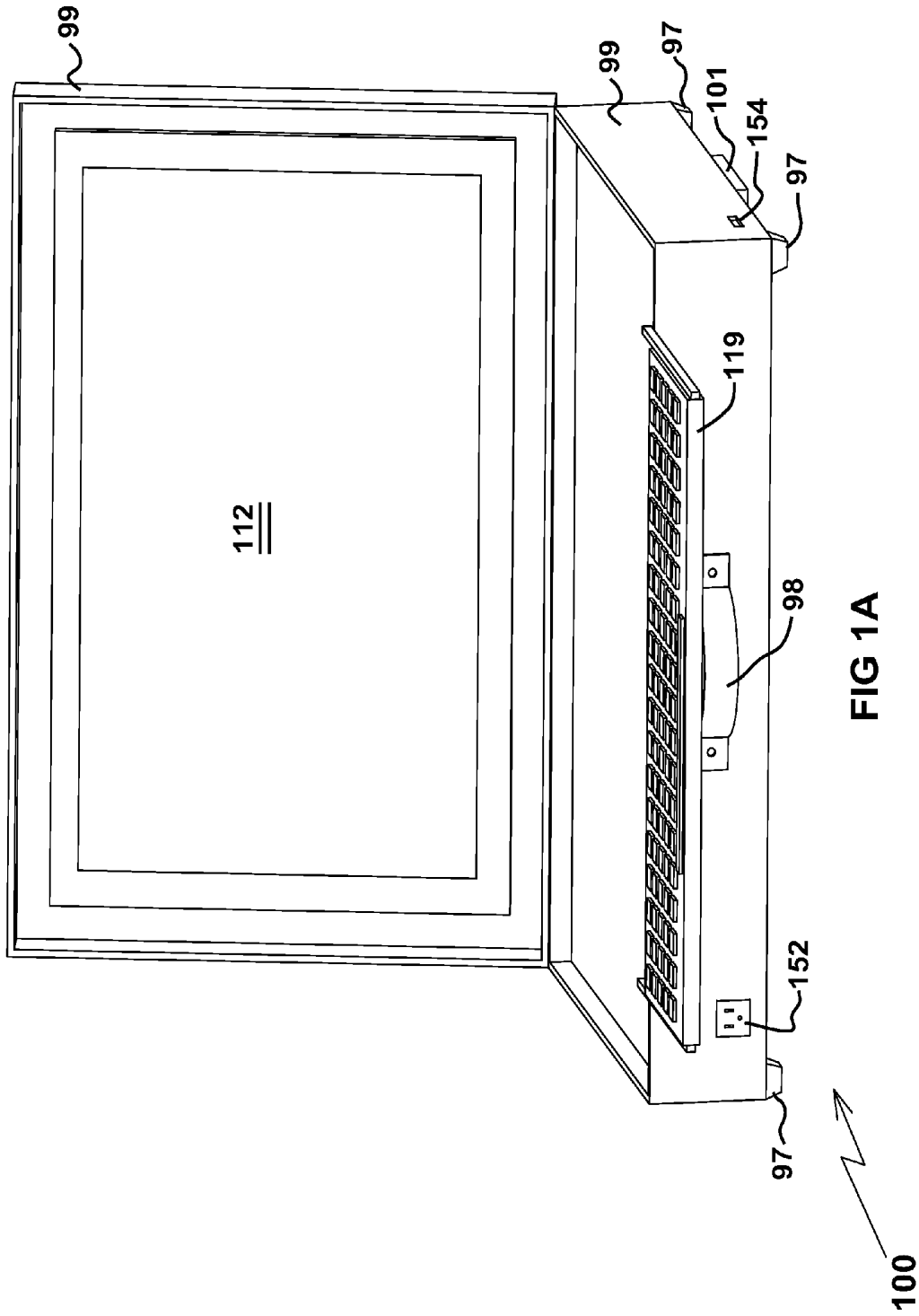


FIG 1A

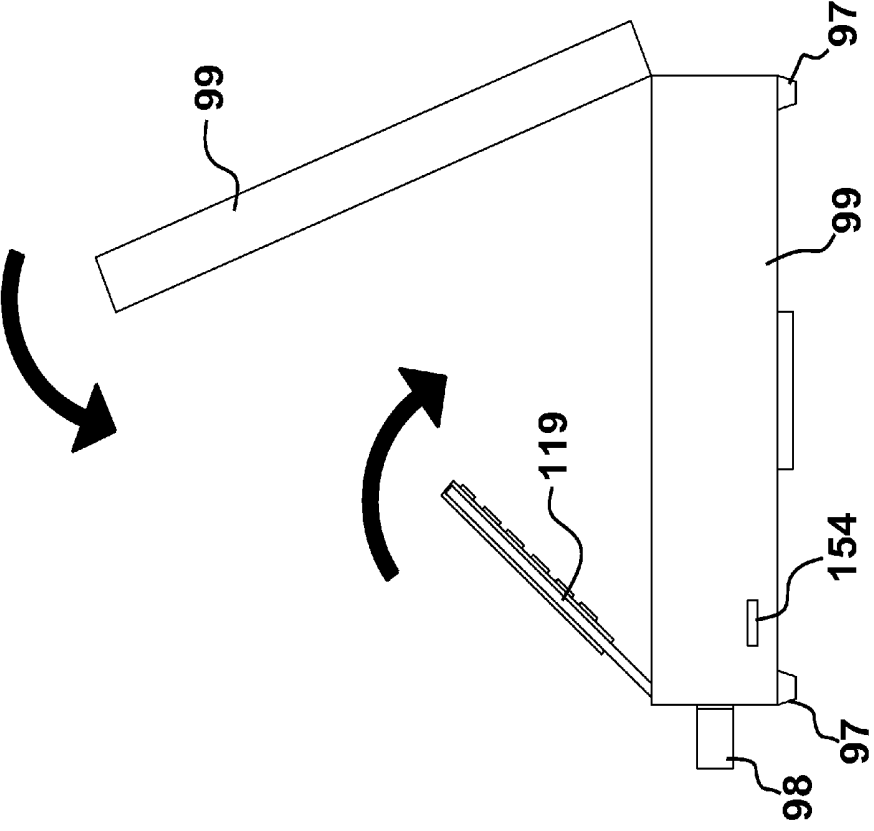
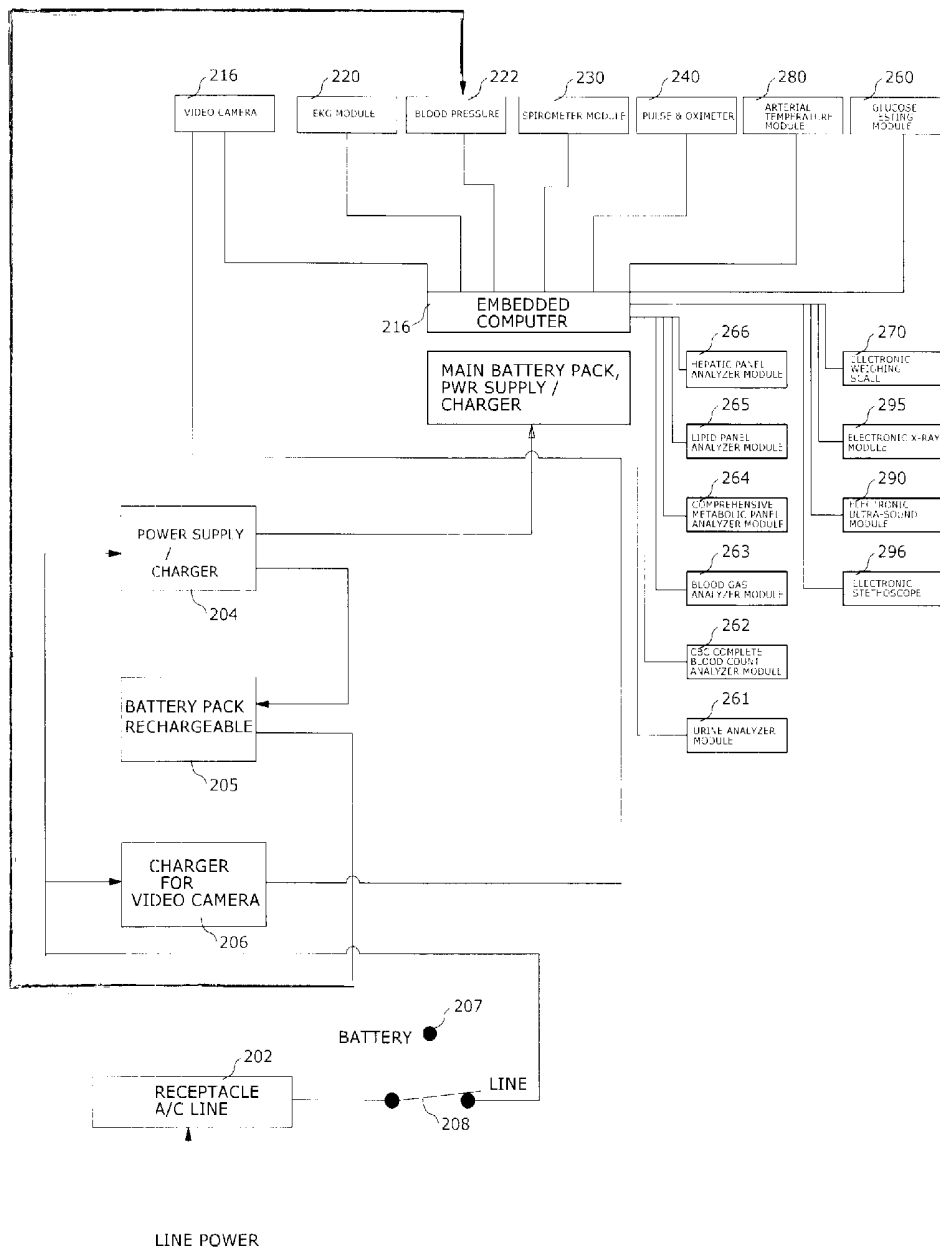


FIG 1B

100



SYSTEM BLOCK DIAGRAM

FIG 2

200

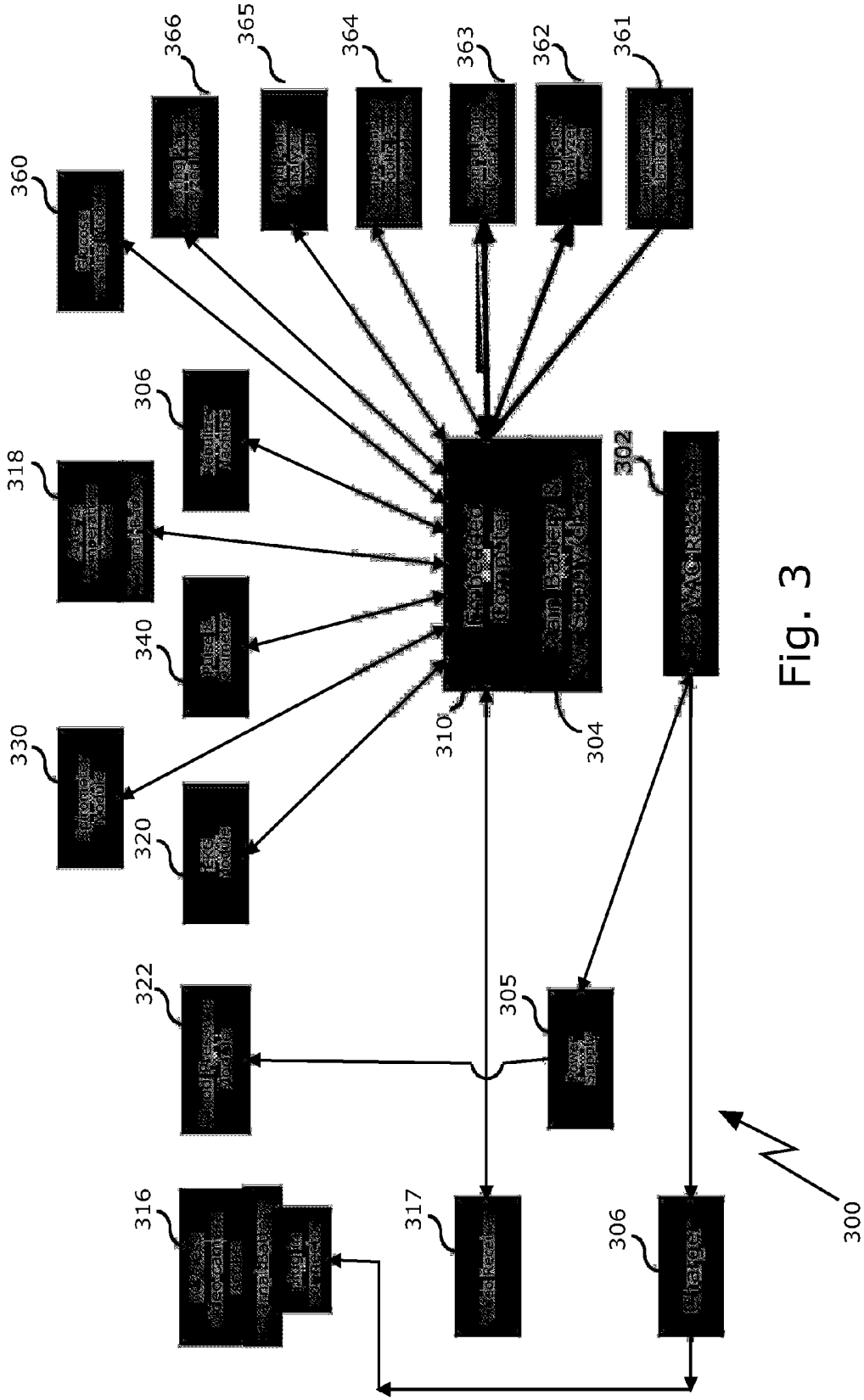
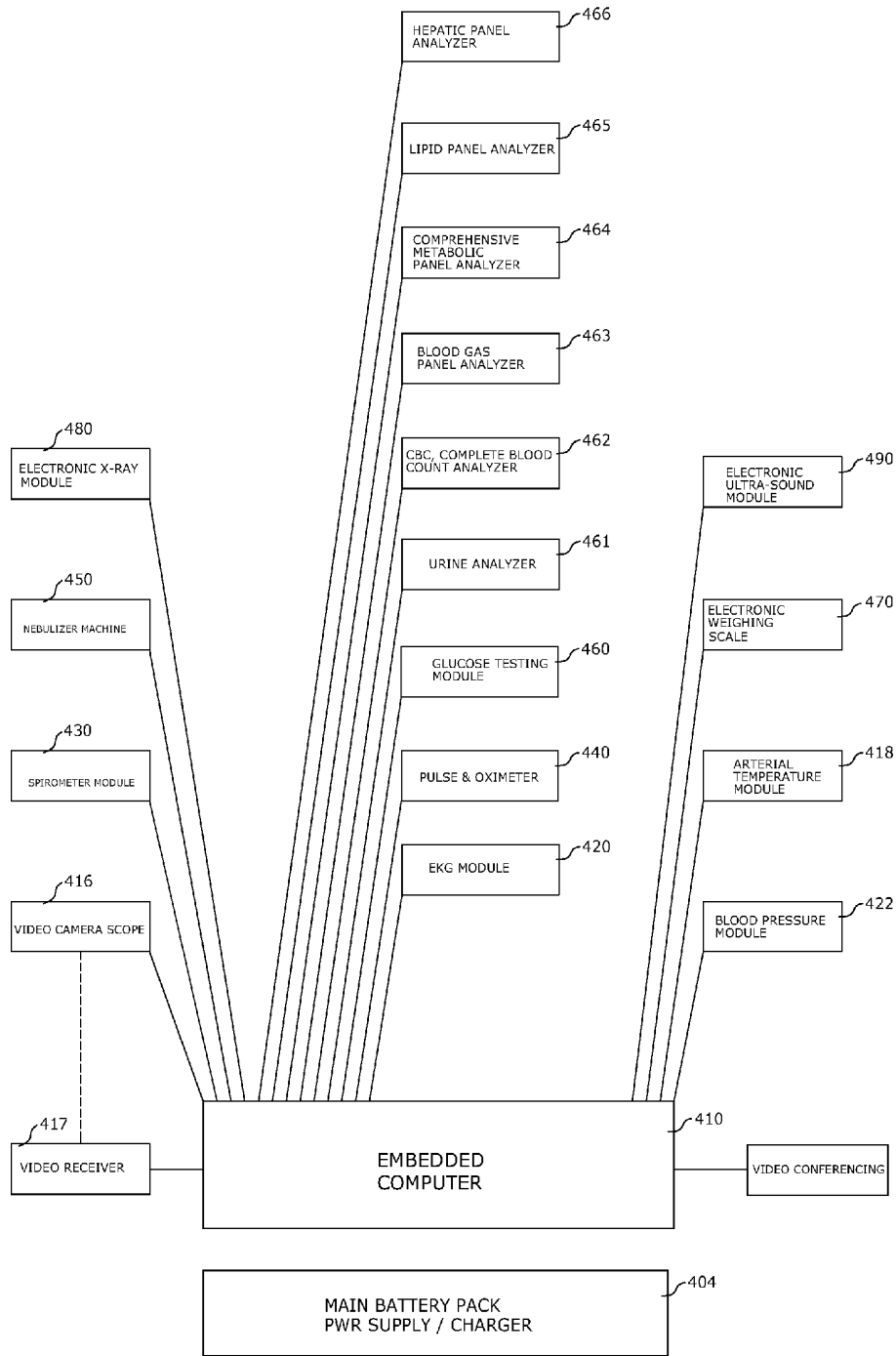


Fig. 3

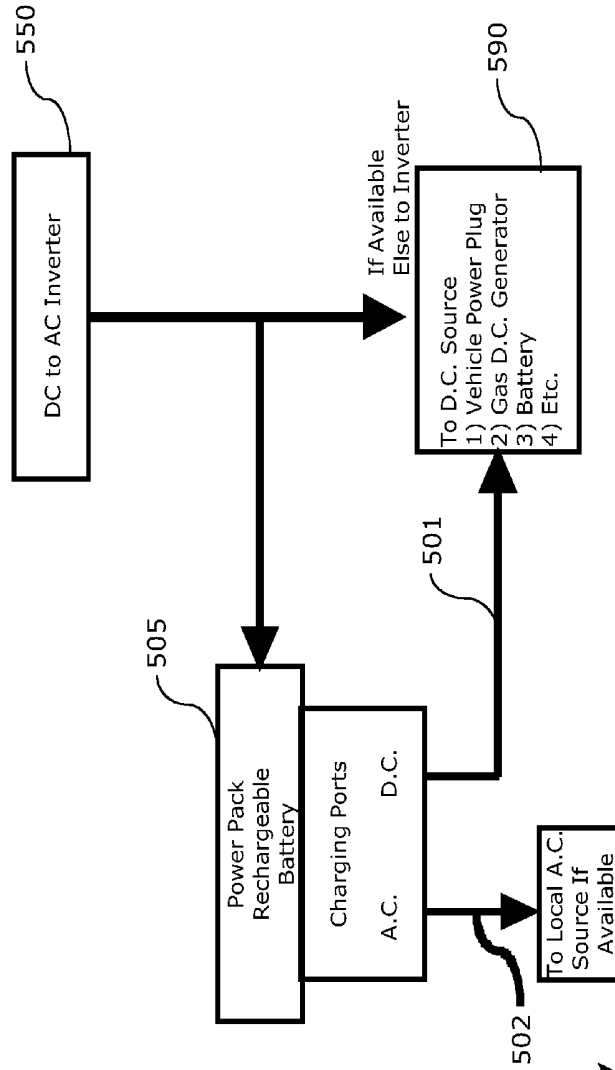


DATA SYSTEM BLOCK DIAGRAM

400

Fig. 4

POWER SYSTEM BLOCK DIAGRAM



Legend
External to Testing Unit

Fig. 5

DOCTOR PATIENT INTERFACE FLOW-CHART

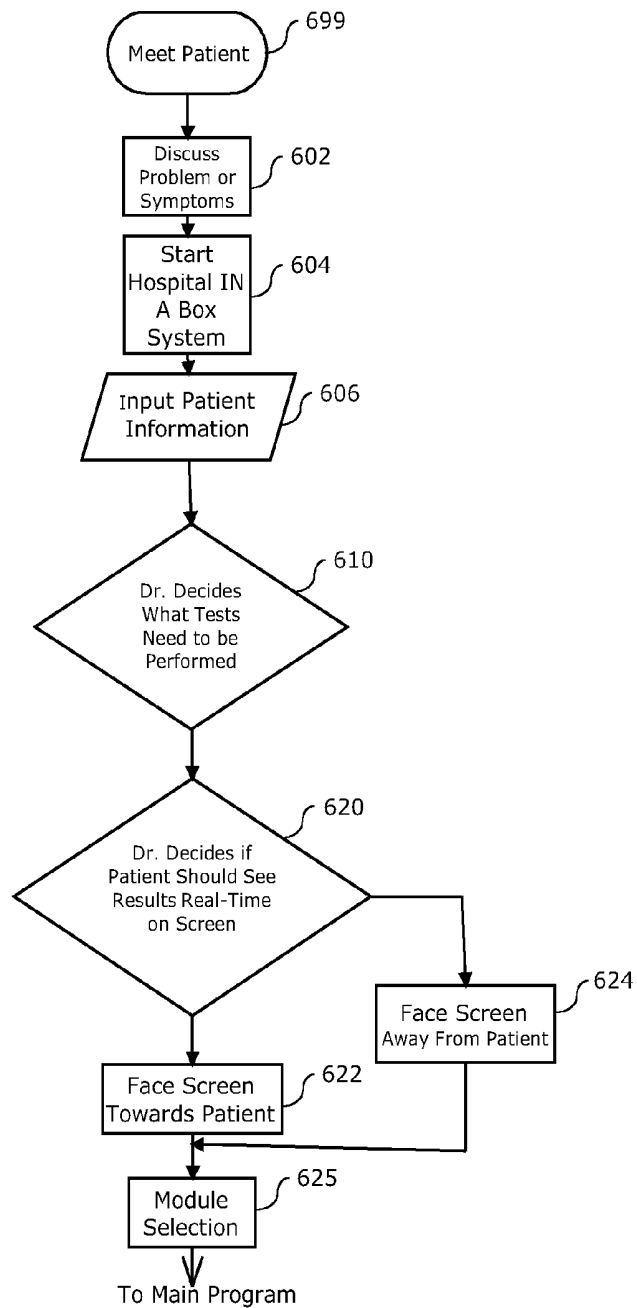


Fig. 6



VIDEO I/F FLOW CHART

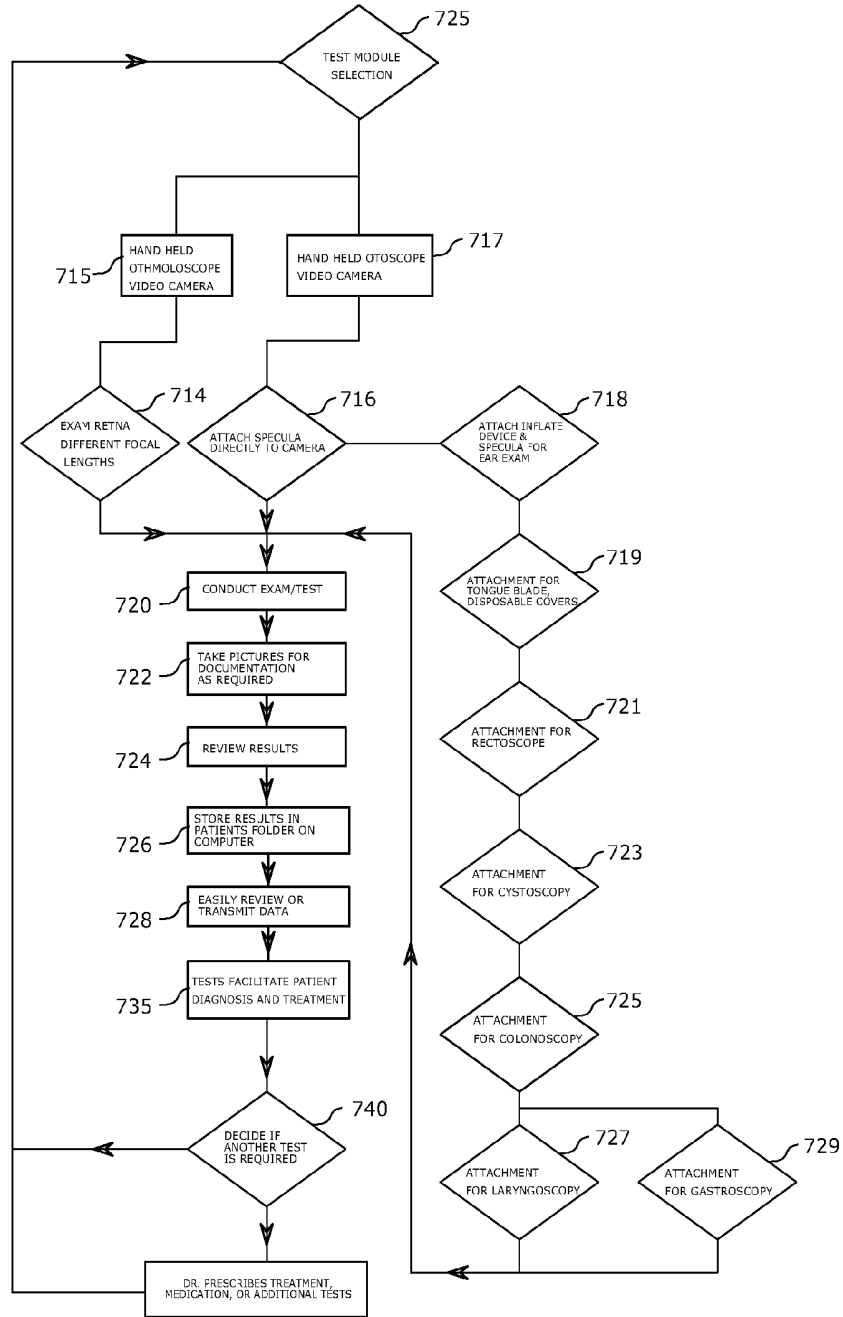


Fig. 7

700

EKG TEST FLOW CHART

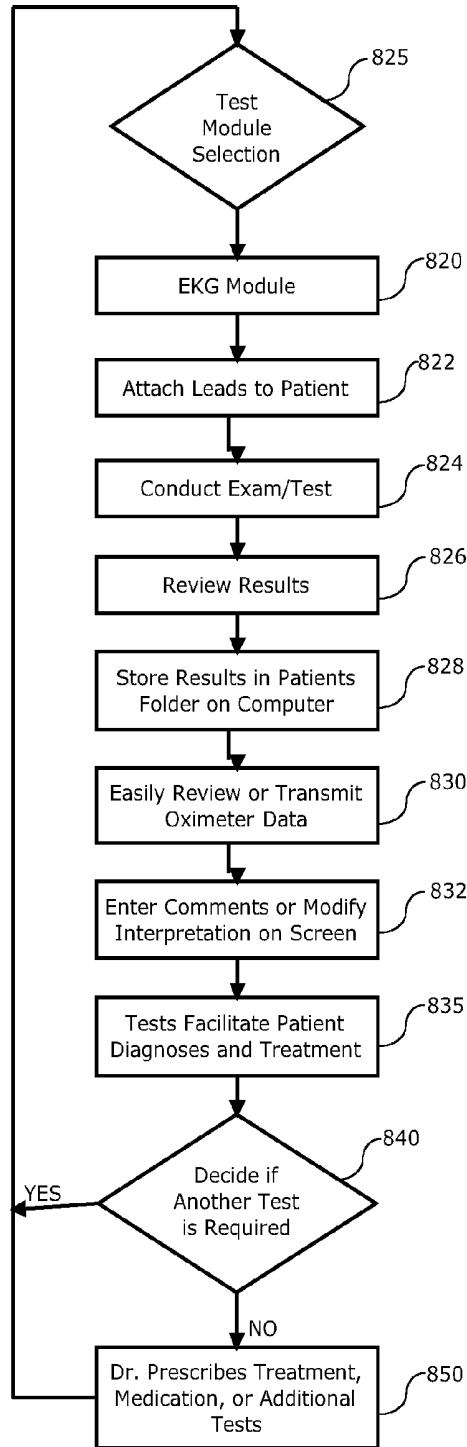


Fig.8

SPIROMETER TEST FLOW CHART

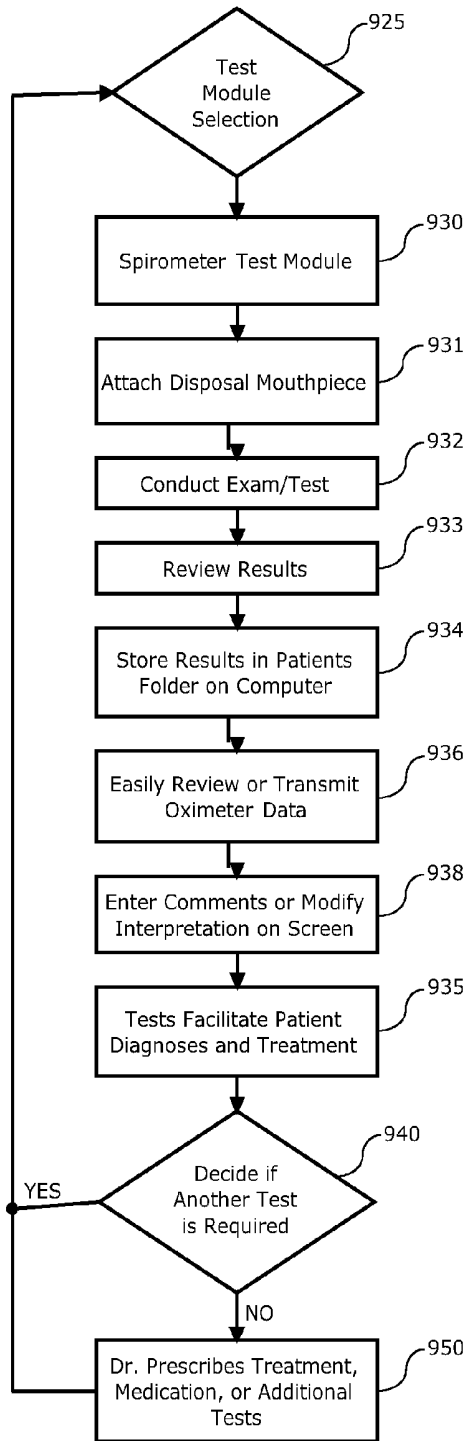


Fig.9

PULSE & OXIMETER TEST FLOW CHART

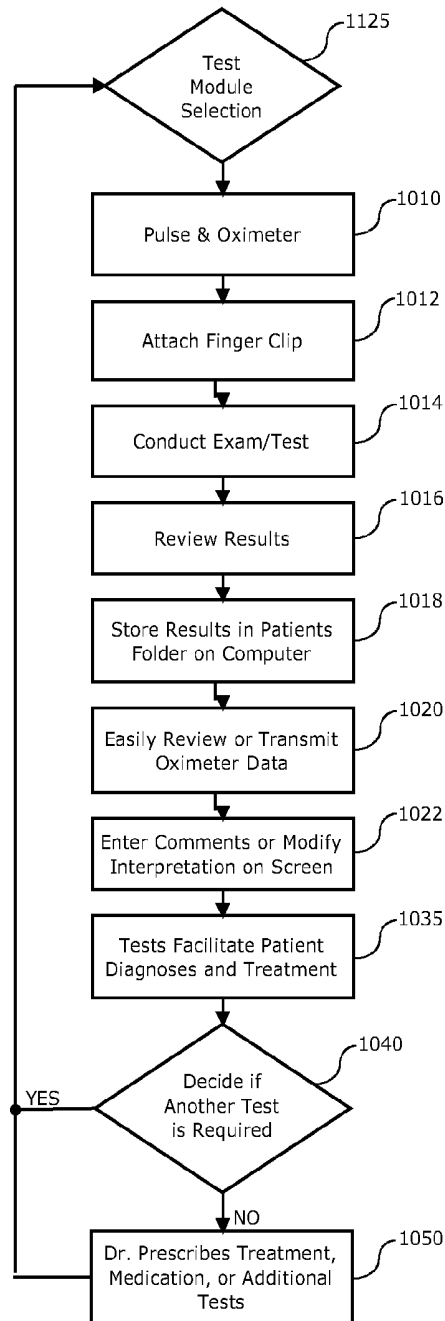


Fig.10

NEBULIZER INTERFACE FLOW CHART

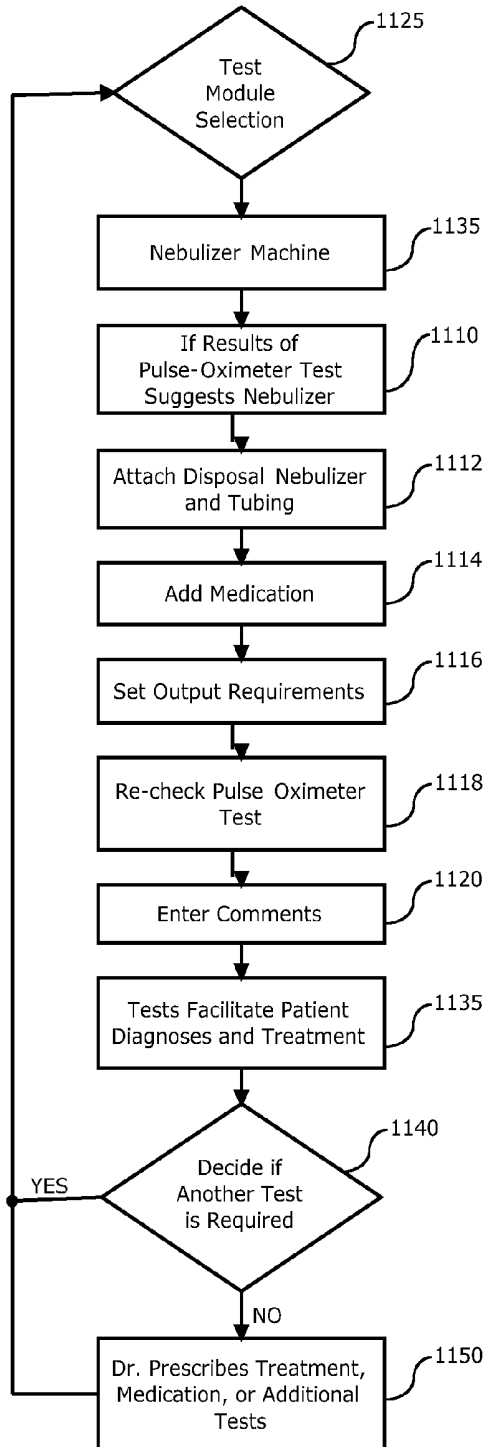
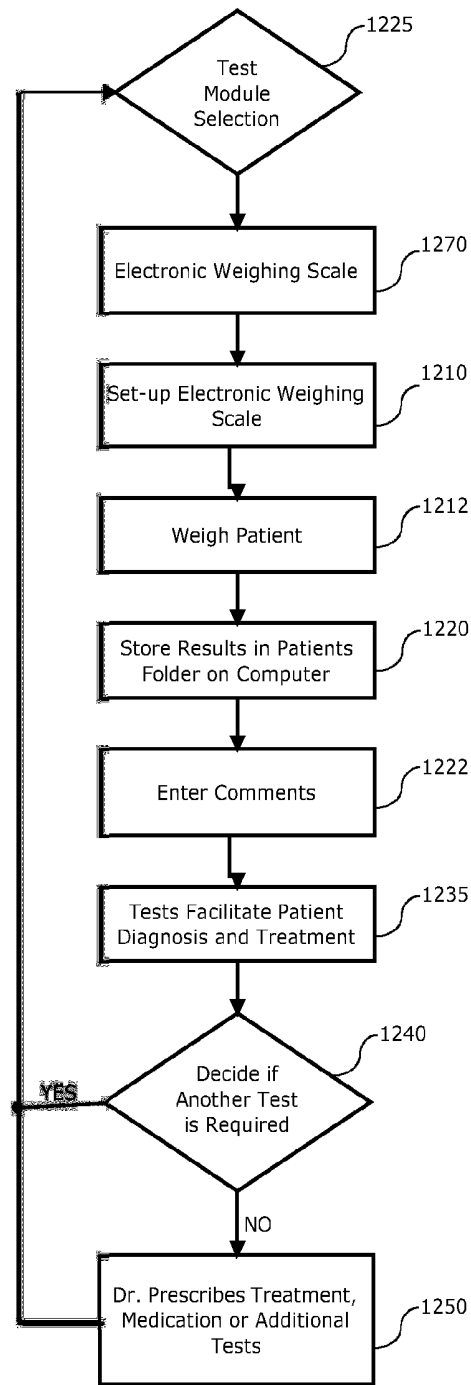


Fig. 11

1100

ELECTRONIC WEIGHT FLOW CHART



1200 ↗

Fig.12

GLUCOSE TEST FLOW CHART

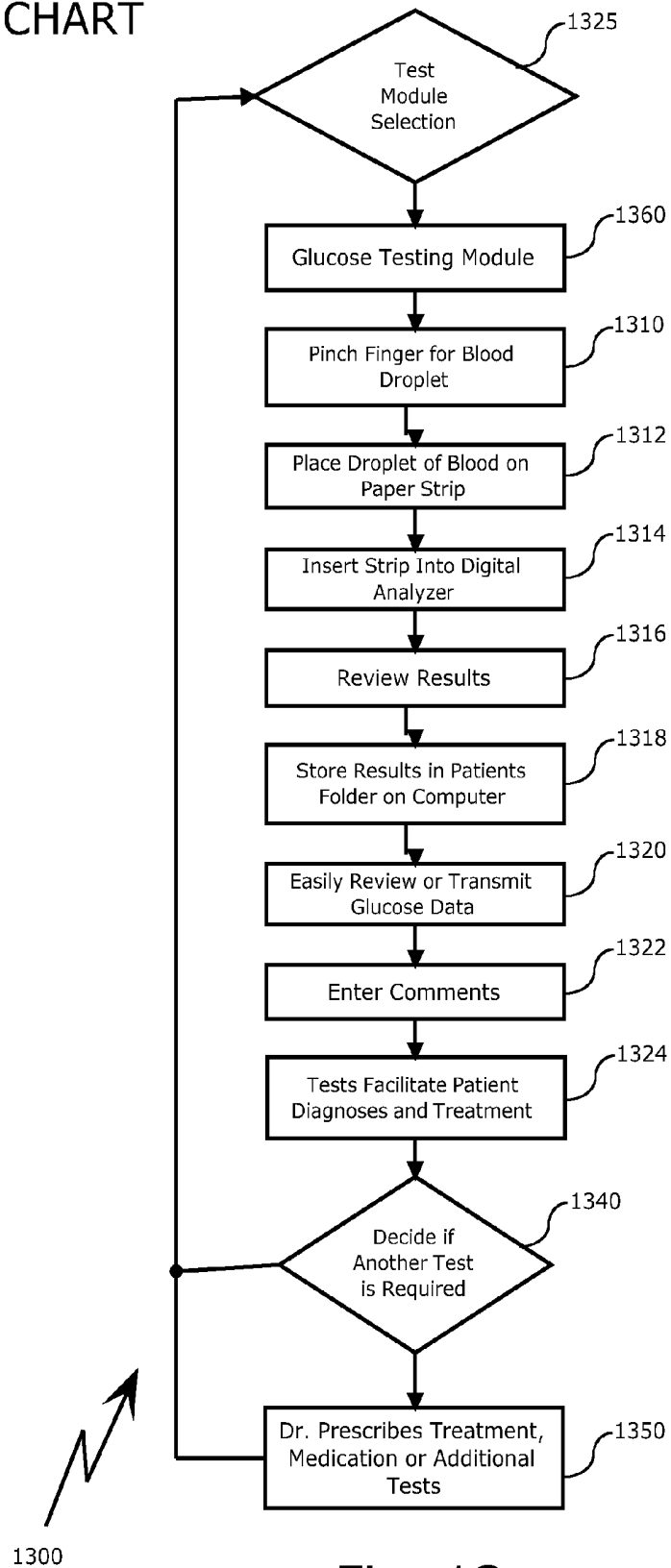


Fig. 13

ARTERIAL TEMPERATURE TEST FLOW-CHART

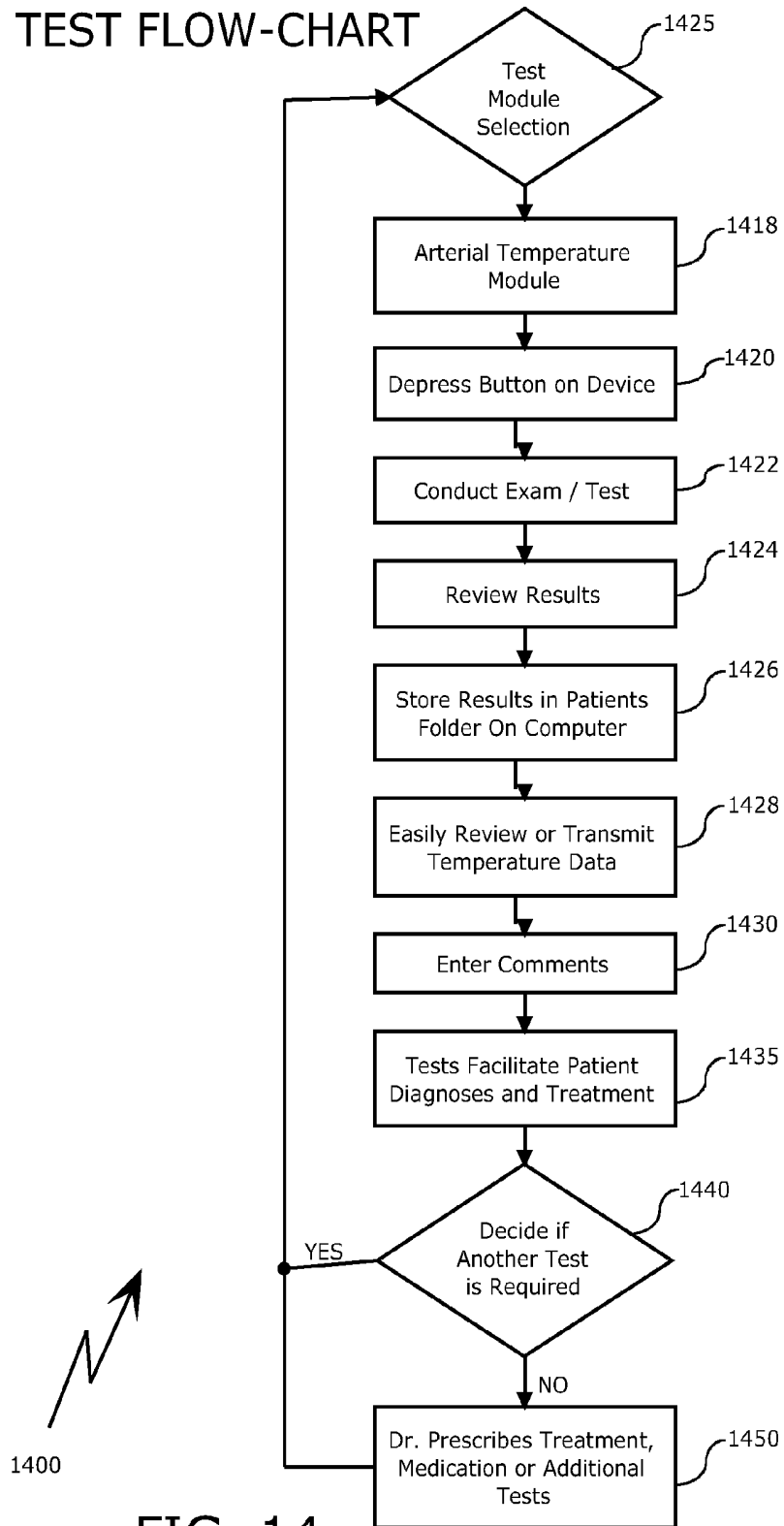


FIG. 14

BLOOD PRESSURE TEST FLOW-CHART

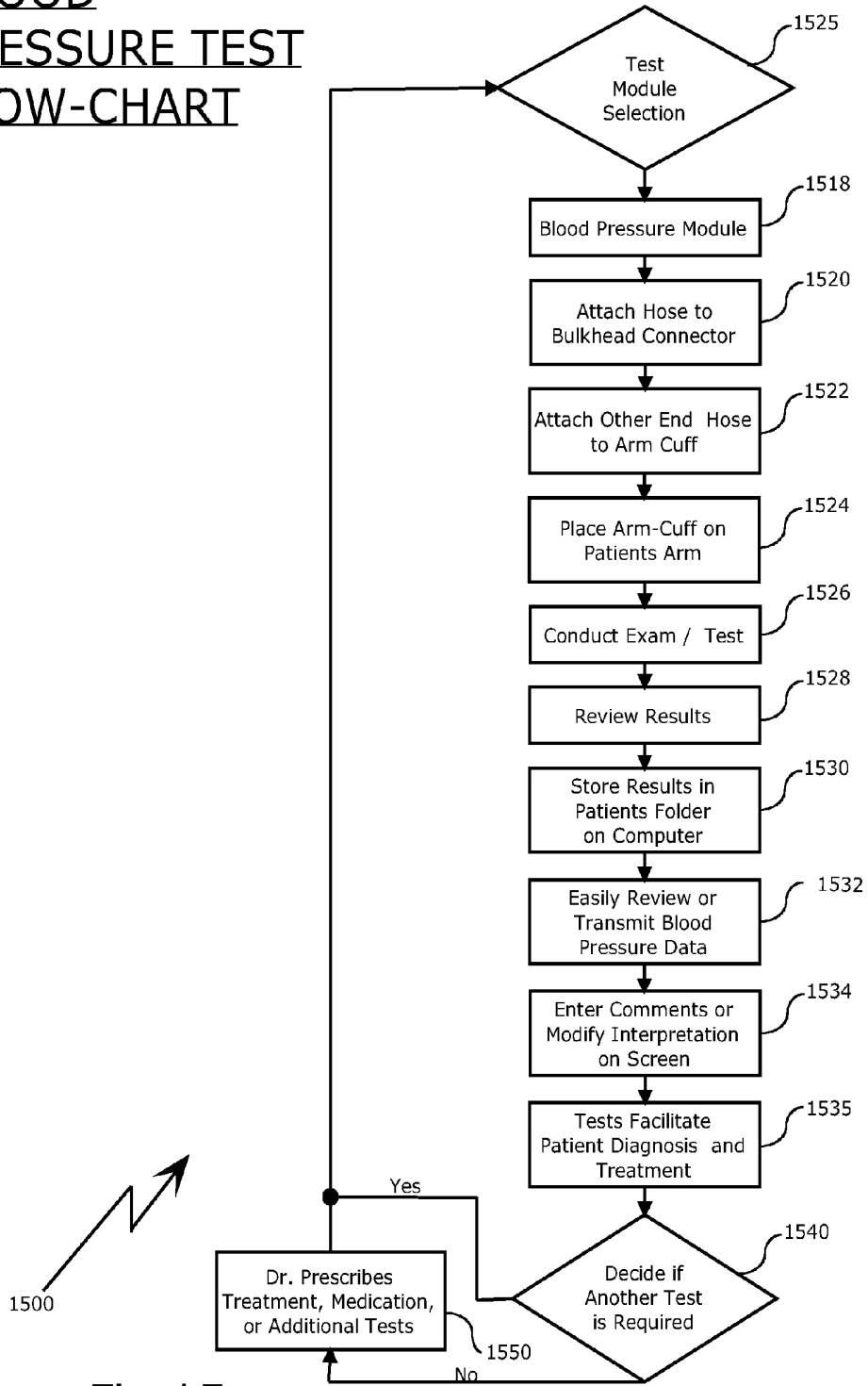


Fig. 15

AD HOC MODULES

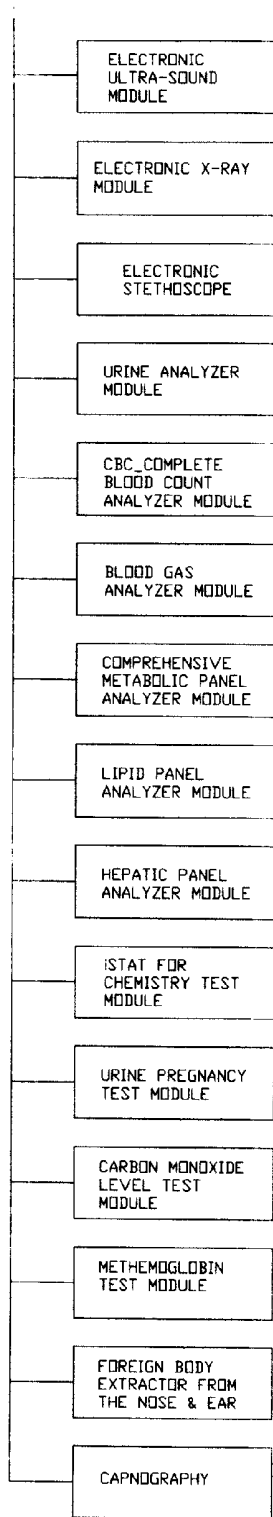


Fig. 16

INTEGRATED PORTABLE MEDICAL DIAGNOSTIC SYSTEM

RELATED PRIORITY DOCUMENT

[0001] This application is related to U.S. Provisional application No. 61/572,643 filed on Jul. 20, 2011 entitled, "Integrated Portable Medical Diagnostic System" by the same inventor and applicant Dr. Stephen Teni Ayanruoh who claims priority therefrom.

BACKGROUND

[0002] This invention relates generally to methods, devices and system for patient diagnostics and tests for use by medical personnel when making house calls or emergency ambulance service or any triage site of temporary and/or emergency medical services in case of natural or manmade catastrophe, especially in remote and rural areas where the Doctor Patent ratio is greater than 1:100,000. It comprises a plurality of hardware and software modules in a suitable self-contained integrated suitcase complete with its own power supply, communications interface and a personal computer or microprocessor or equivalent electronic discrete logic circuits. It is also known by its three trademark names "Hospital-in-a-Box", RKRuskat (Stylized) and Scomet.

THE PROBLEM

[0003] The problem with prior art diagnostic systems is that they are not suitable for house calls and concomitant diagnostic testing and data collection, processing and recording and communications with main frames of the hospital or primary computer of the physicians. The prior art devices are also neither modular nor user friendly nor flexible enough to permit various permutations and combinations of test at will and on demand that a patient may require or the exigencies of the circumstances may dictate.

THE SUMMARY

[0004] The inventor's motivation for this invention is grounded in his healthcare philosophy in his own words, "It is the right of every citizen of the world irrespective of their color, race, political affiliations, religion, sexual orientations or sex should have access to basic comprehensive health care. I am also trying to increase the productivity and efficiency of doctors in the developing world with Hospital-In-a-Box because the ratio of their doctors to their population is about 3:200,000" The invention is an improvement over stationary medical diagnostic systems. It comprises methods, devices and system for patient diagnostics and tests for use by medical personnel when making house calls or emergency ambulance service especially at triage or other natural or manmade catastrophic sites for saving lives and restoring injured or otherwise inflicted patients to good health. It comprises a plurality of hardware and software modules in a suitable self-contained suitcase complete with its own power supply, communications interface and a personal computer or microprocessor or equivalent electronic discrete logic circuits. It is also known by its three trademark names "Hospital-in-a-Box", RKRuskat (Stylized) and Scomet.

PRIOR ART

[0005] A formal preliminary prior art patentability and novelty search was neither conducted nor commissioned, but

the inventor is not only a credentialed Doctor of Medicine but also at the cutting edge of this technology and therefore is intimately familiar with the prior art. No prior art exists to match the functionality and user friendliness of the present invention. Accordingly none of the prior art devices singly or even in combination provides all of the features and objectives established by the inventor for this system as enumerated below.

[0006] The best that can be obtained in prior art is partial solutions which are complicated, cumbersome, burdensome, expensive and impractical. This application at bar is the most cost effective solution to the problem since the physicians stopped making house calls.

OBJECTIVES

- [0007]** 1. It is an objective of this invention to provide methods, devices and system for an integrated portable medical diagnostic system to serve as a Hospital-in-a-Box.
- [0008]** 2. Another objective of this invention is that it be particularly suitable for providing emergency competent and professional medical services at triage or other emergency man made or natural disaster sites.
- [0009]** 3. Another object of this invention is that it be capable of handling mass casualties, large number of patients efficiently even in rural or otherwise hard to reach areas.
- [0010]** 4. Another objective of this invention is that all sensors and transducers, modules and subsystems be plug compatible.
- [0011]** 5. Another objective of this invention is to compensate for the ageing of the components and subsystems of the system.
- [0012]** 6. Another objective of this invention is that the functionality of the system is not compromised in any manner including ergonomics, user-friendliness, and result for each mode of operation.
- [0013]** 7. Another objective of this invention is having all desired functions embedded and be intuitive as well as clearly visible when enabled.
- [0014]** 8. Another objective of this invention is that it be energy efficient.
- [0015]** 9. Another objective of this invention is that it is easy to use even intuitive that requires little additional training if any.
- [0016]** 10. Another objective of this invention is that it be environmentally friendly to prevent spread of disease(s) being cured.
- [0017]** 11. Another objective of this invention is that it be made of modules standard parts easily interface-able to each other.
- [0018]** 12. Another objective of this invention is that it is capable of accommodating new modules as needs change and new technologies become available for curing new disease(s) or afflictions.
- [0019]** 13. Another objective of this invention is that new modules can be added via a USB (Universal Serial Bus) or other portal of duplex medical data and information exchange.
- [0020]** 14. Another objective of this invention is that the database can be shared with a plurality of devices and networks of different types with no or little additional simple interface(s).

- [0021] 15. Another objective of this invention is that it meets all federal, state, local and other private standards, guidelines and recommendations with respect to safety, environment, and quality and energy consumption.
- [0022] 16. Another objective of this invention is that it be elegantly simple in concept and design.
- [0023] 17. Another objective of this invention is that it be suitable for use with all types of patients regardless of the handicap of the patient.
- [0024] 18. Another objective of this invention is that it be easy to assemble, service, transport and store.
- [0025] 19. Another objective of this invention is that it be useable in all types of locations including ambulance, home, schools, work, office, shop floor, factory floor triage and other emergency sites in times of need at short notice even in remote and hard to reach venues, nations, continents and space colonies etc.
- [0026] 20. Another objective of this invention is that it be user friendly and patient transparent.
- [0027] 21. Another objective of this invention is that it lends itself to multiple uses.
- [0028] 22. Another objective of this invention is that it be reliable such that it practically never fails and requires little or no maintenance.
- [0029] 23. Another objective of this invention is that it be made from biodegrade materials to the extent practical and cost effective.
- [0030] 24. Another objective of this invention is that it be long lasting with high MTBF (Mean Time Between Failures) made from durable material,
- [0031] 25. Another objective of this invention is that it have small foot print
- [0032] 26. Another objective of this invention is that it have lower life cycle cost.
- [0033] 27. Another objective of this invention is numerous medical instrument modules are packaged and integrated into a single portable carrying case which is easy to roll as well as easy to carry on non-roll able surfaces to reposition at or near patient/doctor table(s) and platforms.
- [0034] 28. Another objective of this invention is that in conjunction with a knapsack it can be used for military and remote locations.
- [0035] 29. Another objective of this invention is that it provide power options such as direct current batter power, even automobile 12 volt direct current, building alternating current power and generator power of desired voltages and currents and hence the power including means for converting one form of power to another including rectification of power at the power source and/or at the point of consumption or at the Hospital-in-a-Box itself.
- [0036] 30. Another objective of this system is Satellite modem to transfer test data wireless to central computer/ EMS service.
- [0037] 31. Another objective is to provide a Video camera scope that includes an LCD display mounted to it for ease use.
- [0038] 32. Yet another camera related objective is to provide a scope that is capable of real time video streaming & single frame capture of digital images.
- [0039] 33. Another objective of this invention Video camera scope is to incorporate an LED brightness control means on handle.
- [0040] 34. Another objective of this invention is that the video camera scope includes a focus adjustment means on handle or other portable device.
- [0041] 35. Another objective of this system is that it includes the flexibility to mount special attachment to slightly pressurize the eardrum through the specula via a hand bulb.
- [0042] 36. Another objective of this invention is that the pictures can be taken for future reference that will stay in the patient's folder for the life of the patient as permitted by the applicable privacy laws.
- [0043] 37. Another objective of this invention that the documented pictures can make it easier for the physician to determine if the patient's condition is improving satisfactorily or getting worse.
- [0044] 38. Another objective e of this invention is to provide immediate onsite real time feedback to the patient, such that the patient can view concurrently in parallel exactly what the physician is seeing on the computer screen at the same time, allowing for the patients to better understand their condition.
- [0045] 39. Another objective of this invention is to make it once again practical for physicians and other medical professionals to make house calls conveniently, affordably and cost effectively.
- [0046] 40. Another objective of this invention is to encourage Doctors to serve rural areas by providing them with means and modes for service there.
- [0047] 41. Another objective of this invention is to make American medical practice once again respectable and competitive on global basis.
- [0048] 42. Other objectives of this invention reside in its simplicity, elegance of design, ease of manufacture, service and use and even aesthetics as will become apparent from the following brief description of the drawings and the detailed description of the concept embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0049] Following is a brief description of the several views of the drawings complete with reference numerals wherein last two least significant digits represent the item (not necessarily tangible) number and the left most one or two digits represent the figure number.

[0050] a) FIG. 1A is a 3D perspective view of the Integrated Portable Medical Diagnostic System.

[0051] b) FIG. 1B is a right side view of the Hospital-in-a-Box in partially open/closed position.

[0052] c) FIG. 1C is side view of the invention in fully closed ready to roll position with retractable handle extended.

[0053] d) FIG. 2 is a system modules block diagram.

[0054] e) FIG. 3 is another somewhat more detailed rendition of the system modules block diagram of FIG. 2.

[0055] f) FIG. 4 is depicts data system block diagram.

[0056] g) FIG. 5 shows power sub-system block diagram

[0057] h) FIG. 6 is a flow chart of doctor patient interface.

[0058] i) FIG. 7 is a video interface flow chart.

[0059] j) FIG. 8 delineates EKG test flow chart.

[0060] k) FIG. 9 depicts flow of spirometer test.

[0061] l) FIG. 10 is flow chart of the pulse and oximeter test.

[0062] m) FIG. 11 outlines the nebulizer interface flow chart.

[0063] n) FIG. 12 is a rendition of an electronic weight flow chart diagram.

[0064] o) FIG. 13 is a glucose test flow chart for diabetic patients.

[0065] p) FIG. 14 is an arterial temperature test flow chart.

[0066] q) FIG. 15 shows blood pressure test data and information flow chart.

[0067] r) FIG. 16 is an enumeration of ad hoc test modules interfaced via USB.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0068] The following is a brief description of the several views of the drawings complete with reference numerals wherein last two least significant digits represent the item (not necessarily tangible) number and the left most one or two digits represent the figure number.

[0069] FIG. 1A is a 3D perspective view of the Integrated Portable Medical Diagnostic System suitcase 99 for housing a plurality of modules, convenient carrying handle 98, stability feet 97 and an extendable-retractable handle for rolling and carrying ease. The system is shown complete with computer display 112 and for housing plurality of modules as well as room for expansion and option of adding external modules through a USB port 154 provided for this purpose.

[0070] FIG. 1B is a right side view of the Hospital-in-a-Box 100 in partially open/closed position. The display 112 (not visible in this view) is on the underside of the cover of aluminum suitcase 9. The Keyboard 119 is also shown in partially closed position. The dimensions of the Hospital-in-a-Box are such that the keyboard and the display do not interfere with operation of the HIB.

[0071] FIG. 1C is side view of the invention in fully closed ready to roll position with retractable handle 101 extended. As is evident from this figure the travel friendly design of the Hospital-in-a-Box includes a telescoping retractable handle 101 which is mounted to the bottom of the aluminum case 99. In the preferred embodiment the inventor utilized wheels directly to the case edge with dimensions such that adjustable stability pads 97 and wheels 96 do not interfere with proper operation of each.

[0072] FIG. 2 is a system modules block diagram shown complete with alternating current power line receptacle 202, Direct current power supply charger 204, rechargeable battery pack 205, charger for video camera 206, Switch to Battery 207, switch to alternating current on-site power source 208, Embedded computer internal battery 210 as source of direct current, video camera 216, EKG module 220, PB (Blood Pressure) Module 222, Spirometer 230, Pulse oximeter 240, glucose testing module 260 and arterial thermometer 280 for measuring temperature. Also interfaced to the embedded computer are urine analyzer module 261, CBC complete Blood count analyzer module 262, Blood gas analyzer module 263, comprehensive metabolic panel analyzer module 264, Lipid panel analyzer module 265, and Hepatic panel analyzer module 266.

[0073] In addition electronic weighing scale 270, electronic ultrasound module 290, electronic X-Ray module 295 and electronic stethoscope are used on ad hoc basis via the USB interface as they are either bulky or the medical professionals prefer to have the device (such as the stethoscope) on their person for EZ plug in and plug out.

[0074] FIG. 3 is another somewhat more detailed rendition of the system modules block diagram of FIG. 2 delineating internal battery and charger 302, power supply 305, charger for video 306, Embedded computer 310 wireless video cam-

era scope 316 and concomitant video receiver 317, arterial temperature module 318, EKG module 320, Blood Pressure module 322, Spirometer 330, Pulse & Oximeter 340, nebulizer 350, Glucose Test Module 360, electronic weighing machine 370, X-Ray module 380 and ultrasound module 390.

[0075] FIG. 4 is depicts data system block diagram shown complete with Portable computer 410 wireless video camera scope 416 and concomitant video receiver 417, arterial temperature module 418, EKG module 420, Blood Pressure module 422, Spirometer 430, Pulse & Oximeter 440, nebulizer 450, Glucose Test Module 460, electronic weighing machine 470, X-Ray module 480 and ultrasound module 490.

[0076] FIG. 5 shows power sub-system block diagram shown complete with alternating current power 501, alternating current power source 502 (when & where available), rechargeable direct current power pack battery 505, Direct current to alternating current inverter 550, and variety of other direct current sources 590 including vehicle power plug, direct current generator from chemical fuels, and local battery etc.

[0077] FIG. 6 is a flow chart of doctor patient interface shown complete with Greet patient 699, discussion of problems and symptoms 602 of the patient directly or vicariously, starting the sonnet system 604, patient information data entry 606, Doctor decides tests deemed necessary 610, Physician decides 620, if the patient should see the results concurrently in real time on the screen for the circumstances and exigencies of the subject patient, if YES face screen towards the patient 622, if NO face screen away from the patient 624 and selection 625 of the modules identified supra and initiation of the main program.

[0078] FIG. 7 is a video interface flow chart shown complete with test module selection 725, video camera scope 717, decision block 716 to ascertain whether the specula is attached directly to camera, decision block to attach 718 inflate device and specula for ear examination, conduct examination and tests 720, take pictures 722 for documentation as deemed appropriate, review results 724 with or without patient, store results in patient's folder 726, in the computer, review and transmit oximeter data 728, interpretation of tests 735 to determine patient diagnosis and treatment, decision block 740 to determine if additional tests are warranted, if YES go back to test module selection 725 and if NO prescription/script 750 for treatment, medication and additional tests as appropriate in the professional judgment of the physician in-charge as well as sharing the information with the patient and primary physician if the case so admits.

[0079] FIG. 8 delineates EKG test flow chart shown complete with decision block 825 for test module selection, EKG module 820, attaching patches with leads 822 to patient, conducting examination and tests 824, reviewing results 826, storing results 828, in the patient's folder in computer, review and transmission of oximeter data 830, entering comments and/or modifying interpretation 832 on screen, interpretation of tests 835 by medical professionals for diagnosis and treatment, decision block 840 to determine if additional test(s) is/are required, if YES go back to test module selection 825 supra and if NO proceed to or prescription of treatment, medication scripts and additional tests if deemed appropriate.

[0080] FIG. 9 depicts flow of spirometer test shown complete with test module selection 925, spirometer test module 930, examination and testing 932, results review 933, storage of results 934 in patients folder in computer, review or transmission of oximeter data 936, Interpretation and commentary

938, patient diagnosis and treatment **935**, decision point **940** for need for additional tests, if YES go back to test module selection block **925**, if NO treatment, medication and additional tests **950**.

[0081] FIG. 10 is flow chart of the pulse and oximeter test shown complete with test module selection **1025**, pulse and oximeter module **1010**, finger clip attachment **1012**, examination and testing **1014**, results review **1016**, storage of results **1018** in patients folder in computer, review or transmission of oximeter data **1020**, Interpretation and commentary **1022**, patient diagnosis and treatment **1035**, decision point **1040** for need for additional tests, if YES go back to test module selection block **1025**, if NO treatment, medication and additional tests **1050**.

[0082] FIG. 11 outlines the nebulizer interface flow chart shown here complete with test module selection **1125**, nebulizer machine **1135**, verify **1110** pulse oximeter test suggests attachment **1112** of disposal nebulizer and tubing, addition of medication **1114**, setting output requirements **1116**, Recheck pulse oximeter test **1118**, Interpretation and commentary **1120**, patient diagnosis and treatment **1135**, decision point **1140** for need for additional tests, if YES go back to test module selection block **1125**, if NO treatment, medication and additional tests **1150**.

[0083] FIG. 12 is a rendition of an electronic weight flow chart diagram again shown here complete with test module selection **1225**, electronic weighing scales **1270**, set up **1210** and initialization of scales **1270**, weigh patient **1212**, storage of results **1220** in patients folder in computer, Interpretation and commentary **1222**, patient diagnosis and treatment **1235**, decision point **1240** for need for additional tests, if YES go back to test module selection block **1225**, if NO treatment, medication and additional tests **1250**.

[0084] FIG. 13 is a glucose test flow chart for diabetic patients shown complete with test module selection **1325**, glucose testing module **1360**, pinch finger for blood droplet **1310**, place droplet of blood on paper strip **1312**, insert strip into digital analyzer **1314**, review results **1316**, storage of results **1318** in patients folder in computer, review and transmission of Glucose data Interpretation **1320**, add commentary **1322**, patient diagnosis and treatment **1324**, decision point **1340** for need for additional tests, if YES go back to test module selection block **1325**, if NO treatment, medication and additional tests **1350**.

[0085] FIG. 14 is an arterial temperature test flow chart shown complete with test module selection **1425**, Arterial temperature module **1418**, initiate test by depressing button on device **1420**, conduct examination and test **1422**, review of results **1424**, storage of results **1426** review and/or transmit temperature data **1428**, in patients folder in computer, Interpretation and commentary **1430**, patient diagnosis and treatment **1435**, decision point **1440** for need for additional tests, if YES go back to test module selection block **1425**, if NO treatment, medication and additional tests **1450**.

[0086] FIG. 15 shows blood pressure test data and information flow chart shown complete with test module selection **1525**, Blood Pressure Module **1518**, attach hose to Bulkhead connector **1520**, attach other end of hose to arm cutoff **1522**, position arm cuff on patient's arm, **1524** conduct examination and test **1526**, review of results **1528**, storage of results **1530** review and/or transmit temperature data **1532**, in patients folder in computer, Interpretation and commentary **1534**, patient diagnosis and treatment **1535**, decision point **1540** for

need for additional tests, if YES go back to test module selection block **1525**, if NO treatment, medication and additional tests **1550**.

[0087] FIG. 16 is an enumeration of supplemental test modules to be used on ad hoc need basis generally but not necessarily via Universal Serial Bus portal. The inventor's intention here is to incorporate standard existing medical device modules with accompanying software so that no one but OEM (Original Equipment Manufacturer of the module would have the responsibility, burden and liability of developing the medical device modules and associated operating software. The software has tested and approved algorithms that interpret the results. For example: many years of work have gone into the EKG system and the software that interprets the signals received from the sensors. We want to use each individual module and document the results into our database.

[0088] An embedded computer stores all the required software for each module, displays the acquired patient results for physician review and stores these results into the patient's folder on the hard drive. Numerous patients can be evaluated and their medical histories, diagnostic and examination results can be stored on the computer's hard drive until it is convenient to upload the data to a central computer to synchronize all the test and patient information between this portable Medical Diagnostic System, (IPMDS) and the control computer. As an option, the data can be transmitted via a satellite modem to transfer the test data wireless to a central computer and/or EMS service for medical support. The system can operate on AC power or battery power for remote locations.

[0089] The main operating system software program can also be used as a stand-alone program to help the physician in making diagnostic decisions on patients. As the physician types in appropriate keywords the program leads him or her into a support menu describing symptoms in detail to support the findings. The program can also cross reference similar symptoms to help determine the patient's condition and list recommended practices, possible additional testing and medications.

[0090] Typically the use of the system for each patient comprises at least one test from a group consisting of:

- [0091]** a) Electronic Digital Weighing Machine,
- [0092]** b) Temperature using arterial thermometer,
- [0093]** c) Blood Pressure,
- [0094]** d) Glucose test module,
- [0095]** e) EKG,
- [0096]** f) Electronic X-Ray Module,
- [0097]** g) Electronic Ultrasound Module,
- [0098]** h) Nebulizer Machine Module,
- [0099]** i) Pulse Oximeter,
- [0100]** j) Spirometer,
- [0101]** k) Camera & Video-Scope,
- [0102]** l) a glucose Module, and
- [0103]** m) an ultrasound module,
- [0104]** n) Electronic Stethoscope,
- [0105]** o) Urine Analyzer Module including Urine Pregnancy Test Module,
- [0106]** p) CBC Complete Blood Count Analyzer,
- [0107]** q) iStat for Blood Gas Analyzer Module,
- [0108]** r) Comprehensive Metabolic Panel Analyzer Module,
- [0109]** s) Lipid Panel Analyzer Module,
- [0110]** t) Hepatic Panel Analyzer Module,

- [0111] u) iStat for Chemistry Test Module,
 [0112] v) Carbon Monoxide Level Test Module,
 [0113] w) Methemoglobin Test Module,
 [0114] x) Ear Nose and Throat Foreign Body Extractor Module,
 [0115] y) Capnography Module, and
 [0116] z) A hand held device suitable for and use as
 [0117] (i) Disposable cover Tongue depressor,
 [0118] (ii) Colonoscopy,
 [0119] (iii) Rectoscopy,
 [0120] (iv) Cystoscopy,
 [0121] (v) Laryngoscopy; and
 [0122] (vi) Gastroscopy.
 [0123] The following are some of the special features of the preferred embodiment contemplated by the inventor.
- [0124] I. Video camera scope Features:
 [0125] a) Specula attaches for ear, throat & nose examinations
 [0126] b) Capable of applying light pressure to the eardrum via special adapter, specula and inflation bulb
 [0127] c) Wired & wireless versions with an LCD display
 [0128] d) Video camera has the capability of real time video streaming & snapshots.
 [0129] e) Modified camera to vary the LED brightness, designed circuit & installed potentiometer on handle for thumb control.
 [0130] f) Modify the video camera scope by mounting a LCD display to it in order for the physician to get real time feedback via this display as to the location of the specula thereby reducing the possibility of injury during an examination.
 [0131] g) Two versions for the video camera are version 1 which is hard-wired and version 2, which has a wireless transmitter and receiver. Both versions are capable of displaying images on both the computer and LED scope display concurrently.
 [0132] h) Video camera scope has an LCD display mounted to it for ease use
 [0133] i) Video camera scope is capable of real time video streaming & single frame capture of digital images.
 [0134] j) Video camera scope has LED brightness control knob on handle
 [0135] k) Video camera scope has focus adjustment knob on handle
 [0136] l) Video camera scope has the ability to mount special attachment to slightly pressurize the eardrum through the specula via a hand bulb
 [0137] m) Pictures may be taken for future reference that will stay in the patient's folder
 [0138] n) Documented pictures can make it easier for the physician to determine if the patient's condition is getting worse
 [0139] o) Immediate feedback to the patient, they can view exactly what the physician is seeing on the computer screen real time, allowing for the patient to better understand their condition.
- [0140] II. EKG module Features:
 [0141] a) Portable 12-channel electrocardiograph
 [0142] b) Simultaneous real-time waveform viewing
 [0143] c) Performs quick tests or standard tests
 [0144] d) Optional narrative interpretation
 [0145] e) Easily review, transmit and/or export EKG data
 [0146] f) Enter comments, modify and/or confirm interpretation on screen
- [0147] III. Spirometer module Features:
 [0148] a) Portable Spirometer
 [0149] b) Easy to use data collection
 [0150] c) Real-time Flow/Volume or Volume/Time traces
 [0151] d) Disposable mouthpieces
 [0152] IV. Pulse & Oximeter Module Features:
 [0153] a) Reads & displays SpO2
 [0154] b) Reads & displays pulse rate
 [0155] c) Finger clip
 [0156] V. Blood Pressure Module Features:
 [0157] a) Oscillometric measurements for adult & neonatal applications
 [0158] b) Systolic pressure
 [0159] c) Diastolic pressure
 [0160] d) Mean arterial pressure
 [0161] e) Pulse rate
 [0162] f) Automatic cuff inflation
 [0163] g) Automatic cuff overpressure detection
 [0164] h) Supplied with motion insensitive software
 [0165] VI. Arterial Temperature Monitor Module Features:
 [0166] a) Noninvasive temperature measurements
 [0167] b) Measures arterial blood temperature
 [0168] VII. Glucose Testing Module Features:
 [0169] a) To detect if someone is in a diabetic shock
 [0170] b) Disposable test strips
 [0171] c) Disposable needles
 [0172] VIII. Electronic x-ray module Features:
 [0173] a) For the mouth, teeth, etc.
 [0174] b) Electronic image displayed on screen.
 [0175] c) Very sensitive sensor
 [0176] d) If technology is available we can integrate this option into the HOSPITAL-IN-A-BOX system.
 [0177] IX. Electronic Ultra-Sound Module Features:
 [0178] a) Electronic image displayed on screen.
 [0179] b) If technology is available we can integrate this option into the HOSPITAL-IN-A-BOX system.
 [0180] X. Features & Uses of the Hand held Module include:
 [0181] (i) Colonoscopy,
 [0182] (ii) Rectoscopy,
 [0183] (iii) Cystoscopy,
 [0184] (iv) Laryngoscopy,
 [0185] (v) Gastroscopy; and as
 [0186] (vi) Disposable cover tongue depressor,
 [0187] Similarly other modules of past, present or potential use have unique list of features which may be modified as deemed appropriate. Even simple modules like weighing scales and nebulizer module have unique features; notwithstanding this has not been an exhaustive enumeration of features.
- Assembly
 [0188] 1. Purchase and integrate the following OEM medical modules & equipment into a portable carrying case:
 [0189] a) Electronic Digital Weighing Machine
 [0190] b) Temperature using arterial thermometer
 [0191] c) Blood Pressure
 [0192] d) Glucose test module
 [0193] e) EKG (Electrocardiogram or electrocardiograph)
 [0194] f) Electronic X-Ray Module
 [0195] g) Electronic Ultrasound Module,
 [0196] h) Nebulizer Machine Module

- [0197] i) Pulse Oximeter
 [0198] j) Spirometer and
 [0199] k) Camera & Video-Scope
 [0200] Each module is securely mounted and secured within the case or on a sub-frame at its specific location. All the modules are completely wired within the case. Nothing needs to be done. It is ready to use out of the box. Attachments are connected as required. For example: to use the blood pressure module, attach the hose to the bulkhead connector supplied within the case and then attach the arm cuff to the hose. Attach to the arm and start the test. The cuff automatically inflates, takes data, deflates and displays the results.
 [0201] 2. Following additional equipment may be mounted within the case of the Hospital-in-a-Box.
 [0202] a) Hub
 [0203] b) Wireless receiver
 [0204] c) Power supplies
 [0205] d) Rechargeable battery pack
 [0206] e) Recharger for video camera scope
 [0207] f) Electrical receptacle for AC power cord
 [0208] g) Storage for EKG leads & disposable conductive self-adhesive patches
 [0209] h) Storage for Spirometer disposable tubes
 [0210] i) Storage for disposable specula's
 [0211] j) Storage for disposable latex gloves
 [0212] k) Storage for blood pressure cuff & hose
 [0213] It should be noted that for ease of use the inventor has (i) minimized & optimized all wiring and dressed to reduce space requirements. (ii) The system can operate on line while also charging the computer internal battery and video camera internal battery pack and (iii) the case and/or frame structure is organized and may have either a compartment and/or dedicated space for each module.
 [0214] 3. Wire-up and connect each module as required
 [0215] 4. Install computer sub-frame or shelf
 [0216] 5. Install compartment dividers
 [0217] 6. Install computer securely into case or sub-frame
 [0218] 7. Install software programs into the computer for each module
 [0219] 8. Assign communication ports for each module to handshake and operate
 [0220] 9. Set-up Icon's and shortcuts for ease of use
 [0221] 10. Install disposable items in storage areas or a separate case may be utilized for disposals

Alternate Embodiments

[0222] At this time the inventor does not anticipate alternate embodiments beyond the scope of this disclosure and the variation enumerated under the sub-heading of "INVENTOR CONTEMPLATED VARIATIONS" infra but reserves the right to add alternate embodiments when the non-provisional utility application is filed. The inventor applicant also reserves the right to replace any subsystem or module with equivalent functionality for example inventor may replace the personal computer with a microprocessor or equivalent discreet logic function electronic circuits.

Use & Operation

[0223] The operation and use of this device is simple and even intuitive. The device operates as an Integrated Portable Medical Diagnostic System, (IPMD Also known by its three trademark names HOSPITAL-IN-A-BOX, RKRuskat (Styl-

ized) and SCOMET. While the use is obvious and intuitive, the inventor recommends the following sequence of steps.

- [0224] 1. Open Hospital-in-a-Box case
 [0225] 2. Decide if you want line power or battery power
 [0226] 3. Put power switch to the appropriate position
 [0227] 4. If line power is selected, connect power cord to the receptacle on the back of the case.
 [0228] As an option, a portable self-contained rechargeable battery system mounted within a separate carrying case and may include a suitable Dc to Ac inverter to supply AC power. This system can be plugged into the receptacle on the HIB (Hospital-in-a-Box) case.
 [0229] This rechargeable system can be recharged from the AC line or from a standard vehicle 12-volt cigarette lighter/power socket. The vehicle power source can recharge the battery pack while also supplying power to the HOSPITAL-IN-A-BOX system. As a further option the HOSPITAL-IN-A-BOX system can be powered via an extension wire from the rechargeable system while the rechargeable system is located within the vehicle and plugged into the vehicle 12-volt cigarette lighter/power socket producing unlimited operation as long as the vehicle engine is running.
 [0230] If battery power is selected, connect the self-contained portable rechargeable battery and inverter system to the HOSPITAL-IN-A-BOX system receptacle with the appropriate power cord.
 [0231] As another option, the HOSPITAL-IN-A-BOX system can contain the rechargeable batteries internally and may also contain the inverter, which will allow the system to be automatically operated on battery power.
 [0232] 5. Start up computer and wait for it to completely boot up.
 [0233] 6. Choose the medical device required for the patient test & remove the sensor and any disposal attachments that might be required from the case.
 [0234] 7. Start the main program by clicking on the appropriate Icon on the computer screen
 [0235] 8. When the program starts, follow directions to perform the test on the patient
 [0236] 9. At end of patient test, save results to the hard-drive in the patient's folder, add comments as required in appropriate areas.
 [0237] 10. Use video camera scope to view internal ear, nose, eye, etc. and also document the patient's condition, such as contusions, etc. and save digital images (snapshots) to the patient's folder.
 The following examples delineate special customized instructions for the modules discussed infra.
 [0238] 1. Oximeter Measurement
 [0239] 1. Select Oximeter Icon
 [0240] 2. Select OK at message "this version is for evaluation only"
 [0241] 3. Open Comm. port
 [0242] 4. Put on finger sensor
 [0243] 5. Select Comm. Port #1
 [0244] 6. Select OK.
 [0245] 7. Read and watch readings.
 [0246] 8. When satisfied:
 [0247] 9. File, (upper left hand corner)
 [0248] 10. Begin capture, (F12)
 [0249] 11. Save data to C: Data
 [0250] 12. Data starts capturing
 [0251] 13. Save data
 [0252] 14. Close Communication port

- [0253] 15. Exit program.
- [0254] II. SPIROMETER MEASUREMENT
- [0255] 1. Select Spirometer Icon
- [0256] 2. Select OK to save settings reminder
- [0257] 3. Select Data, upper tool bar
- [0258] 4. Add New Patient
- [0259] 5. Fill out form
- [0260] 6. Highlight patients name
- [0261] 7. Select new examination
- [0262] 8. Comment on medication if required
- [0263] 9. Message does not apply, select OK
- [0264] 10. Blow into instrument twice
- [0265] 11. Accept/Done or Reject
- [0266] 12. Select File
- [0267] 13. Save As
- [0268] 14. Enter name
- [0269] 15. Save data
- [0270] III. EKG:
- [0271] 1. Select EKG Icon.
- [0272] 2. Choose patients name or
- [0273] 3. File
- [0274] 4. New
- [0275] 5. Fill out patient form
- [0276] 6. Highlight patients name
- [0277] 7. Select EKG Icon from toolbar
- [0278] 8. Run EKG
- [0279] 9. Save data as required
- [0280] IV. Video Camera/Scope
- [0281] 1. Select camera Icon
- [0282] 2. Turn camera on by using the upper switch.
Hold switch down until an image appears on the LCD display
- [0283] 3. Full screen, Double click left mouse
- [0284] 4. To reduce screen, Double click left mouse again
- [0285] 5. To take picture, momentarily press the upper switch down
- [0286] 6. Camera stacks up to ten pictures internally
- [0287] 7. To download picture into the computer
- [0288] a) Use the lower switch to scroll through the pictures one at a time by pushing the lower switch up.
- [0289] b) When the desired picture is on the LCD display use the mouse to click the Camera Icon on the wood frame
- [0290] c) Select Save
- [0291] d) Select Path, (my documents, my pictures)
- [0292] e) Enter File name
- [0293] f) Save
- [0294] g) Close the Save window
- [0295] h) To exit camera mode, select yellow arrow, (lower right side of wood frame)
- [0296] i) To return camera to real time, momentarily press upper switch down
- [0297] j) To save additional pictures go back to step 8 and repeat sequence as required.
- [0298] V. Temperature Measurement
- [0299] 1. With probe flush on the center of the forehead, depress button and keep this button depressed.
- [0300] 2. Slowly slide probe across the forehead into the hairline.
- [0301] 3. Place probe on head behind the earlobe.
- [0302] 4. Release the button when the LED temperature numbers stabilize.
- [0303] 5. Remove probe from the head.

- [0304] 6. A document patient temperature reading manually until software program is developed.
- [0305] VI. Blood Pressure Metric
- [0306] 1. Select Blood pressure Icon on screen
- [0307] 2. Connect hose to cuff and install cuff on arm
- [0308] 3. Insert hose into bulkhead connector
- [0309] 4. Start BP measurement.
- [0310] 5. When Reply is shown as below, (Right side of screen)
- [0311] 6. Reply O
- [0312] 7. Reply K
- [0313] 8. Select Get BP data
- [0314] 9. Select Read data
- [0315] 10. Read and analyze data
- [0316] 11. Document patient blood pressure readings manually until software program are developed.

Inventor Contemplated Variations

[0317] The basic concept of Integrated Portable Medical Diagnostic System disclosed here would be difficult to design around. The inventor has given a non-limiting description of this invention. Due to the simplicity and elegance of the design of this invention designing around it is very difficult if not impossible. The concept of Hospital-in-a-Box System disclosed here would be difficult to design around. Nonetheless many changes may be made to this design without deviating from the spirit of this invention. Examples of such contemplated variations include the following:

- [0318] 1. The value and the tolerance of various electronic components may be modified.
- [0319] 2. The suitcase box may be built with newer materials, technologies and processes as they become available.
- [0320] 3. The PCB and its conductors can be made of different materials as they become available due to the technological progress in polymer chemistry
- [0321] 4. Design a small dedicated computer to replace the laptop
- [0322] 5. Design a computer program to operate the complete system as mentioned above on a handheld palm type computer. This software would probably have to be compatible with Windows CE and then software and drivers would need to be written for all the medical device modules that operate on Windows.
- [0323] 6. Decrease the overall size of the case and/or modules
- [0324] 7. Integrate different modules with different functions
- [0325] 8. Design a computer motherboard to support all the functions of the various modules and develop the required software within one or multiple operating programs
- [0326] 9. The system may be upscaled or downscaled in size, weight, ease of use, cost, etc.
- [0327] 10. Design a solar powered rechargeable battery system that is integrated into the HOSPITAL-IN-A-BOX system.
- [0328] 11. The value and the tolerance of various electronic components may be modified.
- [0329] 12. The system or any part of it may be built with newer materials, technologies and processes as they become available.
- [0330] 13. The number and types of modules and tests may be varied.

- [0331] 14. The PCB and its conductors can be made of different materials as they become available due to the technological progress in polymer chemistry
- [0332] 15. Additional complimentary and complementary functions and features may be added.
- [0333] 16. A more economical or an upscale version of the device may be adapted.
- [0334] 17. Numerous medical instrument modules are packaged and integrated into a single portable carrying case or a knapsack can be used for military and remote location use.
- [0335] 18. Portable HOSPITAL-IN-A-BOX system operates from the AC line or, from the portable rechargeable battery pack integrated with a Dc to Ac inverter or, from a vehicle 12-volt cigarette lighter/power socket powering the portable rechargeable battery pack and inverter system.
- [0336] 19. Satellite modem to transfer test data wireless to central computer/EMS service.
- [0337] 20. Video camera scope has an LCD display mounted to it for ease use
- [0338] 21. Video camera scope is capable of real time video streaming & single frame capture of digital images.
- [0339] 22. Video camera scope has LED brightness control knob on handle
- [0340] 23. Video camera scope has focus adjustment knob on handle
- [0341] 24. Video camera scope has the ability to mount special attachment to slightly pressurize the eardrum through the specula via a hand bulb
- [0342] 25. Pictures may be taken for future reference that will stay in the patient's folder as documented pictures can make it easier for the physician to determine if the patient's condition is getting worse
- [0343] 26. Immediate feedback to the patient, they can view exactly what the physician is seeing on the computer screen real time, allowing for the patient to better understand their condition.
- [0344] 27. Additional complimentary and complementary functions and features may be added.
- [0345] 28. A more economical or an upscale version of the device may be adapted.
- [0346] 29. Other modules as they become available may be interfaced to this system via the USB port
- [0347] 30. Other changes such as aesthetics and substitution of newer materials as they become available, which substantially perform the same function in substantially the same manner with substantially the same result without deviating from the spirit of the invention may be made.
- [0355] 119=Fold over keyboard
- [0356] 152=Power Receptacle Socket
- [0357] 154=USB port
- [0358] 200=Embodiment of FIG. 2 generally
- [0359] 202=Alternating current power line receptacle
- [0360] 204=Direct current power supply charger
- [0361] 205=Rechargeable battery pack
- [0362] 206=Charger for video camera
- [0363] 207=Switch to Battery
- [0364] 208=Switch to alternating current on-site power source
- [0365] 210=Portable computer internal battery as source of direct current
- [0366] 216=Video camera & Scope
- [0367] 220=EKG module
- [0368] 222=PB (Blood Pressure Meter)
- [0369] 230=Spirometer
- [0370] 240=Pulse oximeter
- [0371] 260=Glucose Test Module
- [0372] 261=Urine analyzer module including urine pregnancy test
- [0373] 262=CBC complete Blood count analyzer module
- [0374] 263=Blood gas analyzer module
- [0375] 264=Comprehensive metabolic panel analyzer module
- [0376] 265=Lipid panel analyzer module
- [0377] 266=Hepatic panel analyzer module
- [0378] 270=Electronic weighing scale
- [0379] 280=Arterial thermometer for measuring temperature.
- [0380] 290=Electronic Ultrasound Module
- [0381] 295=Electronic X-Ray Module
- [0382] 296=Electronic Stethoscope
- [0383] 300=Embodiments of FIG. 3 generally
- [0384] 302=Internal battery and charger 30
- [0385] 305=Power supply
- [0386] 306=Charger for video
- [0387] 310=Portable computer
- [0388] 316=wireless video camera scope
- [0389] 317=Video receiver
- [0390] 318=Arterial temperature module
- [0391] 320=EKG module
- [0392] 322=Blood Pressure module
- [0393] 330=Spirometer
- [0394] 340=Pulse & Oximeter
- [0395] 350=Nebulizer Machine Module
- [0396] 360=Glucose Test Module
- [0397] 370=Electronic weighing machine
- [0398] 380=X-Ray module
- [0399] 390=Ultrasound module
- [0400] 400=Embodiment of FIG. 4 generally
- [0401] 410=Portable computer
- [0402] 416=Wireless video camera scope
- [0403] 417=Video receiver
- [0404] 418=Arterial temperature module
- [0405] 420=EKG module 420
- [0406] 422=Blood Pressure module
- [0407] 430=Spirometer 430
- [0408] 440=Pulse & Oximeter
- [0409] 450=Nebulizer Module
- [0410] 460=Glucose Test Module
- [0411] 470=Electronic weighing machine
- [0412] 480=X-Ray module

REFERENCE NUMBER CONCORDANCE

[0348] Following is a listing of the components uses in this embodiment arranged in ascending order of the reference numerals for ready reference of the reader.

- [0349] 97=HIB Stability Pads
- [0350] 98=Convenient carrying handle
- [0351] 99=Integrated Portable Medical Diagnostic System suitcase
- [0352] 100=HIB Embodiment of FIG. 1 generally
- [0353] 101=Telescopic Pull-out & Retractable handle for rolling HIB
- [0354] 112=Display

- [0413] 490=Ultrasound Module 490.
 [0414] 500=Embodiment of FIG. 5 generally
 [0415] 501=Alternating current power
 [0416] 502=Alternating current power source (if when & where available)
 [0417] 505=Rechargeable direct current power pack battery
 [0418] 550=Direct current to alternating current inverter
 [0419] 590=Variety of other direct current sources including vehicle power plug, direct current generator from chemical fuels & local battery etc.
 [0420] 600=Embodiment of FIG. 6 generally
 [0421] 602=Discussion of problems and symptoms of the patient directly or vicariously
 [0422] 604=Starting the sonnet system
 [0423] 606=Patient information data entry
 [0424] 610=Doctor decides tests deemed necessary for each patient on a case by case basis.
 [0425] 620=Physician decides if whether and when the patient should see the results concurrently in real time on the screen for the circumstances and exigencies of the subject patient, if YES face screen towards the patient 622, if NO face screen away from the patient 624 and selection 625 of the modules identified supra and initiation of the main program.
 [0426] 699=Greet Patient
 [0427] 700=Embodiment of FIG. 7 generally
 [0428] 716=Video camera scope decision block
 [0429] 717=Verification to ascertain whether the specula is attached directly to camera
 [0430] 718=Decision block to Inflate device and specula for ear examination
 [0431] 720=Conduct examination and tests
 [0432] 722=Take pictures for documentation as deemed appropriate
 [0433] 724=Review Results with or without patient
 [0434] 726=Store results in patient's folder in the computer
 [0435] 728=Review and transmit oximeter data
 [0436] 735=Interpretation of tests to determine patient diagnosis and treatment
 [0437] 740=Decision block to determine if additional tests are warranted
 [0438] 750=Prescription/script for treatment, medication and additional tests
 [0439] 800=Embodiment of FIG. 8 generally
 [0440] 825=Decision block for test module selection
 [0441] 820=EKG module
 [0442] 822=Attaching patches with leads to patient
 [0443] 824=Conducting examination and tests
 [0444] 826=Reviewing results
 [0445] 828=Storing results in the patient's folder in computer
 [0446] 830=Review and transmission of oximeter data
 [0447] 832=Entering comments and/or modifying interpretation on screen display screen
 [0448] 835=Interpretation of tests by medical professionals for diagnosis and treatment
 [0449] 840=Decision block to determine if additional test(s) is/are required or deemed appropriate
 [0450] 900=Embodiment of FIG. 9 generally
 [0451] 925=Test module selection
 [0452] 930=Spirometer test module
 [0453] 932=Examination and testing
 [0454] 933=Review of results
 [0455] 934=Storage of results in patients folder in the computer
 [0456] 936=Review and/or transmission of oximeter data
 [0457] 938=Interpretation and commentary
 [0458] 935=Patient diagnosis and treatment
 [0459] 940=Decision point to ascertain need for additional tests
 [0460] 950=Treatment, medication and additional tests.
 [0461] 1000=Embodiment of FIG. 10 generally
 [0462] 1010=Pulse and oximeter module
 [0463] 1012=Attachment of Finger clip
 [0464] 1014=Examination and testing
 [0465] 1016=Results review
 [0466] 1018=Storage of results in patients folder in the patient computer
 [0467] 1020=Review or transmission of oximeter data
 [0468] 1022=Interpretation and commentary
 [0469] 1025=Test module selection decision block
 [0470] 1035=Patient diagnosis and treatment
 [0471] 1040=Decision point for need for additional tests
 [0472] 1050=Treatment, medication and additional tests
 [0473] 1100=Embodiment of FIG. 11 generally
 [0474] 1110=Verification that pulse oximeter tests suggest nebulizer
 [0475] 1112=Attachment of disposal nebulizer and tubing
 [0476] 1114=Addition of medication
 [0477] 1116=Setting output requirements
 [0478] 1118=Recheck pulse oximeter test
 [0479] 1120=Interpretation and commentary
 [0480] 1125=Test module selection decision block
 [0481] 1135=Patient diagnosis and treatment on Nebulizer machine module
 [0482] 1140=Decision point to ascertain need for additional tests
 [0483] 1150=Treatment, medication and additional tests
 [0484] 1200=Embodiment of FIG. 12 generally
 [0485] 1210=Set up and initialization of scales
 [0486] 1212=Weigh patient
 [0487] 1220=Storage of results in patients folder in the patient computer
 [0488] 1222=Interpretation and commentary
 [0489] 1225=Test module selection decision block
 [0490] 1270=Electronic weighing scales
 [0491] 1235=Patient diagnosis and treatment
 [0492] 1240=Decision point to ascertain need for additional tests
 [0493] 1250=Treatment, medication and additional tests
 [0494] 1300=Embodiment of FIG. 13 generally
 [0495] 1312=Pinch finger for blood droplet
 [0496] 1312=Place droplet of blood on paper strip
 [0497] 1314=Insert strip into digital analyzer
 [0498] 1316=Review results
 [0499] 1318=Storage of results in patients folder in the patient computer
 [0500] 1320=Review and/or transmission of Glucose data
 [0501] 1322=Add commentary
 [0502] 1324=Patient diagnosis and treatment
 [0503] 1340=Decision point to ascertain need for additional tests
 [0504] 1350=Treatment, medication and additional tests

- [0505] 1360=Glucose testing module
- [0506] 1400=Embodiment of FIG. 14 generally
- [0507] 1418=Arterial temperature module
- [0508] 1420=Initiate test by depressing button on device
- [0509] 1422=Conduct examination and test
- [0510] 1424=Review of results
- [0511] 1425=Test module selection decision point 1
- [0512] 1426=Storage of results
- [0513] 1428=Review and/or transmit temperature data
- [0514] 1430=Interpretation and commentary
- [0515] 1435=patient diagnosis and treatment
- [0516] 1440=Decision point to ascertain need for additional tests
- [0517] 1450=Treatment, medication and additional tests
- [0518] 1500=Embodiment of FIG. 15 generally
- [0519] 1525=Test module selection decision point
- [0520] 1518=Blood Pressure Module
- [0521] 1520=Attach hose to Bulkhead connector
- [0522] 1522=Attach other end of hose to arm cutoff
- [0523] 1524=Position arm cuff on patient's arm
- [0524] 1526=Conduct examination and tests
- [0525] 1528=Review of results
- [0526] 1530=Storage of results
- [0527] 1532=Review and/or transmit temperature data in patient electronic folder
- [0528] 1534=Interpretation and commentary
- [0529] 1535=Patient diagnosis and treatment
- [0530] 1540=Decision point for need for additional tests.
- [0531] 1550=Treatment, Medication and Additional Tests

DEFINITIONS AND ACRONYMS

[0532] A great care has been taken to use words with their conventional dictionary definitions. Following definitions are included here for clarification.

- [0533] 3D=Three Dimensional
- [0534] AC=Alternating Current Power
- [0535] AD Hoc=Test modules to be added on need basis
- [0536] BP=Blood pressure Metric
- [0537] CPU=Central Processing Unit
- [0538] DC=Direct Current Power
- [0539] DIY=Do It Yourself
- [0540] EKG=Electrocardiogram
- [0541] HIB=Hospital-in-a-Box
- [0542] IC=Integrated Circuit
- [0543] I/O=Input and Output
- [0544] Integrated=Combination of two entities to act like one
- [0545] Interface=Junction between two dissimilar entities
- [0546] LCD=Liquid Crystal Display
- [0547] LED=Light Emitting Diode
- [0548] OEM=Original Equipment Manufacturer
- [0549] PB=Blood Pressure Module
- [0550] PCB=Printed Circuit Board
- [0551] Pixel=Smallest/finest resolution on a display.
- [0552] Symmetrical=The shape of an object of integrated entity which can be divided into two along some axis through the object or the integrated entity such that the two halves form mirror image of each other.
- [0553] USB=Universal Serial Bus Port or Portal

[0554] While this invention has been described with reference to illustrative embodiments, this description is not intended to be construed in a limiting sense. Various modifi-

cations and combinations of the illustrative embodiments as well as other embodiments of the invention will be apparent to a person of average skill in the art upon reference to this description. It is therefore contemplated that the appended claim(s) cover any such modifications, embodiments as fall within the true scope of this invention.

The inventor claims:

1. An Integrated Portable Medical Diagnostic System comprising;

- a) A roll able self-contained suitcase;
- b) a central processing unit as an embedded computer housed in said suitcase;
- c) a display connected to said central processing unit;
- d) plurality of storage areas connected to said central processing unit;
- e) a power module for supplying power needs of said portable medical diagnostic system;
- f) a video scope connected to said central processing unit;
- g) an EKG module interfaced to said central processing unit;
- h) a blood pressure monitor module interfaced to said central processing unit;
- i) a spirometer module interfaced to said central processing unit;
- j) a pulse and oximeter interfaced to said central processing unit; and
- k) an arterial thermometer interfaced to said central processing unit.

2. The Integrated Portable Medical Diagnostic System of claim 1 wherein said suitcase includes a retractable pull out handle and a convenient fixed carrying handle.

3. The Integrated Portable Medical Diagnostic System of claim 1 wherein said suitcase includes a power sub-system and a camera & video scope housed in said suitcase and interfaced to said central processing unit.

4. The Integrated Portable Medical Diagnostic System of claim 3 wherein said power sub-system comprises a power module with alternating current power means and rechargeable direct current power battery pack and a generator for emergency power backup.

5. An Integrated Portable Medical Diagnostic System comprising;

- a) a central processing unit as a computer;
- b) a display connected to said central processing unit;
- c) plurality of storage areas connected to said central processing unit;
- d) a video scope connected to said central processing unit; and

at least one medical module from the group consisting of:

- (i) an EKG module,
- (ii) a blood pressure monitor,
- (iii) a spirometer,
- (iv) a pulse and oximeter,
- (v) an arterial thermometer,
- (vi) arterial temperature module,
- (vii) a nebulizer
- (viii) a glucose Module
- (ix) an electronic weighing machine
- (x) An X-Ray module
- (xi) an ultrasound module; and
- e) wherein said medical module is interfaced to said central processing unit.

6. The Integrated Portable Medical Diagnostic System of claim 5 which includes at least one ad hoc medical test module from the group consisting of:

- (i) Electronic Ultra Sound Module,
- (ii) Electronic X-Ray Module,
- (iii) Electronic Stethoscope,
- (iv) Urine Analyzer Module,
- (v) CBC Complete Blood Count Analyzer,
- (vi) iStat for Blood Gas Analyzer Module,
- (vii) Comprehensive Metabolic Panel Analyzer Module,
- (viii) Lipid Panel Analyzer Module,
- (ix) Hepatic Panel Analyzer Module,
- (x) iStat for Chemistry Test Module,
- (xi) Urine Pregnancy Test Module,
- (xii) Carbon Monoxide Level Test Module,
- (xiii) Methemoglobin Test Module,
- (xiv) Ear Nose and Throat Foreign Body Extractor Module; and
- (xv) Capnography Module.

7. The Integrated Portable Medical Diagnostic System of claim 6 wherein said ad hoc module is connected to said system through a Universal Serial Bus port.

8. The Integrated Portable Medical Diagnostic System of claim 5 which includes a hand held device with at least one test selected from a group consisting of:

- (i) Colonoscopy,
- (ii) Rectoscopy,
- (iii) Cystoscopy,
- (iv) Gastrosopy,
- (v) Laryngoscopy, and as
- (vi) Tongue depressor with disposable cover.

9. The process of medical diagnosis and tests comprising the steps of:

- a) opening system carrying case;
- b) selecting alternating current line power or direct current battery power;
- c) starting central processing unit computer and waiting for it to completely boot up;
- d) choosing the medical device required for the patient test & remove the sensor and any disposal attachments that might be required from the case;
- e) initiating at least one computer program by clicking on the appropriate Icon on the computer screen;
- f) performing test protocol on the patient as directed by the instructions from the system;
- g) saving test results to the hard-drive at the end of the test in the patient's; and
- h) adding comments as required in appropriate areas.

10. The process of medical diagnosis and tests of claim 9 which includes at least one test from a group consisting of;

- (i) an EKG module,
- (ii) a blood pressure monitor module,
- (iii) a spirometer module,
- (iv) a pulse and oximeter module,
- (v) an arterial thermometer,
- (vi) arterial temperature module,
- (vii) a nebulizer,
- (viii) a glucose Module,
- (ix) an electronic weighing machine,
- (x) an X-Ray module; and
- (xi) an ultrasound module.

11. The process of medical diagnosis and tests of claim 9 which includes at least one ad hoc test from a group consisting of;

- (i) Electronic Ultra Sound Module,
- (ii) Electronic X-Ray Module,
- (iii) Electronic Stethoscope,
- (iv) Urine Analyzer Module,
- (v) CBC Complete Blood Count Analyzer,
- (vi) iStat for Blood Gas Analyzer Module,
- (vii) Comprehensive Metabolic Panel Analyzer Module,
- (viii) Lipid Panel Analyzer Module,
- (ix) Hepatic Panel Analyzer Module,
- (x) iStat for Chemistry Test Module,
- (xi) Urine Pregnancy Test Module,
- (xii) Carbon Monoxide Level Test Module,
- (xiii) Methemoglobin Test Module,
- (xiv) Ear Nose and Throat Foreign Body Extractor Module; and
- (xvi) Capnography Module.

12. The process of medical diagnosis and tests of claim 11 wherein said ad hoc module is connected to said system through a Universal Serial Bus port.

13. The process of medical diagnosis and testing of claim 9 which includes a hand held device with at least one test selected from a group consisting of:

- (vii) Colonoscopy,
- (viii) Rectoscopy,
- (ix) Cystoscopy,
- (x) Gastrosopy,
- (xi) Laryngoscopy, and as
- (xii) Tongue depressor with disposable cover.

14. The process of medical diagnosis and tests of claim 9 which entails use of a video camera scope to view internal ear, nose, eye, etc. and also document the patient's condition, such as contusions, etc. and save digital images (snapshots) to the patient's folder.

15. A process of building a portable medical diagnostic and testing system comprising the steps of:

- a) integrating five or more OEM modules from the group consisting of the following into a portable carrying case;
 - (i) an Electronic Digital Weighing Machine;
 - (ii) a temperature using arterial thermometer;
 - (iii) Blood Pressure;
 - (iv) Glucose test module;
 - (v) EKG;
 - (vi) Electronic X-Ray Module;
 - (vii) Electronic Ultrasound Module;
 - (viii) Nebulizer Machine Module;
 - (ix) Pulse Oximeter;
 - (x) Spirometer; and
 - (xi) Camera & Video-Scope
- b) optionally adding and integrating at least additional equipment from the group consisting of;
 - (i) hub;
 - (ii) wireless receiver;
 - (iii) power supply;
 - (iv) rechargeable battery pack;
 - (v) recharger for battery;
 - (vi) recharger for video camera scope;
 - (vii) electrical receptacle for AC power cord;
 - (viii) storage for EKG leads & disposable conductive self-adhesive patches;
 - (ix) storage for Spirometer disposable tubes;
 - (x) storage for disposable speculas;
 - (xi) storage for disposable latex gloves; and
 - (xii) storage for blood pressure cuff & hose: and
- c) connecting each module as directed by the instructions;

- d) installing computer sub-frame or shelf;
- e) installing compartment dividers;
- f) installing computer and all equipment selected for the configuration securely into a suitcase;
- g) installing software programs into the computer for each module selected;
- h) assigning communication ports for each module for proper hardware software interface protocol; and
- i) setting-up Icon's and shortcuts for ease of use.

16. The process of building a portable medical diagnostic and testing system of claim **15** which includes at least one ad hoc medical test module from the group consisting of:

- (i) Electronic Ultra Sound Module,
- (ii) Electronic X-Ray Module,
- (iii) Electronic Stethoscope,
- (iv) Urine Analyzer Module,
- (v) CBC Complete Blood Count Analyzer,
- (vi) iStat for Blood Gas Analyzer Module,
- (vii) Comprehensive Metabolic Panel Analyzer Module,
- (viii) Lipid Panel Analyzer Module,
- (ix) Hepatic Panel Analyzer Module,

- (x) iStat for Chemistry Test Module,
- (xi) Urine Pregnancy Test Module,
- (xii) Carbon Monoxide Level Test Module,
- (xiii) Methemoglobin Test Module,
- (xiv) Ear Nose and Throat Foreign Body Extractor Module; and
- (xvii) Capnography Module.

17. The process of building a portable medical diagnostic and testing system of claim **15** wherein said ad hoc module is connected to said system through a Universal Serial Bus port.

18. The process of building a portable medical diagnostic testing system of claim **15** which includes a hand held device with at least one test selected from a group consisting of:

- (xiii) Colonoscopy,
- (xiv) Rectoscopy,
- (xv) Cystoscopy,
- (xvi) Gastroscopy,
- (xvii) Laryngoscopy, and as
- (xviii) Tongue depressor with disposable cover.

* * * * *

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摘要(译)

一种便携式集成式独立可充电电池 (100) , 其具有安装在仪器壳体99内的AC-DC直流电池系统, 用于容纳可折叠键盘 (119) , 显示器 (112) 和多个医疗测试和处理模块。它可选地包括合适的DC到AC逆变器以提供AC电力。该系统包括至少一个USB端口 (154) , 用于临时添加外部测试和处理模块。它还包括全双工数据和信息输入, 处理 (216) , 输出和通信接口, 传感器, 传感器, 网络和其他数据/信息生成或消耗模块, 设备和子系统。它的三个商标名称是“Hospital-in-a-Box”, RK Ruskat (程式化) 和SCOMET。

