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(54) **DEVICE FOR SAMPLING BLOOD DROPLETS UNDER VACUUM CONDITIONS**

VORRICHTUNG ZUR BLUTTRÖPCHENENTNAHME UNTER VAKUUMVERHÄLTNISSEN

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Description

FIELD OF THE INVENTION

[0001] This invention relates to blood sampling and analysis.

BACKGROUND OF THE INVENTION

[0002] It has been a long-standing goal in the health care community to integrate advanced communications systems with information processing systems to provide superior medical services. Various devices have been developed that enable medical data to be obtained for improving the monitoring of medical conditions of patients thus providing an earlier warning of possible distress.

[0003] By way of example, U.S. Patent No. 4,004,577 discloses a method for treating coronary-prone patients when heart attack symptoms occur before qualified direct contact personal care can be administered. In this patent, a device provides auditory signals indicative of the existing heartbeat, and telephone communication is established between the patient and a remote center, capable of making a qualified response based on the auditory signals.

[0004] Another example is US Patent No. 4,712,562, that discloses a system and method for obtaining from a patient's body information pertaining to the patient's blood pressure and heart rate, and generates signals representative thereof in a form suitable for telephonic communication, and transmits these signals to a remote central digital processor for storage and analysis. The data resulting from the analysis is submitted to the patient or physician. Similar systems are disclosed in US Patent Nos. 3,724,455 and 5,007,429. All of the above patents disclose non-invasive measurements that are to be performed at home (typically by the patient himself). The scope of medical information that can be thus gathered from a patient and transmitted to a remote medical center is limited.

[0005] Important medical indications can be measured by blood analysis. It is known from US Patent No. 6,071,251 for example, to monitor levels of Glucose in the blood as an indication of diabetes. For diagnosing various cardiac conditions, particularly damage to the heart muscle, it is known to measure levels of Troponin T, Troponin I and Myoglobin in the blood.

[0006] Blood sampling and analyses are usually performed in a hospital or laboratory. Typically, the test is not performed by the patient himself but rather by professional personnel. The blood sample can either be analyzed immediately or, at a later time and at a different location from where it is sampled. Usually blood is drawn by vacuum by means of either a manual or automated process. The test may be performed either *in situ* or at a remote location.

[0007] The use of vacuum for blood extraction is exemplified in US Patent No. 4,396,023, which discloses an apparatus for obtaining blood samples from the tails of animals, such as mice or rats. The tail is nicked or transected and then placed in a single-use vacuum tube connected to a one-hole rubber stopper. The vacuum is communicated into the interior of the tube via a hole therein and promotes the flow of blood from the tail. When the desired volume of blood has been collected, the vacuum is turned off and the animal is removed.

[0008] The use of a vacuum for blood extraction is also exemplified in US Patent No. 5,320,607, which discloses a leech-like skin-adhesive blood sampling device comprising a sealed vacuum chamber in a state of pre-existing reduced pressure, a piercing means and means for collecting the drawn blood. However, this patent does not disclose the possibility to control the operation of the device in accordance with the quantity of the drawn blood.

[0009] In several patents to Abbot Laboratories, particularly US Patent No. 6,071,251 a method and apparatus for obtaining blood for diagnostic testing is disclosed. In the above patent, an opening in the skin is made and a vacuum is used to aid in extracting the sample of blood. The vacuum is applied to the surface of the skin in the vicinity of the opening, causing the site to become engorged with blood and the skin to become more stretched. As a result, the skin rises up to a position where it seals the vacuum chamber, after which it is pricked by a lancet assembly. The blood is then drawn to a strip capable of detecting analytes therein. The detecting strip is positioned near the site of the opening of the skin (no more than a few millimeters), so there is physical contact between the blood extracted and the strip, a minute quantity of blood being absorbed by the chemical strip and diffused through the layers thereof. To this end, a special multi-layer chemical strip must be used and the device is not suitable for use with standard chemical strips, which on the other hand, require a larger quantity of blood, typically several drops (quantities in the range of 150-200 micro-liters of blood) usually sampled in a separate process, by professional personnel. Thus, it would be of advantage, for the purpose of self-sampling and testing of blood, to utilize a common and standard chemical test strip.

[0010] US Patent No. 3,634,039 discloses a blood-testing device that enables a predetermined amount of blood to be withdrawn as a function of the number of teats to be performed. US Patent No. 5,035,865 discloses a vacuum blood sample-collecting device which includes means for measuring the amount of collected blood in the blood container. Neither patent discloses an apparatus for predetermining or measuring a small quantity of blood, such as a few drops.

[0011] Likewise, US Patent No. 6,306,104 also to Abbot Laboratories discloses a method and apparatus for obtaining a sample of blood from a patient for subsequent diagnostic tests, e.g., glucose monitoring. A blood collection device is placed over a region on the surface

of the skin from which a sample is to be obtained and a seal is formed between the blood collection device and the skin surface. A vacuum sufficient to result in the skin surface becoming stretched and engorged with blood is created and a lancing assembly is triggered causing a lancet to penetrate the skin. The lancet is retracted, blood is withdrawn toward and onto a fluid collector, and the vacuum is then released.

[0012] Here, too, no provision is made to withdraw u controlled number of drops of blood. To the contrary, it is clear from the description at col. 6, lines 14 and 31 that an unobstructed opening is formed in the skin to draw blood and this is clearly not conducive to the controlled collection of a minimal number of drops of blood.

[0013] Furthermore, it is clear from the description at col. 3, lines 24 *ff* that the blood that is released on puncturing the skin is applied directly to the detector. Thus, on the one hand an unrestricted flow of blood is permitted through an opening of the skin, and the blood is applied directly to the detector or collected in a capillary tube for subsequent analysis. It is also suggested to collect the blood in a collection zone that is integrated with a conventional diagnostic device.

[0014] US Patent No. 4,493,710 discloses a drip-rate sensing means which is included in an intravenous drip-rate controller device for use in controlling the drip rate of a solution from an intravenous container into the vein. US Patent No. 4,261,388 discloses a liquid drip-rate controller including an optical sensor for controlling the flow of fluid from an infusion fluid reservoir to an intravenous infusion site. Neither patent discloses a device capable of counting drops of blood drawn from the vein.

[0015] There is a need in the art for a device that would enable a patient to perform a blood test and analysis on his own (or with the help of a non-professional), and that would require withdrawal of only several drops of blood.

SUMMARY OF THE INVENTION

[0016] The present invention provides a blood extraction device and method for withdrawing a controlled number of drops of blood from a patient. According to one embodiment of the invention, the device comprises an incision unit for creating an incision in the patient; a release unit for urging blood drops to flow from said incision, and a disabling unit coupled to the incision unit for disabling the release unit;

characterized in that:

a collecting receptacle is disposed in spaced relationship with the release unit for collecting discrete drops blood that fall thereon; and

the disabling unit is adapted to disable the release unit when a predetermined number of discrete drops of blood have been withdrawn.

[0017] According to one aspect of the invention, the device also comprises a chemical test holder that constitutes the receptacle or is placed in the receptacle for receiving a single-use chemical test strip on which the blood drops are gathered. Alternatively, the blood may be collected in the receptacle for subsequent analysis.

[0018] The device may also comprise a camera for imaging the chemical test result obtained by the chemical test strip and an electronic circuit coupled to the camera for transmitting the resulting test data to a remote unit.

[0019] The invention provides a method for withdrawing a quantity of blood from a patient, comprising the steps of: creating an incision in the patient; urging blood drops to flow from said incision; and inhibiting blood flow;

characterized in that:

blood flows from the incision and fall on to a collection receptacle disposed in spaced relationship with the release unit for collecting discrete drops blood that fall thereon; and

said inhibiting blood flow is performed when a predetermined number of discrete drops of blood have been withdrawn.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] In order to understand the invention and to see how it may be carried out in practice, a preferred embodiment will now be described, by way of non-limiting example only, with reference to the accompanying drawings, in which:

Fig. 1 is a top perspective view of a blood sampling and testing device according to the invention;

Fig. 2 is a top perspective view of a blood sampling and testing device of Fig. 1 with the cover in "open position";

Fig. 3 is a cross-section view of the blood sampling and testing device of Figs. 1-2; and

Fig. 4 is a flow chart of the main operational steps during use of the blood sampling and testing device of Fig. 1-3.

DETAILED DESCRIPTION OF THE INVENTION

[0021] Reference is first made to **Figs. 1** and **2** showing a blood sampling and testing device **100** according to the invention. The device **100** enables a desired number of drops of blood to be drawn from a patient's finger, (typically 5-6 drops) and performs a desired chemical analysis of the blood by means of an appropriate chemical test strip.

[0022] The device **100** comprises a base **102** and a cover **104** pivotally connected to base **102** by a hinge **106**. A cover release button **108** is located in the base **102** and a pushbutton actuator **110** and an indicator **112** are located in the cover **104**. The indicator **112** may in-

clude an LCD display and LED (light emitting diode) and indicates the operational steps performed by the device **100**. A canopy **116** forms part of the cover **104**. On top of the canopy **116** there are located a finger compartment **118** and a vacuum manual release button **124.** The finger compartment **118** is covered by a finger holder **120** that is rotatably connected to the canopy **116** by a hinge **122** and can be lifted to an open position. The finger holder **120** may be resiliently biased so as to exert slight pressure on the patient's finger when inserted into the finger compartment **118**.

[0023] Reference is now made to **Fig. 2** showing a top perspective view of a blood sampling and testing device of **Fig. 1**, with the cover **104** in the "open position". Snap-holes **126** are located in the base **102** and are connected to the cover release button **108** for accommodating therein clasps **128**. A table **130** is located within the base **102** and is surrounded by a channel **132** forming an annular recess for accommodating a sealing edge **134** being the lower part of the canopy **116**. Around the outer periphery of the sealing edge **134** is attached an elastic sealing ring **135** made of silicon or the like. When the cover **104** is in its "closed position", the sealing edge **134** and the circumferential elastic sealing ring **135** are sealingly pressed into the channel **132,** thus creating a sealed chamber **115** (shown in Fig. 3) within the canopy **116** that is part of the release unit (as described below with reference to Fig. 3). An opening **131** is accessible from the surface of the table **130** and is connected to a vacuum source **160** through tubing **162** shown partially in Fig. 3. The chamber **115** within the canopy **116** can be subjected to a vacuum when the finger compartment **118** is sealed, for example by a patient's finger or other body part. On the table **130,** there is located an incision unit which comprises a motor **136**, lifting gear **138**, spring **140**, lancet holder **142** and lancet **144**. The motor **136,** lifting gear **138** and spring **140** of the incision unit are covered, so that during regular operation only the lancet holder **142** and the lancet **144** can be freely accessed.

[0024] Projecting upwardly from the table **130** is a light source **145** that operates in conjunction with an opposing an electro-optical sensor **146** so as to intercept and count drops of blood released from the patient's finger. The light source **145** and the electro-optical sensor **146** are a part of a disabling unit (as will be further described with reference to Fig. 3). Likewise, a chemical test strip holder **147** and a chemical test strip **148** are located on the table **130**. The chemical test strip holder **147** constitutes a collecting receptacle for collecting blood droplets and for accommodating therein the chemical test strip **148**. The chemical test strip **148** receives blood samples through a sample window **150** and shows the test result visually at a result window **152**. The incision unit, the light source **145**, the electro-optical sensor **146**, and the chemical test strip **148** are spatially arranged with respect to the finger compartment **118** so as to ensure that blood drops extracted from the patient's finger pricked by the lancet **144** fall on to the sample window 150, and upon falling are sensed by the electro-optical sensor **146**.

[0025] Further reference is now made to **Fig. 3**, showing a cross-section view of the blood sampling and testing device **100** in its closed position and showing more particularly the release unit including a vacuum pump **160** coupled to an electronic circuit **170** that is activated by the pushbutton actuator **110**. In this embodiment of the invention, the device **100** comprises an internal vacuum source, i.e., vacuum pump **160**. However, the device **100** can also be implemented using an external vacuum source connected to the chamber **115** by tubing. The disabling unit comprises the electro-optical sensor **146**, the light source **145** and electronic circuit **170**. The disabling unit is coupled to the release unit, and can thus release the vacuum and in consequence, cease blood extraction as soon as a desired number of drops are collected.

[0026] The device operates from a power source (not shown) that may be disposed within the base **102** or be externally coupled to the device **100**.

[0027] Also shown in Fig. 3 is an optional lens **180** optically coupled to a camera **182** (constituting an imaging device), for imaging the visual test result appearing at the result window **152** and being connected to the electronic circuit **172** for converting the image to a suitable form and transmitting it to a remote end through an electric connection (not shown). The device **100** may be coupled to another device, which receives the visual test results and transmits them via a telephone line to a remote end to the physician of the tested patient.

[0028] In a specific embodiment, the device **100** may be a portable self-test device for a cardiac patient. When using the device, the patient performs a series of preliminary steps for preparing the device, and then operates the device by depressing the pushbutton actuator **110** which activates the device to automatically perform operational steps for sampling and testing freshly drawn blood for blood enzymes that indicate a heart disorder. The results of the analysis may then be transmitted over a telephone line to a remote monitoring station, for allowing remote diagnosis of the patient's medical condition and determining if and what medical action is necessary.

[0029] By way of example, the chemical test strip may aim at testing the Myoglobin, Troponin T and Troponin I levels in a patient's blood. However, it should be understood that the device could be used with any other chemical test strip that requires a known and predefined quantity of blood, for any diagnostic purpose.

[0030] **Fig. 4** is a flow chart of the main operational steps of the blood sampling and testing device of **Figs. 1** to **3**. Operation begins with preliminary manual steps **300-315.** A typical scenario for preliminary steps **300-315** may be as follows: the patient opens the cover **104** (step **300)** and inserts a new single-use chemical test strip **148** into the chemical test strip holder **147** (step

305). The patient then inserts a sterile lancet **144** into the lancet holder **142** (step **310**), and closes the cover **104** (step **315**). It should be noted that step **310** may be carried out before step **305**. It should also be noted that it is not mandatory to perform steps **300-315** as preliminary steps directly before steps **330-370** (i.e. blood sampling), although for sterilization reasons, it is recommended to do so.

[0031] The device **100** is ready for executing the subsequent blood sampling and testing when steps **300-315** are completed. When the patient is ready, he or she places a finger over the compartment **118**, closes the finger holder **120** (step **330)** and then pushes the pushbutton actuator **110** (step **350).** This starts a sequence of steps **350-370**, carried out automatically by device **100**, as will now be explained.

[0032] The vacuum pump **160** establishes sufficient vacuum within the chamber **115** (step **350**). In response, the motor **136** is activated causing the lancet **144** to move toward the patient's finger and prick it. The lancet **144** punctures the finger skin and creates a small incision. After pricking the finger, the motor causes the extracting unit to withdraw back into its original position so as not to collide with the blood drops after they are extracted from the finger during their downward fall on to the test strip **148**.

[0033] The incision in the patient's finger that is created by the extracting unit is so small that blood cannot flow unless an external force is applied to release the blood: the vacuum achieves this by applying negative pressure, but in the absence of the vacuum, blood flow is prevented. Under vacuum conditions within the chamber **115**, blood drops are drawn from the patient's finger; and fall on to the chemical test strip **148**.

[0034] Whilst failing, the blood drops are sensed by the optical sensor **146** (step **360**). When the desired number of blood drops is sensed, the disabling unit disables the action of vacuum pump **160** so that the vacuum is released and the patient is able to move her finger (step **365**). As a consequence of the vacuum being released, blood flow ceases. Meanwhile, the chemical analysis process is executed by the chemical test strip **148**. After a fixed interval of time (say a few minutes) the result of this test is indicated visually at the result window **152** and is read by the camera **182**, converted to a suitable form by the electronic circuit **172** and transmitted to a remote unit. The operation of camera **182** and light source **145** are synchronized to illuminate result window **152** while the visual result is read.

[0035] According to one embodiment of the invention, device **100** may be coupled by a cable to a unit, which receives the visual test result and transmits it via a telephone line to a remote end to the physician of the tested patient.

[0036] According to another embodiment of the invention device **100** may be directly coupled to a telephone line for transmitting the imaged results to a remote end.

[0037] According to the above embodiment of the invention, the device **100** can establish a fixed and sufficient vacuum level within chamber **115**. However, it is possible to utilize the device **100** to establish several levels of vacuum. This creates the ability to control the rate of drop extraction by varying the vacuum level.

[0038] As exemplified above, the device **100** enables a patient to perform a self-blood test without the help of another person. However, it should be understood that the device **100** might be operated by another person, as long as the patient's finger is placed properly in the compartment **118**. According to another embodiment of the present invention, the device **100** may be operable for successive tests on different people, for example, at a first aid station. In such an embodiment, the operation of the device **100** may or may not include step **370** (i.e., reading, converting and transmitting chemical test results).

[0039] Although in the above embodiment of the invention, a lancet cuts the skin, it should be understood that the cut might be accomplished by another means such as a laser or a blast of air.

[0040] According to another embodiment of the invention, the device **100** may be used for collecting blood for subsequent analysis rather than performing an immediate chemical test. According to this embodiment, the collecting receptacle does not require the chemical test strip **148**.

[0041] The operation of the device **100** is not limited to extracting blood from a patient's finger, and any part of the human body wherein blood vessels are easy to reach may be suitable, providing that suitable suction can be applied to the organ from which blood is to be extracted. Moreover, the compartment **118** may be constructed in a way that enables placing one's whole finger inside.

[0042] Likewise, the device **100** is not limited to performing a chemical test on blood but can be utilised to perform, different chemical tests on different body fluid. samples. Thus, it is possible to perform chemical tests on urine or saliva by using a suitable chemical test strip and delivering the fluid sample through finger compartment **118**.

[0043] It is also possible to perform an additional operational step in which the light source **145** and the camera **182** are activated respectively to illuminate and read the chemical test strip **148** at the beginning of the automated steps so that the device **100** identifies the chemical test to be performed and automatically adjusts the amount of fluid drops to be collected and the time interval between collecting the fluid and reading the result. In such case, the chemical test strip **148** may be encoded with an identity of the test associated therewith, for example by means of a barcode or serial number. The disabling unit is responsively coupled to the electronic circuit **172** for control thereby, and the electronic circuit **172** is adapted to determine an identity of the chemical test strip and control the disabling unit accordingly. It will be understood that such adjustment can also be effect-

ed without the need of a camera so long as the electronic circuit **172** is able to determine the identity of the chemical test strip. Thus, in the case that a barcode is used to identify the chemical test strip, a barcode reader may be mounted inside the device for reading the barcode and conveying data indicative thereof to the electronic circuit.

Claims

1. A blood extraction device (100) for withdrawing a quantity of blood from a patient, said blood extraction device comprising:

an incision unit (136, 138, 140, 142 and 144) for creating an incision in the patient;
a release unit (160) for urging blood drops to flow from said incision, and
a disabling unit (145, 146, 170) coupled to the incision unit for disabling the release unit;

characterized in that:

a collecting receptacle is disposed in spaced relationship with the release unit for collecting discrete drops blood that freely fall thereon; and the disabling unit (145, 146, 170) is adapted to disable the release unit when a predetermined number of discrete drops of blood have been withdrawn.

2. The device according to Claim 1, wherein the collecting receptacle is a chemical test strip holder (147) for receiving a single use chemical test strip on which the blood drops are gathered.

3. The device according to Claim 2, further comprising:

an imaging device (182) for imaging the chemical test result obtained by the chemical test strip; and
an electronic circuit (172) coupled to the imaging device for transmitting data representative of an image of the result to a remote unit.

4. The device according to Claim 2, wherein:

the chemical test strip is visibly identified by a unique identity code,
the disabling unit (145, 146, 170) is responsively coupled to an electronic circuit (172) for control thereby, and
the electronic circuit (172) is adapted to determine an identity of the chemical test strip and control the disabling unit accordingly.

5. The device according to any one of Claims 1 to 4, wherein the incision unit comprises a lancet (144).

6. The device according to any one of Claims 1 to 4, wherein the incision unit comprises a laser.

7. The device according to any one of Claims 1 to 4, wherein the incision unit comprises an air blast unit.

8. The device according to any one of Claims 1 to 4, wherein the release unit (160) comprises a vacuum unit.

9. The device according to any one of claims 1 to 8, wherein the disabling unit comprises an electro-optical sensor (146) for optically sensing the number of blood drops extracted.

10. A body fluid testing device for performing chemical testing of a body fluid sample, said testing device comprising:

a chemical test strip holder (147) for receiving a single use chemical test strip on which drops of the fluid are collected;
a drop counting unit (145, 146, 170) responsive to blood flowing freely on to the chemical test strip for signaling when a predetermined number of discrete drops of body fluid have been applied to said chemical test strip;
an imaging device (182) for imaging the chemical test result obtained by the chemical test strip; and
an electronic circuit (172) coupled to said imaging device for transmitting data representative of an image of the result to a remote unit.

Patentansprüche

1. Blutentnahmevorrichtung (100) zum Entnehmen einer Menge an Blut aus einem Patienten, wobei die Blutentnahmevorrichtung umfasst:

eine Einschnitteinheit (136, 138,140, 142 und 144) zum Erzeugen eines Einschnitts in dem Patienten;

eine Herauslöseeinheit (160), die Bluttropfen zwingt, aus dem Einschnitt zu fließen, und

eine Sperreinheit (145, 146, 170), die mit der Einschnitteinheit verbunden ist, um die Herauslöseeinheit zu sperren;

dadurch gekennzeichnet, dass:

ein Auffangbehälter in beabstandeter Bezie-

hung zu der Herauslöseeinheit angeordnet ist, um einzelne Bluttropfen aufzufangen, die frei darauf fallen; und

die Sperreinheit (145, 146, 170) so eingerichtet ist, dass sie die Herauslöseeinheit sperrt, wenn eine vorgegebene Anzahl einzelner Bluttropfen entnommen worden ist.

2. Vorrichtung nach Anspruch 1, wobei der Auffangbehälter eine Aufnahme (147) für einen chemischen Teststreifen ist, die einen chemischen Einmal-Teststreifen aufnimmt, auf dem die Bluttropfen gesammelt werden.

3. Vorrichtung nach Anspruch 2, die des Weiteren umfasst:

eine Abbildungsvorrichtung (182), die das mit dem chemischen Teststreifen gewonnene chemische Testergebnis abbildet; und eine elektronische Schaltung (172), die mit der Abbildungsvorrichtung verbunden ist, um Daten, die eine Abbildung des Ergebnisses darstellen, zu einer entfernten Einheit zu übertragen.

4. Vorrichtung nach Anspruch 2, wobei:

der chemische Teststreifen sichtbar durch einen einzigartigen Identitätscode identifiziert wird,

die Sperreinheit (145, 146, 170) ansprechend mit einer elektronischen Schaltung (172) zur Steuerung durch diese verbunden ist, und

die elektronische Schaltung (172) so eingerichtet ist, dass sie eine Identität des chemischen Teststreifens bestimmt und die Sperreinheit entsprechend steuert.

5. Vorrichtung nach einem der Ansprüche 1 bis 4, wobei die Einschnitteinheit eine Lanzette (144) umfasst.

6. Vorrichtung nach einem der Ansprüche 1 bis 4, wobei die Einschnitteinheit einen Laser umfasst.

7. Vorrichtung nach einem der Ansprüche 1 bis 4, wobei die Einschnitteinheit eine Drucklufteinheit umfasst.

8. Vorrichtung nach einem der Ansprüche 1 bis 4, wobei die Herauslöseeinheit (160) eine Vakuumeinheit umfasst.

9. Vorrichtung nach einem der Ansprüche 1 bis 8, wobei die Sperreinheit einen elektrooptischen Sensor (146) umfasst, der die Anzahl entnommener Bluttropfen optisch erfasst.

10. Körperfluid-Testvorrichtung zum chemischen Testen einer Körperfluidprobe, wobei die Testvorrichtung umfasst:

eine Aufnahme (147) für einen chemischen Teststreifen, die einen chemischen Einmal-Teststreifen aufnimmt, auf dem Tropfen des Fluids aufgefangen werden;

eine Tropfenzähleinheit (145, 146, 147), die auf Blut anspricht, das frei auf den chemischen Teststreifen fließt, um zu signalisieren, wenn eine vorgegebene Anzahl einzelner Tropfen Körperfluid auf den chemischen Teststreifen aufgebracht worden sind;

eine Abbildungsvorrichtung (182), die das mit dem chemischen Teststreifen gewonnene chemische Testergebnis abbildet und

eine elektronische Schaltung (172), die mit der Abbildungsvorrichtung verbunden ist, um Daten, die eine Abbildung des Ergebnisses darstellen, zu einer entfernten Einheit zu übertragen.

Revendications

1. Dispositif d'extraction de sang (100) pour prélever une quantité de sang chez un patient, ledit dispositif d'extraction de sang comprenant:

une unité d'incision (136, 138, 140, 142 et 144 pour créer une incision chez le patient;
une unité de libération (160) pour faire s'écouler des gouttes de sang depuis ladite incision, et
une unité de désactivation (145, 146, 170) couplée à l'unité d'incision pour désactiver l'unité de libération ;

caractérisé en ce que :

un réceptacle de collecte est placé en relation espacée avec l'unité de libération pour collecter des gouttes de sang individuelles qui en tombent librement ; et
l'unité de désactivation (145, 146, 170) est adaptée pour désactiver l'unité de libération lorsqu'un nombre prédéterminé de gouttes individuelles de sang ont été prélevées.

2. Dispositif selon la revendication 1, dans lequel le réceptacle de collecte est un support de bandelette

de test chimique (147) pour recevoir une bandelette de test chimique à usage unique sur laquelle les gouttes de sang sont rassemblées.

3. Dispositif selon la revendication 2, comprenant en outre :

un dispositif d'imagerie (182) pour l'imagerie du résultat du test chimique obtenu par la bandelette de test chimique ; et
un circuit électronique (172) couplé au dispositif d'imagerie pour transmettre les données représentatives d'une image du résultat à une unité à distance.

4. Dispositif selon la revendication 2, dans lequel :

la bandelette de test chimique est visiblement identifiée par un code d'identité unique,
l'unité de désactivation (145, 146, 170) est couplée de manière responsive à un circuit électronique (172) pour contrôle par ce dernier, et
le circuit électronique (172) est adapté pour déterminer une identité de la bandelette de test chimique et contrôler l'unité de désactivation en fonction de cette identité.

5. Dispositif selon l'une quelconque des revendications 1 à 4, dans lequel l'unité d'incision comprend une lancette (144).

6. Dispositif selon l'une quelconque des revendications 1 à 4, dans lequel l'unité d'incision comprend un laser.

7. Dispositif selon l'une quelconque des revendications 1 à 4, dans lequel l'unité d'incision comprend une unité de soufflage.

8. Dispositif selon l'une quelconque des revendications 1 à 4, dans lequel l'unité de libération (160) comprend une unité de vide.

9. Dispositif selon l'une quelconque des revendications 1 à 8, dans lequel l'unité de désactivation comprend un capteur électro-optique (146) pour capter optiquement le nombre de gouttes de sang extraites.

10. Dispositif de test de liquide organique pour réaliser un test chimique d'un échantillon de liquide organique, ledit dispositif de test comprenant :

un support de bandelette de test chimique (147) pour recevoir une bandelette de test chimique à usage unique sur laquelle des gouttes du liquide sont collectées ;
une unité de comptage des gouttes (145, 146, 170) répondant au sang s'écoulant librement sur la bandelette de test chimique pour signaler le moment où un nombre prédéterminé de gouttes individuelles de liquide organique ont été appliquées sur ladite bandelette de test chimique ;
un dispositif d'imagerie (182) pour l'imagerie du résultat du test chimique obtenu par la bandelette de test chimique ; et
un circuit électronique (172) couplé audit dispositif d'imagerie pour transmettre les données représentatives d'une image du résultat à une unité à distance.

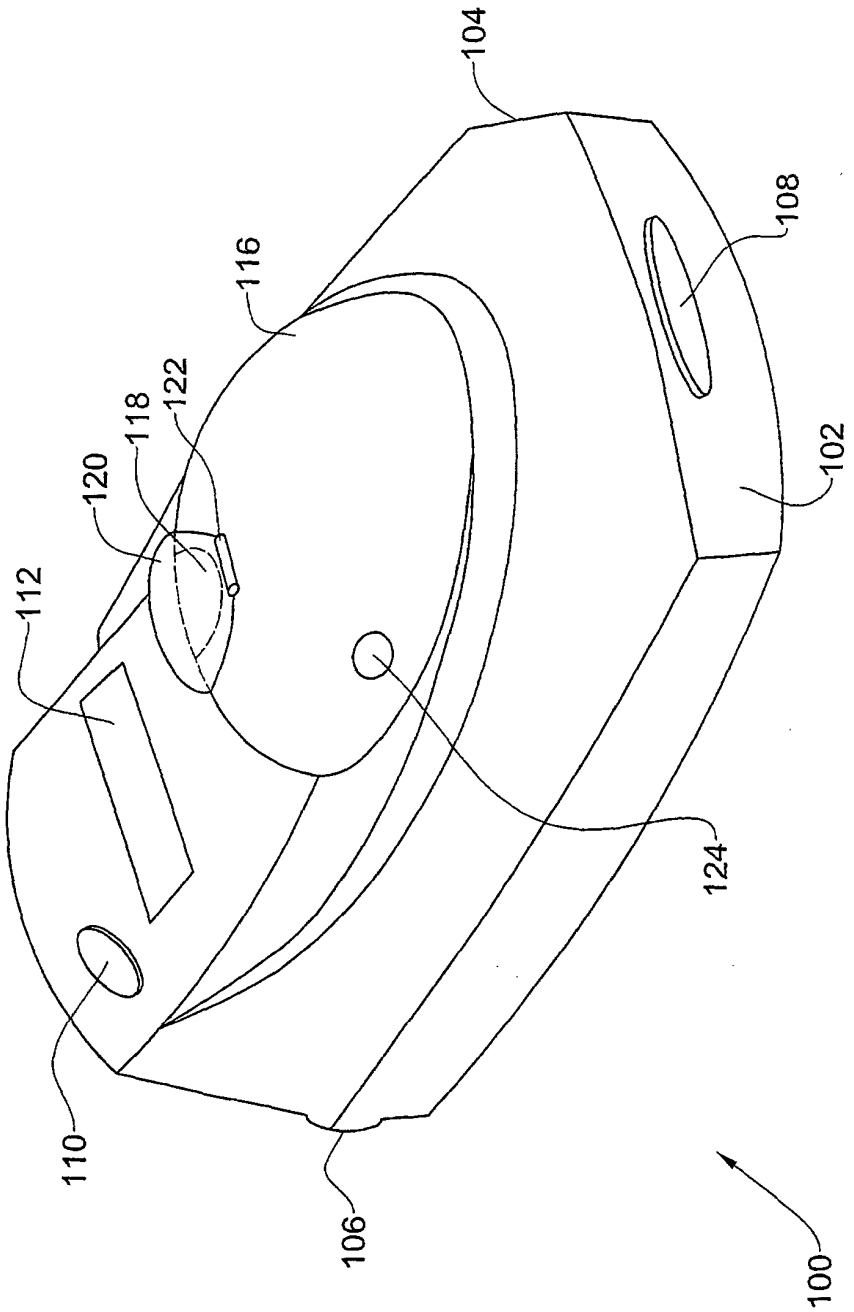
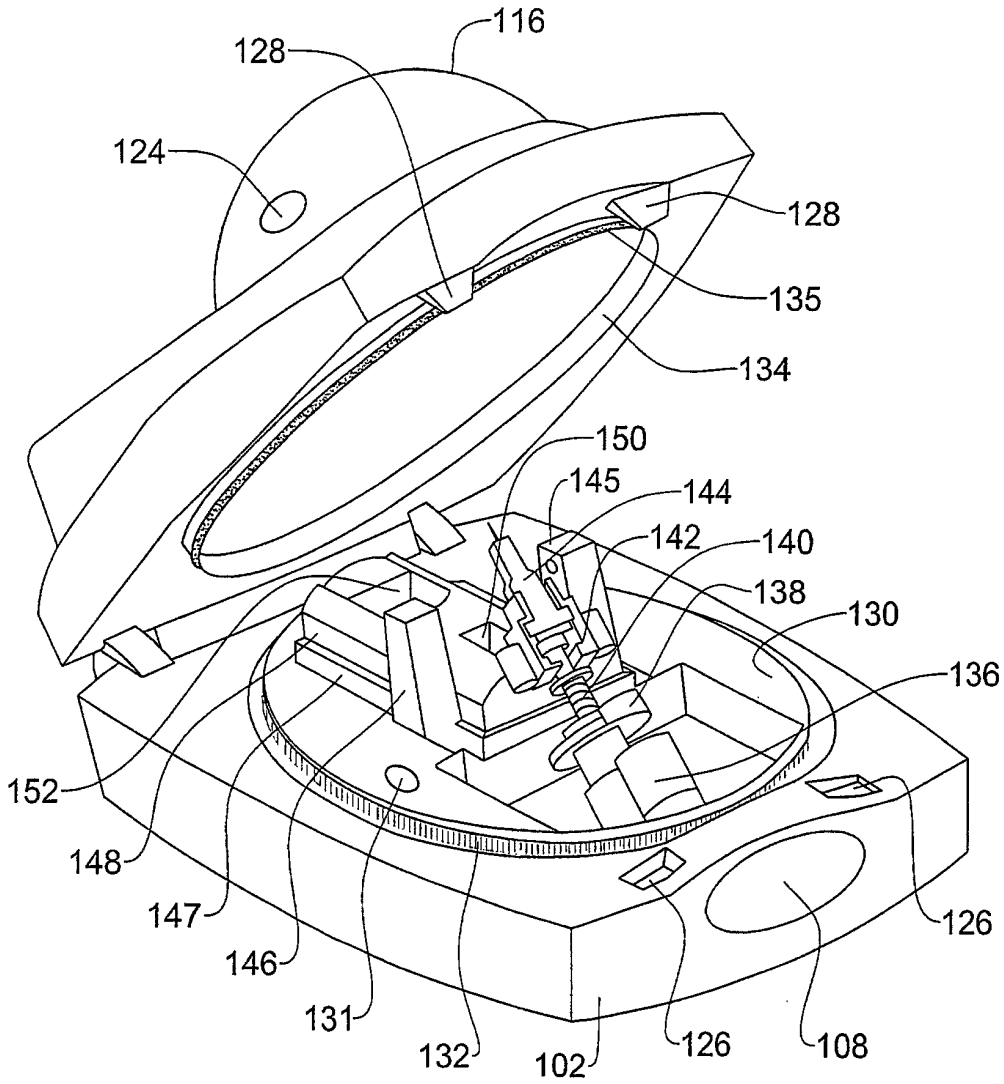


FIG. 1


116
128
124
128
135
134
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145
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138
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136
152
148
147
146
131
132
102
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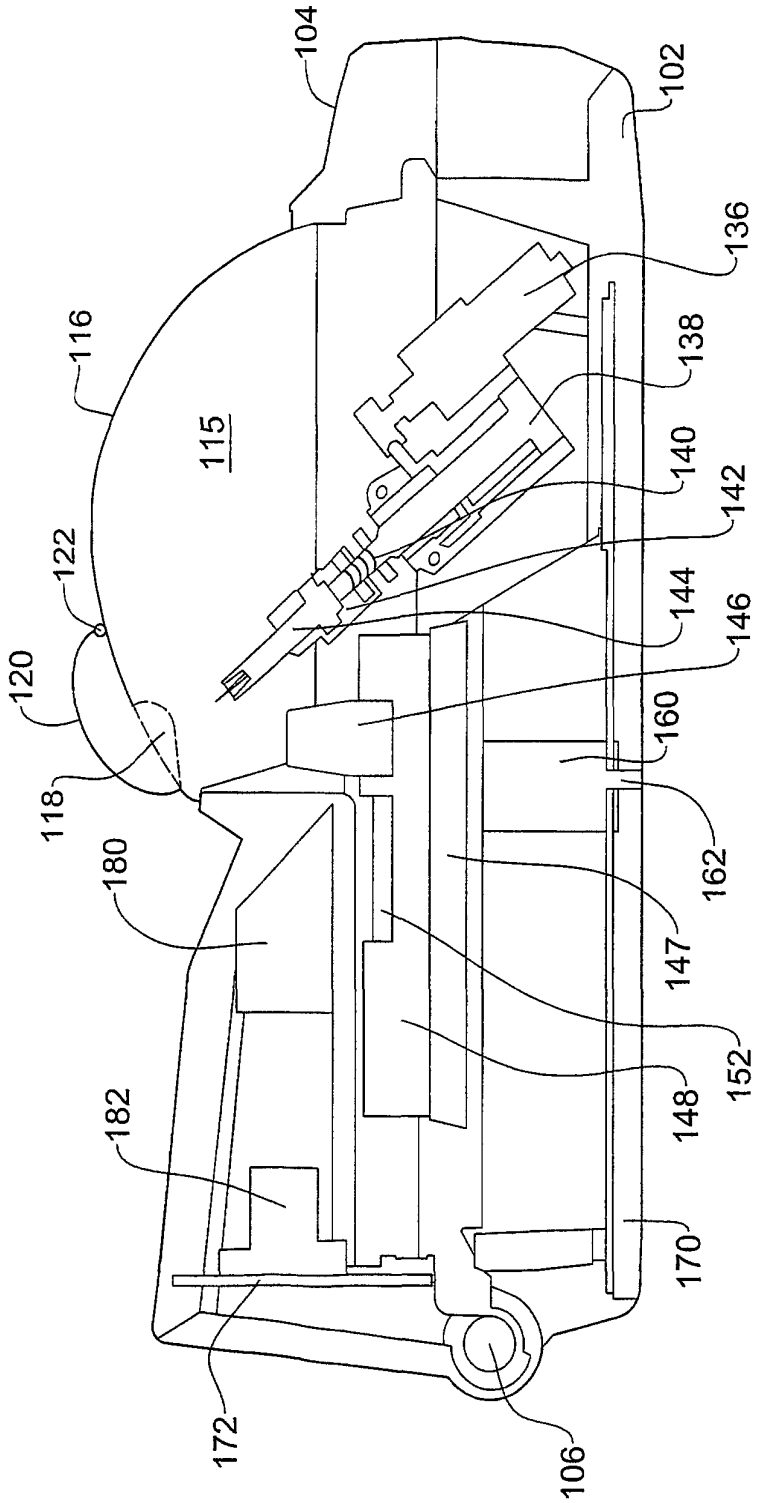
108
126

FIG. 2


104
102
136
116
138
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146
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160
118
162
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148
182
170
172
106

FIG. 3

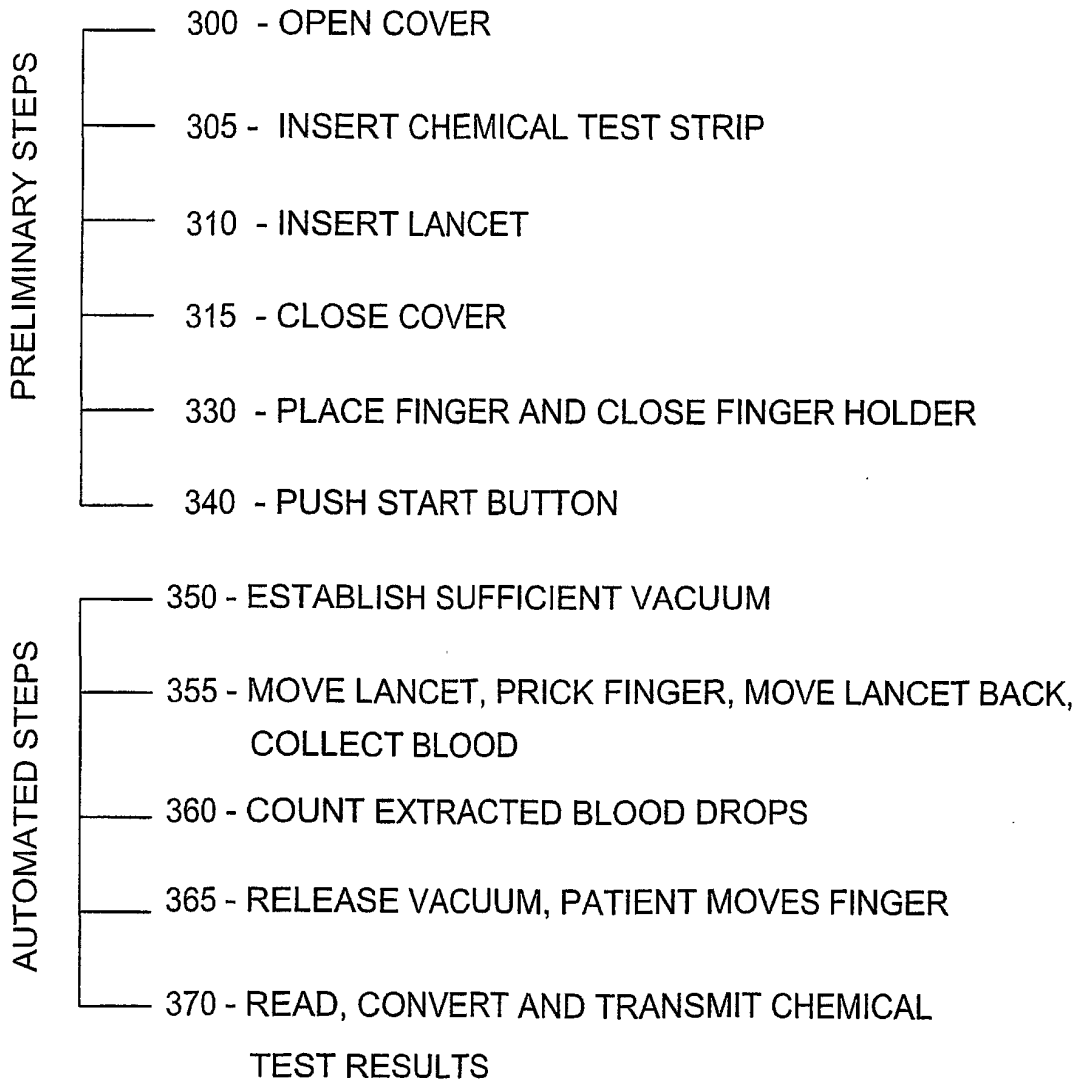
PRELIMINARY STEPS
300 - OPEN COVER
305 - INSERT CHEMICAL TEST STRIP
310 - INSERT LANCET
315 - CLOSE COVER
330 - PLACE FINGER AND CLOSE FINGER HOLDER
340 - PUSH START BUTTON
AUTOMATED STEPS
350 - ESTABLISH SUFFICIENT VACUUM
355 - MOVE LANCET, PRICK FINGER, MOVE LANCET BACK, COLLECT BLOOD
360 - COUNT EXTRACTED BLOOD DROPS
365 - RELEASE VACUUM, PATIENT MOVES FINGER
370 - READ, CONVERT AND TRANSMIT CHEMICAL TEST RESULTS

FIG. 4

专利名称(译)	用于在真空条件下采样血滴的装置		
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申请号	EP2002755586	申请日	2002-07-23
申请(专利权)人(译)	SHL远程医疗INTERNATIONAL LTD.		
当前申请(专利权)人(译)	SHL远程医疗INTERNATIONAL LTD.		
[标]发明人	ALROY YORAM		
发明人	ALROY, YORAM		
IPC分类号	A61B5/151 A61B5/00 A61B5/15 A61B5/154		
CPC分类号	A61B5/157 A61B5/0022 A61B5/150022 A61B5/150099 A61B5/150229 A61B5/150358 A61B5/150412 A61B5/150786 A61B5/150824 A61B5/150946 A61B5/15111 A61B5/15117 A61B5/15123 A61B5/15136 A61B5/1514 A61B5/1519 A61B5/15194		
优先权	146776 2001-11-27 IL		
其他公开文献	EP1450686A1		
外部链接	Espacenet		

摘要(译)

一种血液提取装置（100）和用于从患者抽出受控数量的血液滴的方法，其中产生这样的尺寸的切口，使得血液不会从其自由地流动。释放单元（160）促使血滴从切口流出，例如通过施加真空，并且禁用单元（145,146,170）连接到切口单元，用于在预定数量的情况下禁用释放单元。血滴已被撤回。

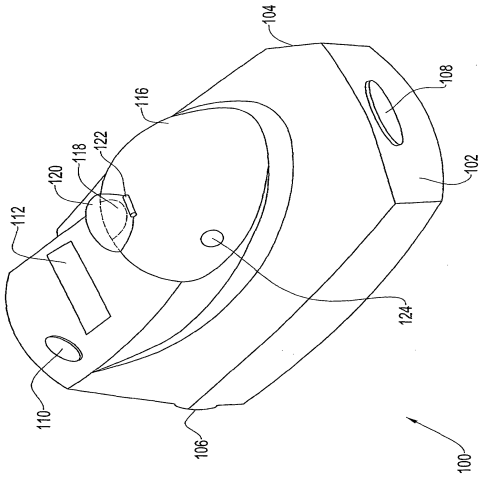

FIG. 1