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(54) **SELF CLOSING FINGER CUFF**

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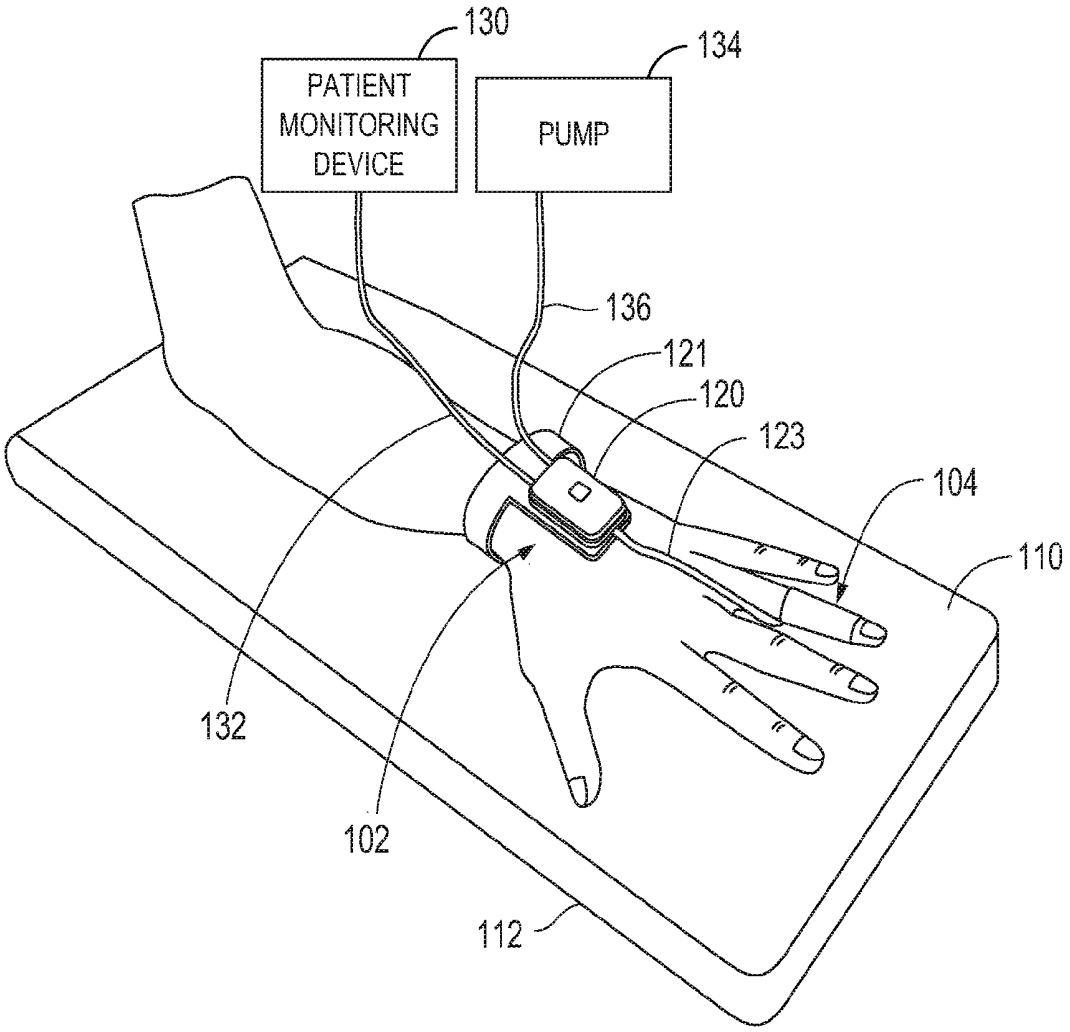
(57) **ABSTRACT**

Disclosed is a finger cuff that is attachable to a patient's finger to be used in measuring the patient's blood pressure by a blood pressure measurement system utilizing a volume clamp method. The finger cuff comprises a wrappable portion that wraps around a patient's finger. The wrappable portion includes a bladder and a light emitting diode (LED) and photodiode (PD) pair. The finger cuff further comprises a plurality of tubules mountable on an exterior of the wrappable portion. The tubules are inflatable to provide pressure to the wrappable portion of the finger cuff to the patient's finger and to provide tightness of the wrappable portion of the finger cuff to the patient's finger. When the finger cuff is placed around the patient's finger, the bladder and the LED-PD pair aid in measuring the patient's blood pressure by the blood pressure measurement system utilizing the volume clamp method.



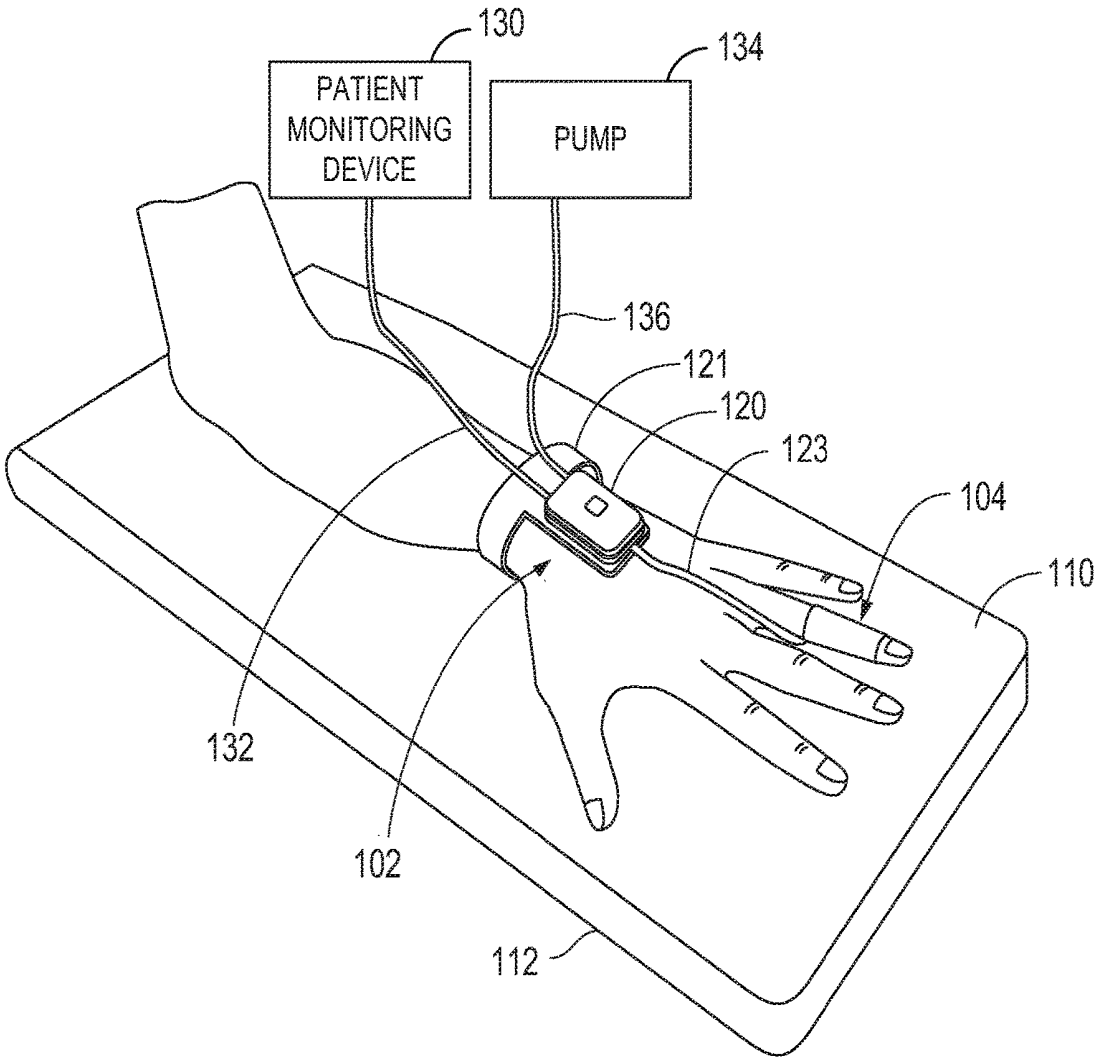

130
PATIENT MONITORING DEVICE
134
PUMP
136
121
120
123
104
110
132
102
112

FIG. 1

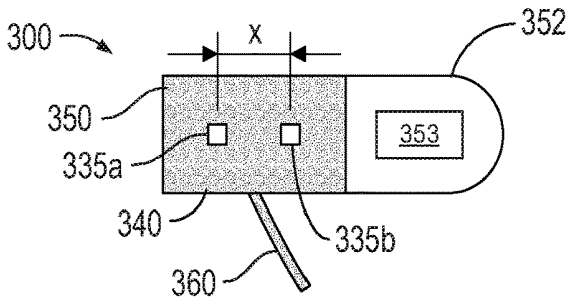


FIG. 2

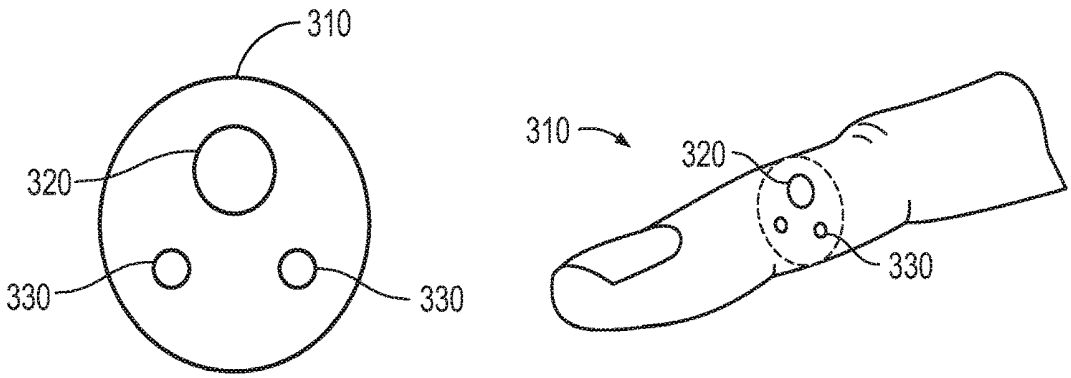


FIG. 3A

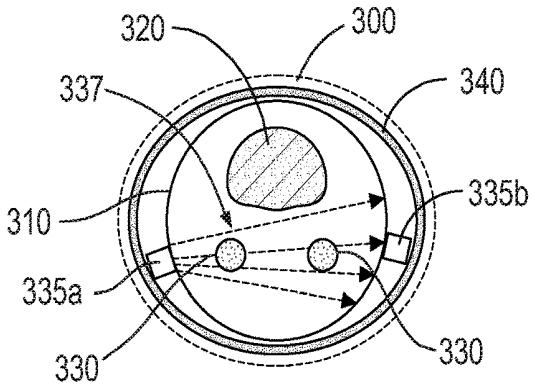


FIG. 3B

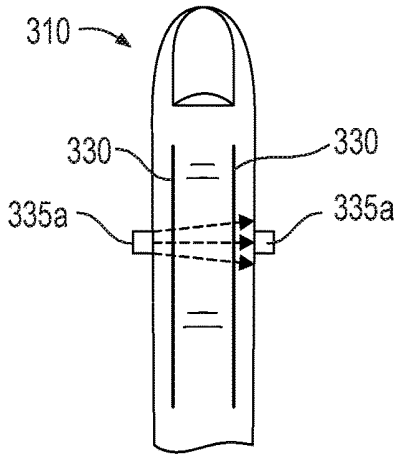


FIG. 3C

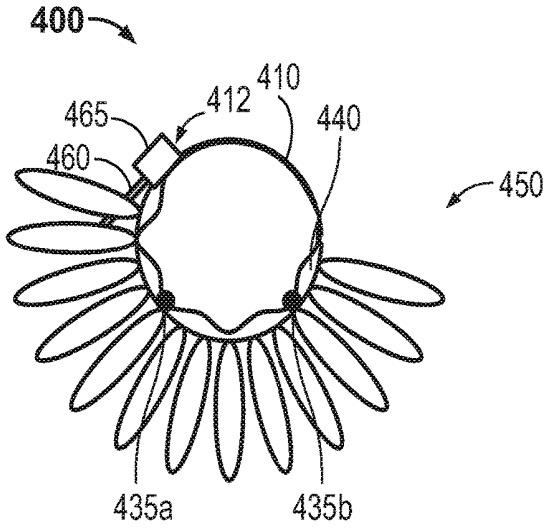


FIG. 4A

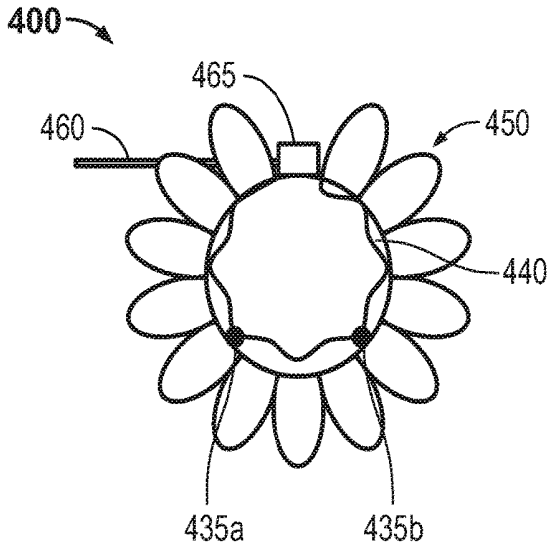


FIG. 4B

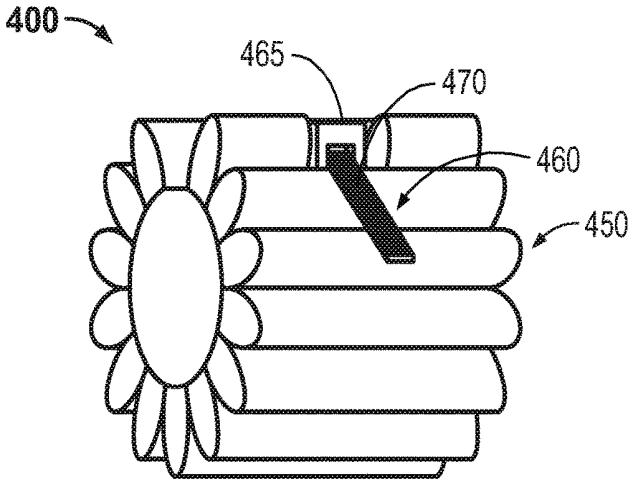


FIG. 4C

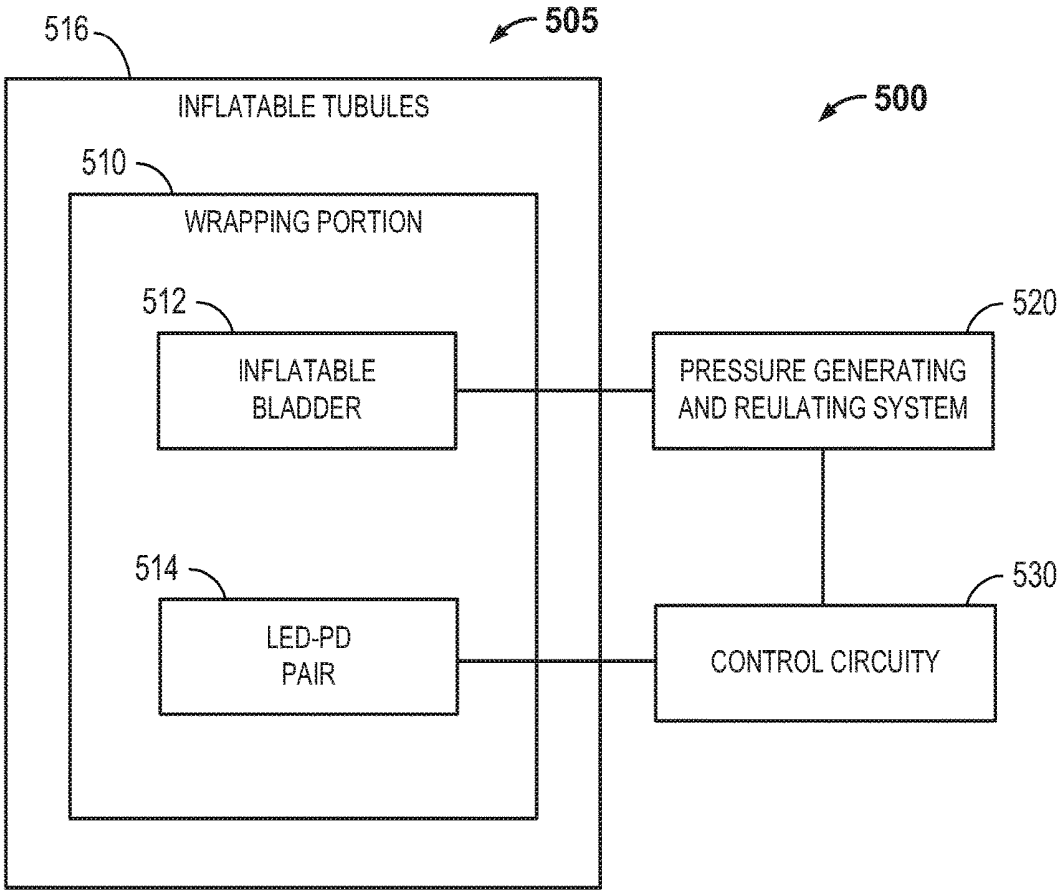

516
505
INFLATABLE TUBULES
500
510
WRAPPING PORTION
512
520
INFLATABLE BLADDER
PRESSURE GENERATING AND REULATING SYSTEM
514
530
LED-PD PAIR
CONTROL CIRCUITY

FIG. 5

SELF CLOSING FINGER CUFF

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Application No. 62/571,098, filed Oct. 11, 2017, the contents of which are incorporated herein by reference in their entirety.

BACKGROUND

Field

[0002] Embodiments of the invention relate generally to non-invasive blood pressure measurement. More particularly, embodiments of the invention relate to a finger cuff for blood pressure measurement.

Relevant Background

[0003] Volume clamping is a technique for non-invasively measuring blood pressure in which pressure is applied to a patient's finger in such a manner that arterial pressure may be balanced by a time varying pressure to maintain a constant arterial volume. In a properly fitted and calibrated system, the applied time varying pressure is equal to the arterial blood pressure in the finger. The applied time varying pressure may be measured to provide a reading of the patient's arterial blood pressure.

[0004] This may be accomplished by a finger cuff that is arranged or wrapped around a finger of a patient. The finger cuff may include an infrared light source, an infrared sensor, and an inflatable bladder. The infrared light may be sent through the finger in which a finger artery is present. The infrared sensor picks up the infrared light and the amount of infrared light registered by the sensor may be inversely proportional to the artery diameter and indicative of the pressure in the artery.

[0005] In the finger cuff implementation, by inflating the bladder in the finger cuff, a pressure is exerted on the finger artery. If the pressure is high enough, it will compress the artery and the amount of light registered by the sensor will increase. The amount of pressure necessary in the inflatable bladder to compress the artery is dependent on the blood pressure. By controlling the pressure of the inflatable bladder such that the diameter of the finger artery is kept constant, the blood pressure may be monitored in very precise detail as the pressure in the inflatable bladder is directly linked to the blood pressure. In a typical present day finger cuff implementation, a volume clamp system is used with the finger cuff. The volume clamp system typically includes a pressure generating system and a regulating system that includes: a pump, a valve, and a pressure sensor in a closed loop feedback system that are used in the measurement of the arterial volume. To accurately measure blood pressure, the feedback loop provides sufficient pressure generating and releasing capabilities to match the pressure oscillations of the patient's blood pressure.

[0006] Today, finger cuff based blood pressure monitoring devices generally use the same technology (e.g., photoplethysmography or similar technologies) to measure blood pressure. Unfortunately, such finger cuff devices may not be easily attachable to a patient's finger and may not be that accurate due to the finger cuff's positioning and snugness or tightness on the patient's finger.

SUMMARY

[0007] Embodiments of the invention may relate to a finger cuff that is attachable to a patient's finger to be used in measuring the patient's blood pressure by a blood pressure measurement system utilizing a volume clamp method. The finger cuff comprises a wrappable portion that wraps around a patient's finger. The wrappable portion includes a bladder and a light emitting diode (LED) and photodiode (PD) pair. The finger cuff further comprises a plurality of tubules mountable on an exterior of the wrappable portion. The tubules are inflatable to provide pressure to the wrappable portion of the finger cuff to the patient's finger and to provide tightness of the wrappable portion of the finger cuff to the patient's finger. When the finger cuff is placed around the patient's finger, the bladder and the LED-PD pair aid in measuring the patient's blood pressure by the blood pressure measurement system utilizing the volume clamp method.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1** is a diagram of an example of a blood pressure measurement system according to one embodiment.

[0009] FIG. **2** is a diagram illustrating an example of a conventional finger cuff.

[0010] FIGS. **3**A-**3**C are diagrams illustrating the example of the conventional finger cuff that is arranged around a finger of a patient.

[0011] FIGS. **4**A-**4**C are diagrams illustrating views of examples of finger cuffs according to embodiments of the invention.

[0012] FIG. **5** is a block diagram illustrating an example environment in which embodiments of the invention may be practiced.

DETAILED DESCRIPTION

[0013] With reference to FIG. **1**, which illustrates an example of a blood pressure measurement system according to one embodiment, a blood pressure measurement system **102** that includes a finger cuff **104** that may be attached to a patient's finger and a blood pressure measurement controller **120**, which may be attached to the patient's body (e.g., a patient's wrist or hand) is shown.

[0014] The blood pressure measurement system **102** may further be connected to a patient monitoring device **130**, and, in some embodiments, a pump **134**. Further, finger cuff **104** may include a bladder (not shown) and an LED-PD pair (not shown), which are conventional for finger cuffs.

[0015] In one embodiment, the blood pressure measurement system **102** may include a pressure measurement controller **120** that includes: a small internal pump, a small internal valve, a pressure sensor, and control circuitry. In this embodiment, the control circuitry may be configured to: control the pneumatic pressure applied by the internal pump to the bladder of the finger cuff **104** to replicate the patient's blood pressure based upon measuring the pleth signal received from the LED-PD pair of the finger cuff **104**. Further, the control circuitry may be configured to: control the opening of the internal valve to release pneumatic pressure from the bladder; or the internal valve may simply be an orifice that is not controlled. Additionally, the control circuitry may be configured to: measure the patient's blood pressure by monitoring the pressure of the bladder based upon the input from a pressure sensor, which should be the

same as patient's blood pressure, and may display the patient's blood pressure on the patient monitoring device **130**.

[0016] In another embodiment, a conventional pressure generating and regulating system may be utilized, in which, a pump **134** is located remotely from the body of the patient. In this embodiment, the blood pressure measurement controller **120** receives pneumatic pressure from remote pump **134** through tube **136** and passes on the pneumatic pressure through tube **123** to the bladder of finger cuff **104**. Blood pressure measurement device controller **120** may also control the pneumatic pressure (e.g., utilizing a controllable valve) applied to the finger cuff **104** as well as other functions. In this example, the pneumatic pressure applied by the pump **134** to the bladder of finger cuff **104** to replicate the patient's blood pressure based upon measuring the pleth signal received from the LED-PD pair of the finger cuff **104** (e.g., to keep the pleth signal constant) and measuring the patient's blood pressure by monitoring the pressure of the bladder may be controlled by the blood pressure measurement controller **120** and/or a remote computing device and/or the pump **134** and/or the patient monitoring device **130** to implement the volume clamping method. In some embodiments, a blood pressure measurement controller **120** is not used at all and there is simply a connection from tube **136** from a remote pump **134** including a remote pressure regulatory system to finger cuff **104**, and all processing for the pressure generating and regulatory system, data processing, and display is performed by a remote computing device.

[0017] Continuing with this example, as shown in FIG. **1**, a patient's hand may be placed on the face **110** of an arm rest **112** for measuring a patient's blood pressure with the blood pressure measurement system **102**. The blood pressure measurement controller **120** of the blood pressure measurement system **102** may be coupled to a bladder of the finger cuff **104** in order to provide pneumatic pressure to the bladder for use in blood pressure measurement. Blood pressure measurement controller **120** may be coupled to the patient monitoring device **130** through a power/data cable **132**. Also, in one embodiment, as previously described, in a remote implementation, blood pressure measurement controller **120** may be coupled to a remote pump **134** through tube **136** to receive pneumatic pressure for the bladder of the finger cuff **104**. The patient monitoring device **130** may be any type of medical electronic device that may read, collect, process, display, etc., physiological readings/data of a patient including blood pressure, as well as any other suitable physiological patient readings. Accordingly, power/data cable **132** may transmit data to and from patient monitoring device **130** and also may provide power from the patient monitoring device **130** to the blood pressure measurement controller **120** and finger cuff **104**.

[0018] As can be seen in FIG. **1**, in one example, the finger cuff **104** may be attached to a patient's finger and the blood pressure measurement controller **120** may be attached on the patient's hand or wrist with an attachment bracelet **121** that wraps around the patient's wrist or hand. The attachment bracelet **121** may be metal, plastic, Velcro, etc. It should be appreciated that this is just one example of attaching a blood pressure measurement controller **120** and that any suitable way of attaching a blood pressure measurement controller to a patient's body or in close proximity to a patient's body may be utilized and that, in some embodiments, a blood pressure measurement controller **120** may not be used at all. It should further be appreciated that the finger cuff **104** may be connected to a blood pressure measurement controller described herein, or a pressure generating and regulating system of any other kind, such as a conventional pressure generating and regulating system that is located remotely from the body of the patient (e.g., a pump **134** located remotely from a patient). Any kind of pressure generating and regulating system can be used, including but not limited to the blood pressure measurement controller, and may be described simply as a pressure generating and regulating system that may be used with a finger cuff **104** including an LED-PD pair and a bladder to implement the volume clamping method.

[0019] FIG. **2** is an example of a conventional finger cuff. With reference to FIG. **2**, a conventional finger cuff **300** may be formed from a flexible material with a Velcro clamping system. The finger cuff **300** may include a first side **350** and a second side **352**. In one embodiment, for attachment purposes to a patient's finger, the second side **352** on the interior may include a first connecting portion **353** (e.g., a Velcro type portion) that connects with a second connecting portion (not shown), e.g., a Velcro type portion, on the exterior of the first side **350** of the finger cuff **300**. In another embodiment, the first connecting portion **353** may include removable or reusable adhesive material that can be removably attached to the exterior surface of the first side **350** of the finger cuff **300**. It should be appreciated that this is just one example of an attachment mechanism and that any suitable type may be utilized (e.g., adhesive, tape, mechanical latching mechanisms, etc.). It should be appreciated that any type of wrappable finger cuff, fixed type of finger cuff, or any type of finger cuff may be used, and this is just one example.

[0020] Further, finger cuff **300** may include a bladder **340** and an LED-PD pair **335***a-b* mounted on the interior of the finger cuff **300**. In one embodiment, the bladder **340** may include a pair of openings that surround the LED-PD pair **335***a-b*, respectively. The bladder **340** and LED-PD pair **335***a-b* may be coupled to tube or cable **360** through a connector, which may be attached to finger cuff **300**, to provide pneumatic pressure to the bladder **340**, and to provide power to and receive data from the LED-PD pair **335***a-b*. The LED-PD pair **335***a-b* may be used to perform measurements of a pleth signal to aid in measuring the patient's blood pressure.

[0021] With additional reference to FIGS. **3**A-**3**C, the conventional finger cuff **300** may be wrapped around a patient's finger **310** that may include a finger bone **320** and one or more finger arteries **330**. In operation, light (or optical signals) **337** generated by LED **335***a* may be transmitted or emitted in multiple directions through the finger **310**, in which the finger arteries **330** are present. The PD **335***b* may detect some or all of the light **337** from the LED **335***a*. The amount of light registered by the PD **335***b* may be inversely proportional to the artery diameters of the finger arteries **330** and indicative of the pressure of the finger arteries **330**.

[0022] For example, in FIGS. **3**A-**3**C, the bladder **340** may be inflated to exert pressure on the finger arteries **330**. If the pressure is high enough, for example, it may compress the finger arteries **330**, thereby decreasing the diameter of the finger arteries **330** and increasing the amount of light registered by the PD **335***b*. Conversely, if the pressure is not high enough, it may compress the finger arteries **330** to a lesser extent (or may not compress at all), thereby increasing

the diameter of the finger arteries **330** and decreasing the amount of light registered by the PD **335***b*. The amount of pressure necessary in the bladder **340** to compress the arteries **330** is dependent on the blood pressure. Therefore, by controlling the pressure of the inflatable bladder **340** such that the diameter of the finger arteries **330** is kept constant, the blood pressure of the patient may be computed and monitored as the pressure in the inflatable bladder **340** is directly linked to the blood pressure. As an example, as part of the volume clamp method, the pneumatic pressure is applied to the bladder **340** of the finger cuff based upon measuring the pleth signal received from the LED-PD pair **335***a* and **335***b* of the finger cuff (e.g., to keep the pleth signal constant) so that the pressure applied to the bladder **340** and measured by a pressure sensor should be correlated to the patient's blood pressure.

[0023] With respect to the conventional finger cuff **300**, previously described, it is generally available in different sizes (e.g., small, medium, large), and includes differently sizes bladders **340** (depending on the size of the finger cuff **300**). The distance between the LED **335***a* and the PD **335***b* (which may be referred to as "x"), therefore, may vary depending on the size of the finger cuff and bladder to meet the different finger sizes and finger physiology of the patient. In applying the finger cuff **300** on a patient's finger (e.g., finger **310**), it is important for a healthcare provider to select a suitable finger cuff size for the patient such that the LED-PD pair **335***a-b* is properly and effectively positioned on the patient's finger in order to obtain an accurate optical measurement. However, the various sized conventional finger cuffs **300** may not be suitable for the finger sizes and physiology of many patients such that inadequate finger cuff attachments by health care providers may occur. In such circumstances, the LED-PD pair **335***a-b* may not be properly positioned on the patient's finger, and therefore, the PD **335***b* may not adequately detect or register light signals from the LED **335***a* (as shown in FIG. **3**B), thereby producing a low quality signal (e.g., a pleth signal) that may result in an inaccurate blood pressure measurement.

[0024] Embodiments shown in FIGS. **4**A-**4**C, which are diagrams illustrating views of examples of a finger cuff **400** according to embodiments of the invention, may be utilized. Finger cuff **400** may mitigate or eliminate many of the problems associated with the convention finger cuff **300**.

[0025] With reference to FIGS. **4**A-**4**C, finger cuff **400** may be wrapped around a patient's finger **310** having finger bone **320** and finger arteries **330** (as previously described). As shown, finger cuff **400** may include a wrapping (or wrappable) portion **410** that wraps around the patient's finger. Wrapping portion **410** may include a first side and a second side, and may be formed of flexible material or may be a fixed finger cuff, as previously described.

[0026] In one embodiment, for attachment purposes to a patient's finger, finger cuff **400** may utilize a latching mechanism, for example a releasable tie wrap (or cable tie) fastening system (i.e., a tie wrap system that may be closed/locked in place and may thereafter be released), to latch the wrapping portion **410** to the patient's finger. For example, as shown, the first side of the wrapping portion **410** may include a head **465** and the second side of the wrapping portion **410** may include an elongated strap **460** (which may be formed of flexible material, e.g., nylon). The head **465** may include a strap entrance end **412** for insertion of the strap **460**. Although not shown, in some embodiments, head **465** may include a locking device with a release tab. In some embodiments, as shown in FIG. **4**C, strap **460** may include extending locking teeth **470** that are longitudinally spaced along the length of strap **460**.

[0027] In operation, strap **460** may be pulled (e.g., by a healthcare provider) towards head **465** so that finger cuff **400** comfortably (or snuggly) fits around a patient's finger, and a tip of the strap **460** may be inserted through the strap entrance end **412**. The locking device of head **465** may engage with a selected tooth **470** of the locking teeth so as to lock or secure the strap **460** in position within the head **465**. Subsequently, to release strap **460** from head **465**, the release tab may be activated to allow strap **460** to move in a release direction (e.g., a direction away from head **465**), thereby permitting strap **460** to be removed or adjusted as desired.

[0028] Although a releasable tie wrap fastening system is illustrated in FIGS. **4**A-**4**C, in some embodiments, finger cuff **400** may utilize any type of attachment mechanism (e.g., adhesive, tape, mechanical latching mechanisms, etc.) and finger cuff **400** may be any type of wrappable finger cuff, fixed type of finger cuff, or any type of finger cuff structure, as previously described.

[0029] As particularly shown in FIGS. **4**A-**4**B, in one embodiment, finger cuff **400** may include a bladder **440** and an LED-PD pair **435***a-b* mounted on the interior of the wrapping portion **410**. In one embodiment, bladder **440** may include openings that surround the LED-PD pair **435***a-b*. The bladder **440** and LED-PD pair **435***a-b* may be coupled to a tube or cable through a connector, which may be attached to finger cuff **400**, to provide pneumatic pressure to the bladder **440**, and to provide power to and receive data from the LED-PD pair **435***a-b*.

[0030] As further shown in FIGS. **4**A-**4**C, finger cuff **400** may further include inflatable tubules **450** that are attached to (e.g., permanently attached or removably attached) or mounted on the exterior of the wrapping portion **410**, and surround the wrapping portion **410**. In one embodiment, tubules **450** may be approximately cylindrically-shaped and may include round edges. In one embodiment, tubules **450** may be longitudinally arranged along the length of the wrapping portion **410**. In one embodiment, each of the tubules **450** may be attached to one another along the side of the tubule, or may be separately spaced from one another. It should be appreciated that these inflatable tubules are used as an example shape, and that any suitable shape, size, or structure to apply pressure to the finger cuff may be utilized.

[0031] Operationally, after the wrapping portion **410** is secured around a patient's finger (e.g., using the releasable tie wrap fastening system, as previously described), tubules **450** may be inflated (e.g., filled with a liquid or gas) to exert pressure and form tightness around the patient's finger so that finger cuff **400** effectively (or comfortably) fits around the patient's finger. Accordingly, the tightness or snugness of the finger cuff **400** around the patient's finger is dependent on the pressure provided to the tubules **450**. Therefore, the tightness or snugness of the finger cuff **400** can be standardized by applying standardized pressure to the tubules **450** providing a snug or tight fit to the patient's finger improving the accuracy of the blood pressure measurement by the finger cuff.

[0032] With the previously described embodiments, the application of the finger cuff **400** to a patient's finger by a healthcare provider is less susceptible to application errors.

Further, the finger cuff **400**, with the adjustment ability of the latching mechanism and the pressure exerted by tubules **450**, allows for the finger cuff **400** to be single-sized or a one-size-fits-all finger cuff, such that different finger cuff sizes (as previously discussed with respect to finger cuff **300**) do not need to be utilized and a single-sized finger cuff **400** may be utilized for almost any size finger.

[0033] FIG. **5** is a block diagram illustrating an example environment **500** in which embodiments of the invention may be practiced. As shown in FIG. **5**, finger cuff **505** may include wrapping portion **510**, an inflatable bladder **512**, an LED-PD pair **514**, and inflatable tubules **516**. The tubules **516** may be attached to or mounted on the exterior of the wrapping portion **510**. The tubules **516** may be inflated or deflated (e.g., using a pump) to exert desired pressure so that finger cuff **505** may comfortably fit around a patient's finger. The inflatable bladder **512** may be pneumatically connected to a pressure generating and regulating system **520**. The pressure generating and regulating system **520** and control circuitry **530** may generate, measure, and regulate pneumatic pressure that inflates or deflates the inflatable bladder **512** and/or tubule **516**, and may further comprise such elements as a pump, a valve, a pressure sensor, and/or other suitable elements, as previously described. In particular, pressure generating and regulating system **520** in cooperation with control circuitry **530** may be configured to implement a volume clamp method with the finger cuff **510** by: applying pneumatic pressure to the inflatable bladder **512** of the finger cuff **505** to replicate the patient's blood pressure based upon measuring pleth signals received from the LED-PD pair **514** (e.g., to keep the pleth signal constant), and measuring the patient's blood pressure by monitoring the pressure of the inflatable bladder **512** based upon input from a pressure sensor, which should be the same or correlated to the patient's blood pressure, and may further command the display of the patient's blood pressure on the patient monitoring device.

[0034] It should be appreciated that aspects of the invention previously described may be implemented in conjunction with the execution of instructions by processors, circuitry, controllers, control circuitry, etc. As an example, control circuitry may operate under the control of a program, algorithm, routine, or the execution of instructions to execute methods or processes in accordance with embodiments of the invention previously described. For example, such a program may be implemented in firmware or software (e.g. stored in memory and/or other locations) and may be implemented by processors, control circuitry, and/or other circuitry, these terms being utilized interchangeably. Further, it should be appreciated that the terms processor, microprocessor, circuitry, control circuitry, circuit board, controller, microcontroller, etc., refer to any type of logic or circuitry capable of executing logic, commands, instructions, software, firmware, functionality, etc., which may be utilized to execute embodiments of the invention.

[0035] The various illustrative logical blocks, processors, modules, and circuitry described in connection with the embodiments disclosed herein may be implemented or performed with a general purpose processor, a specialized processor, circuitry, a microcontroller, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array (FPGA) or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A processor may be a microprocessor or any conventional processor, controller, microcontroller, circuitry, or state machine. A processor may also be implemented as a combination of computing devices, e.g., a combination of a DSP and a microprocessor, a plurality of microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration.

[0036] The steps of a method or algorithm described in connection with the embodiments disclosed herein may be embodied directly in hardware, in a software module/firmware executed by a processor, or any combination thereof. A software module may reside in RAM memory, flash memory, ROM memory, EPROM memory, EEPROM memory, registers, hard disk, a removable disk, a CD-ROM, or any other form of storage medium known in the art. An exemplary storage medium is coupled to the processor such the processor can read information from, and write information to, the storage medium. In the alternative, the storage medium may be integral to the processor.

[0037] The previous description of the disclosed embodiments is provided to enable any person skilled in the art to make or use the present invention. Various modifications to these embodiments will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other embodiments without departing from the spirit or scope of the invention. Thus, the present invention is not intended to be limited to the embodiments shown herein but is to be accorded the widest scope consistent with the principles and novel features disclosed herein.

What is claimed is:

1. A finger cuff connectable to a patient's finger to be used in measuring the patient's blood pressure by a blood pressure measurement system utilizing the volume clamp method, the finger cuff comprising:

a wrappable portion that wraps around a patient's finger, the wrappable portion including a bladder and a light emitting diode (LED) and photodiode (PD) pair; and

a plurality of tubules mountable on an exterior of the wrappable portion, the tubules being inflatable to provide pressure to the wrappable portion of the finger cuff to the patient's finger and to provide tightness of the wrappable portion of the finger cuff to the patient's finger, and wherein, when the finger cuff is placed around the patient's finger, the bladder and the LED-PD pair aid in measuring the patient's blood pressure by the blood pressure measurement system utilizing the volume clamp method.

2. The finger cuff of claim **1**, further comprising a latching mechanism to latch the wrappable portion of the finger cuff to the patient's finger.

3. The finger cuff of claim **2**, wherein the latching mechanism includes a head and a strap.

4. The finger cuff of claim **3**, wherein the strap is pulled towards, inserted through, and then secured within the head such that the wrappable portion of the finger cuff snuggly fits the patient's finger.

5. The finger cuff of claim **4**, wherein the strap is releasable from the head such that the wrappable portion of the finger cuff can be removed from the patient's finger.

6. The finger cuff of claim **1**, wherein the tubules are filled with a gas to provide pressure to the wrappable portion of

the finger cuff to the patient's finger to provide tightness of the wrappable portion of the finger cuff to the patient's finger.

7. The finger cuff of claim **1**, wherein the tubules are filled with a liquid to provide pressure to the wrappable portion of the finger cuff to the patient's finger to provide tightness of the wrappable portion of the finger cuff to the patient's finger.

8. A method to measure a patient's blood pressure by a blood pressure measurement system utilizing a finger cuff and a volume clamp method, the finger cuff comprising a wrappable portion including a bladder and a light emitting diode (LED) and photodiode (PD) pair and a plurality of tubules mountable on an exterior of the wrappable portion, the method comprising:

placing the finger cuff around a patient's finger such that the bladder and the LED-PD pairs aid in measuring the patient's blood pressure by the blood pressure measurement system utilizing the volume clamp method; and

inflating the tubules to provide pressure to the wrappable portion of the finger cuff to the patient's finger and to provide tightness of the wrappable portion of the finger cuff to the patient's finger.

9. The method of claim **8**, further comprising latching, by a latching mechanism of the finger cuff, the wrappable portion of the finger cuff to the patient's finger.

10. The method of claim **9**, wherein the latching mechanism includes a head and a strap.

11. The method of claim **10**, wherein latching the wrappable portion of the finger cuff to the patient's finger includes pulling the strap towards the head, inserting the strap through the head, and securing the strap within the head such that the wrappable portion of the finger cuff snuggly fits the patient's finger.

12. The method of claim **11**, further comprising releasing the strap from the head such that the wrappable portion of the finger cuff can be removed from the patient's finger.

13. A blood pressure measurement system utilizing a volume clamp method, the blood pressure measurement system comprising:

a finger cuff attachable to a patient's finger to be used in measuring the patient's blood pressure by the blood pressure measurement system utilizing the volume clamp method, the finger cuff comprising:

a wrappable portion that wraps around a patient's finger, the wrappable portion including a bladder and a light emitting diode (LED) and photodiode (PD) pair; and

a plurality of tubules mountable on an exterior of the wrappable portion, the tubules being inflatable to provide pressure to the wrappable portion of the finger cuff to the patient's finger and to provide tightness of the wrappable portion of the finger cuff to the patient's finger, and wherein, when the finger cuff is placed around the patient's finger, the bladder and the LED-PD pair aid in measuring the patient's blood pressure by the blood pressure measurement system utilizing the volume clamp method.

14. The blood pressure measurement system of claim **13**, wherein the finger cuff further comprises a latching mechanism to latch the wrappable portion of the finger cuff to the patient's finger.

15. The blood pressure measurement system of claim **14**, wherein the latching mechanism includes a head and a strap.

16. The blood pressure measurement system of claim **15**, wherein the strap is pulled towards, inserted through, and then secured within the head such that the wrappable portion of the finger cuff snuggly fits the patient's finger.

17. The blood pressure measurement system of claim **16**, wherein the strap is releasable from the head such that the wrappable portion of the finger cuff can be removed from the patient's finger.

18. The blood pressure measurement system of claim **13**, wherein the tubules are filled with a gas to provide pressure to the wrappable portion of the finger cuff to the patient's finger to provide tightness of the wrappable portion of the finger cuff to the patient's finger.

19. The blood pressure measurement system of claim **13**, wherein the tubules are filled with a liquid to provide pressure to the wrappable portion of the finger cuff to the patient's finger to provide tightness of the wrappable portion of the finger cuff to the patient's finger.

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专利名称(译)	自闭手指袖口		
公开(公告)号	US20190104991A1	公开(公告)日	2019-04-11
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[标]申请(专利权)人(译)	爱德华兹生命科学公司		
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当前申请(专利权)人(译)	爱德华生命科学公司		
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摘要(译)

本发明公开了一种手指套，其可附接到患者的手指，以通过利用体积钳方法的血压测量系统来测量患者的血压。指套包括缠绕患者手指的可缠绕部分。可缠绕部分包括囊和发光二极管（LED）和光电二极管（PD）对。指套还包括可安装在可缠绕部分的外部上的多个小管。小管是可充气的，以向指套的可缠绕部分提供对患者手指的压力，并提供指套的可缠绕部分对患者手指的紧密度。当手指套被放置在患者手指周围时，膀胱和LED-PD对通过血压测量系统利用体积钳方法帮助测量患者的血压。