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(54) **BLOOD PRESSURE MONITORING CUFF**

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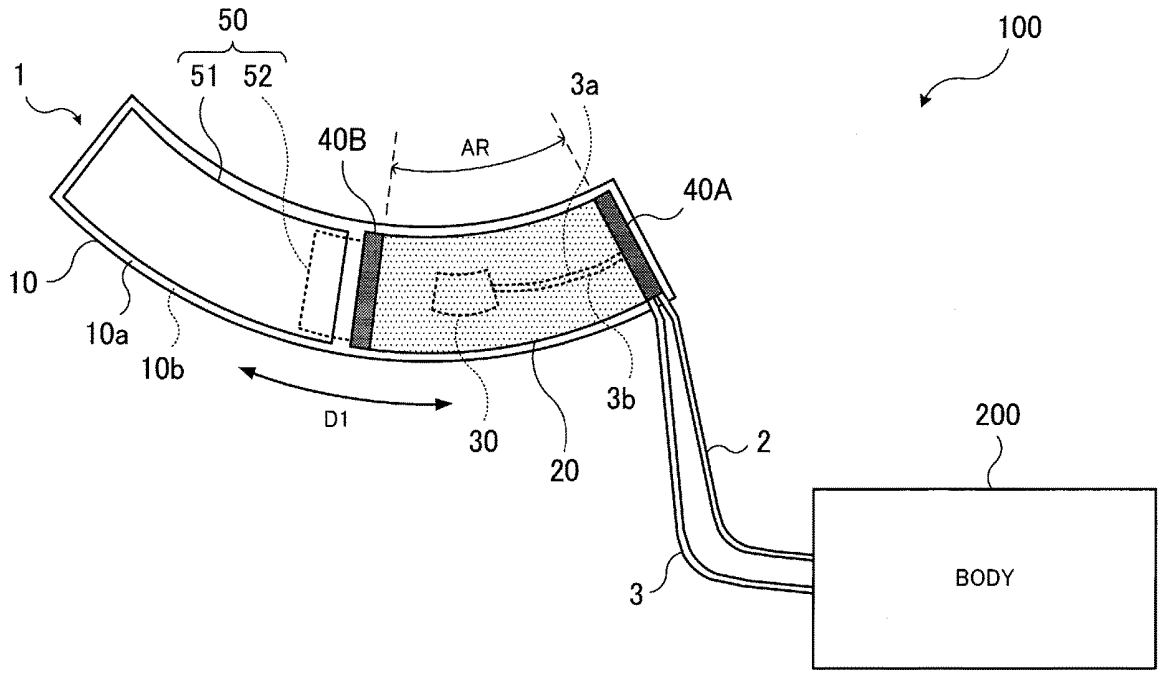
CPC ***A61B 5/022*** (2013.01); ***A61B 5/6831*** (2013.01)

(57) **ABSTRACT**

A cuff includes a band that is wound around a measuring position where blood pressure is measured and an air bag that is provided on a measuring position side of the band and whose length in a length direction is shorter than an outer circumference of the measuring position. A first spacer and a second spacer are respectively provided at the ends in the length direction of the air bag. The band is wound around the measuring position so as to cover the first spacer and the second spacer and detachably fixed by a fixing portion to a surface on an opposite side to the measuring position side.



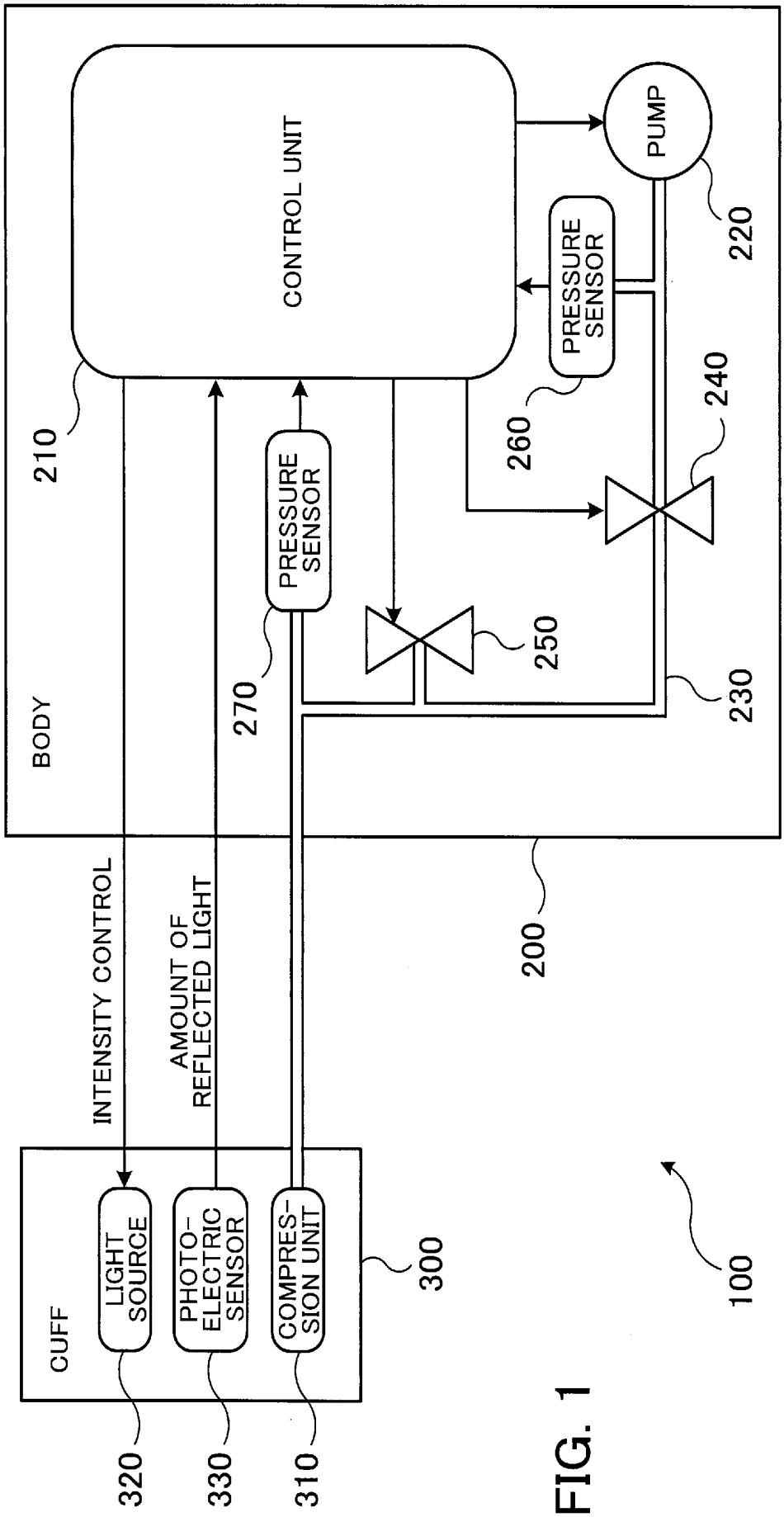

BODY
CONTROL UNIT
PUMP
PRESSURE SENSOR
PRESSURE SENSOR
210
220
240
260
270
250
230
200
INTENSITY CONTROL
AMOUNT OF REFLECTED LIGHT
CUFF
LIGHT SOURCE
PHOTO-ELECTRIC SENSOR
COMPRES-SION UNIT
300
100
320
330
310

FIG. 1

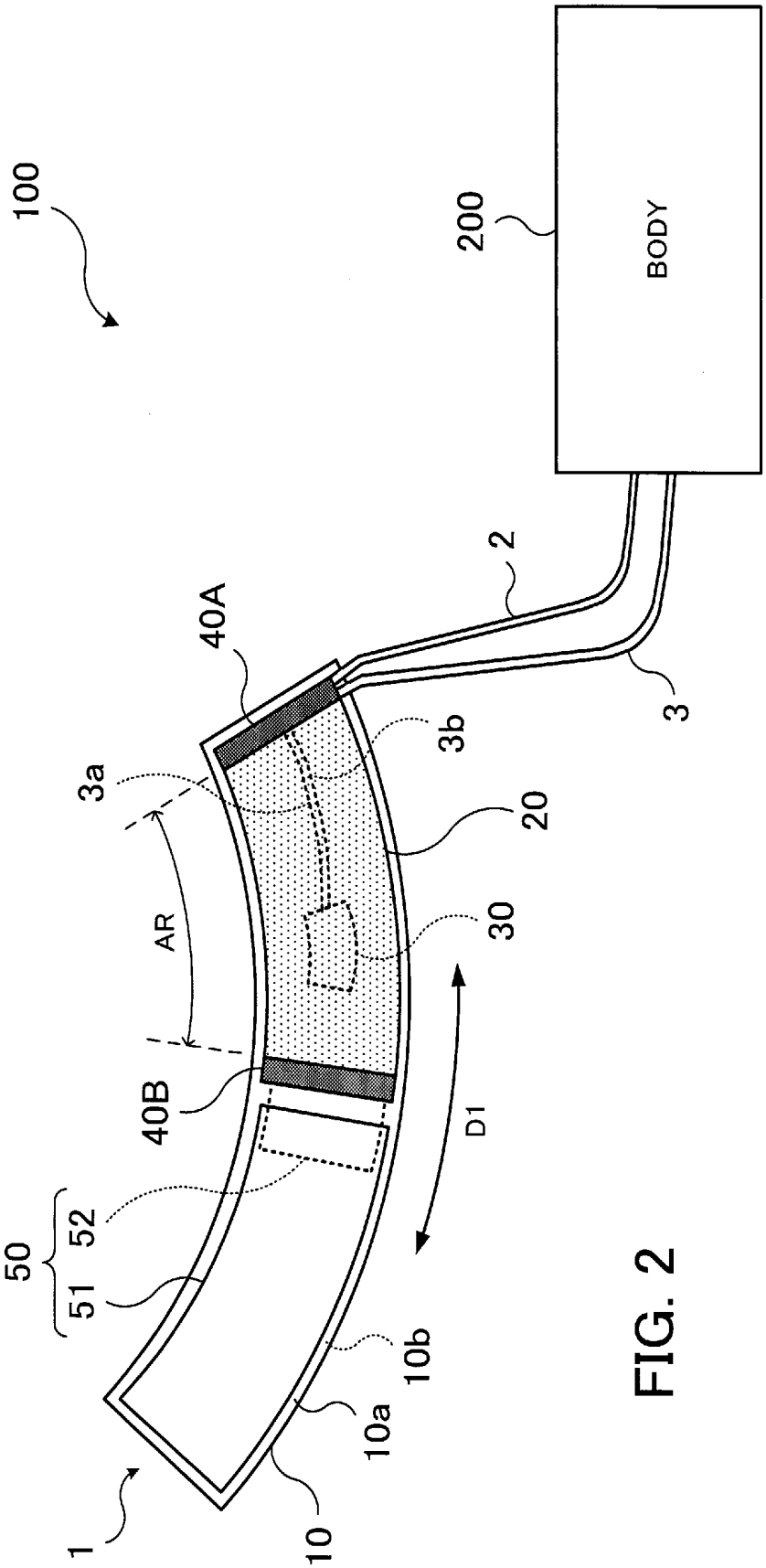


FIG. 2

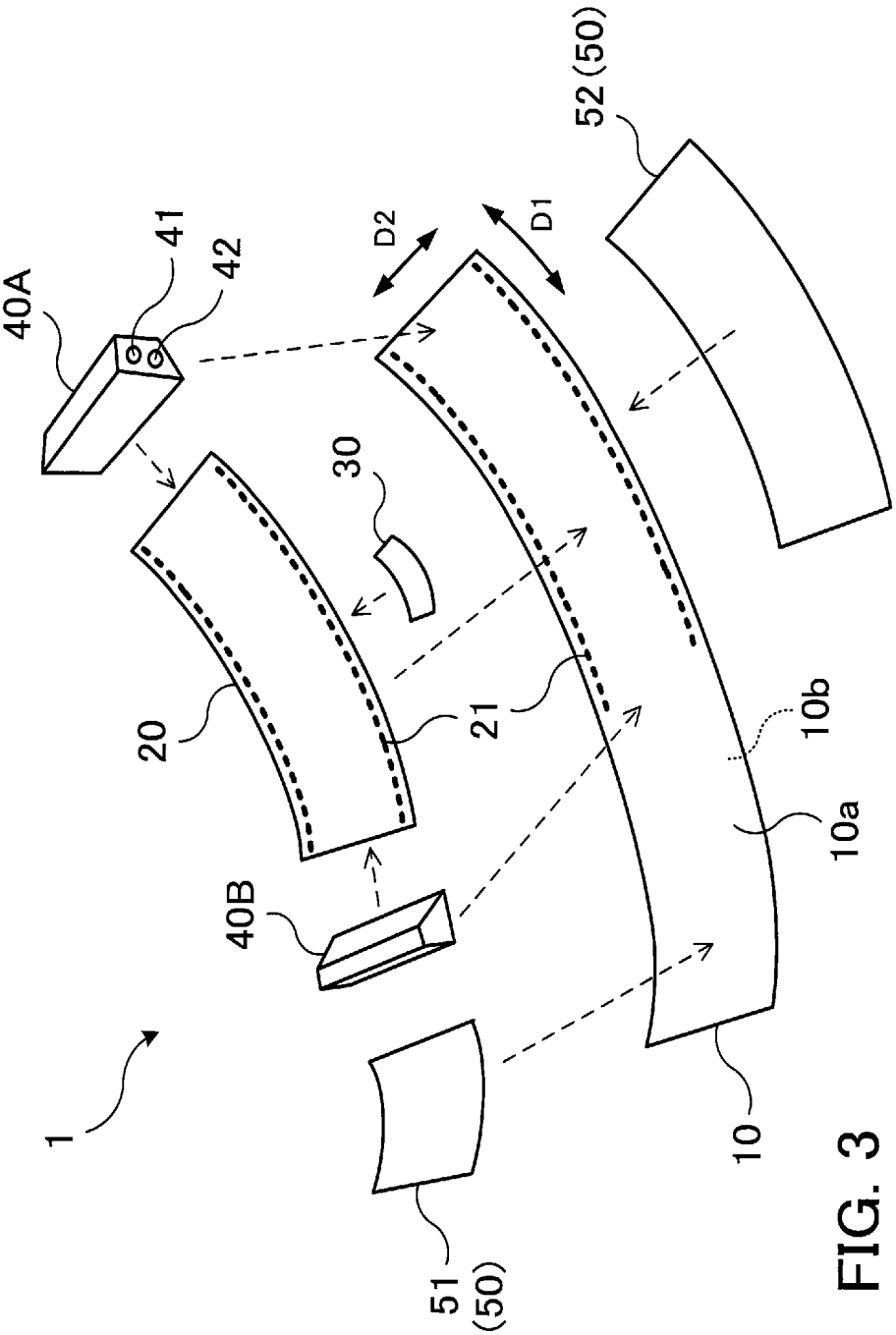


FIG. 3

FIG. 4A

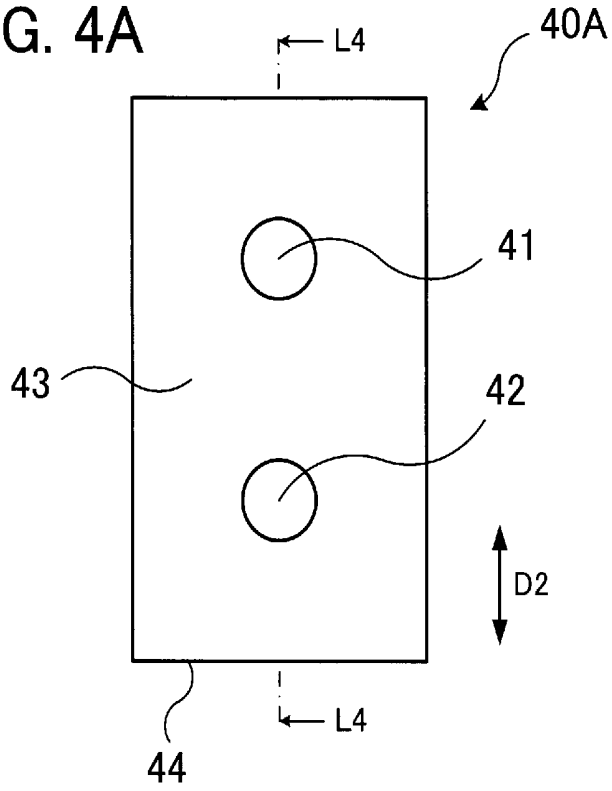


FIG. 4B

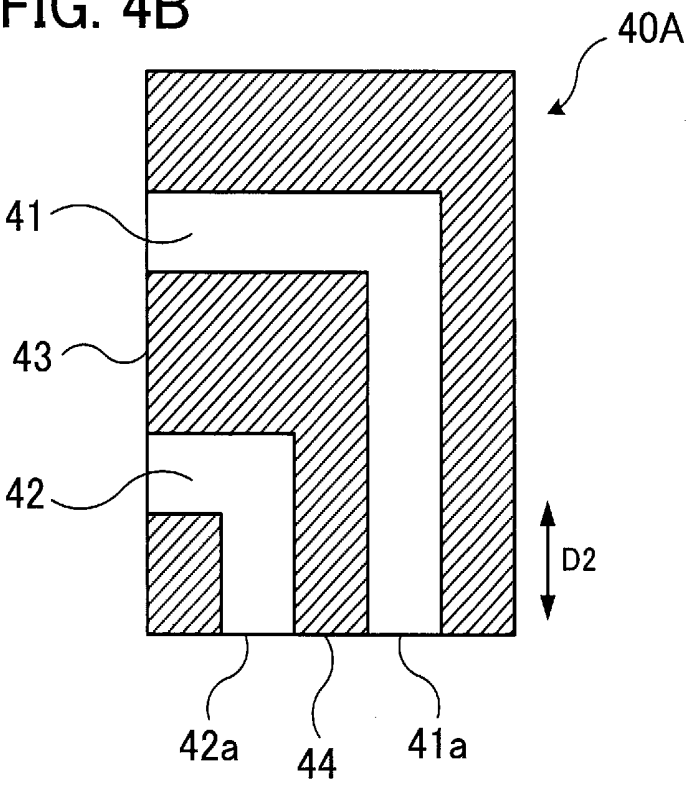


FIG. 5A

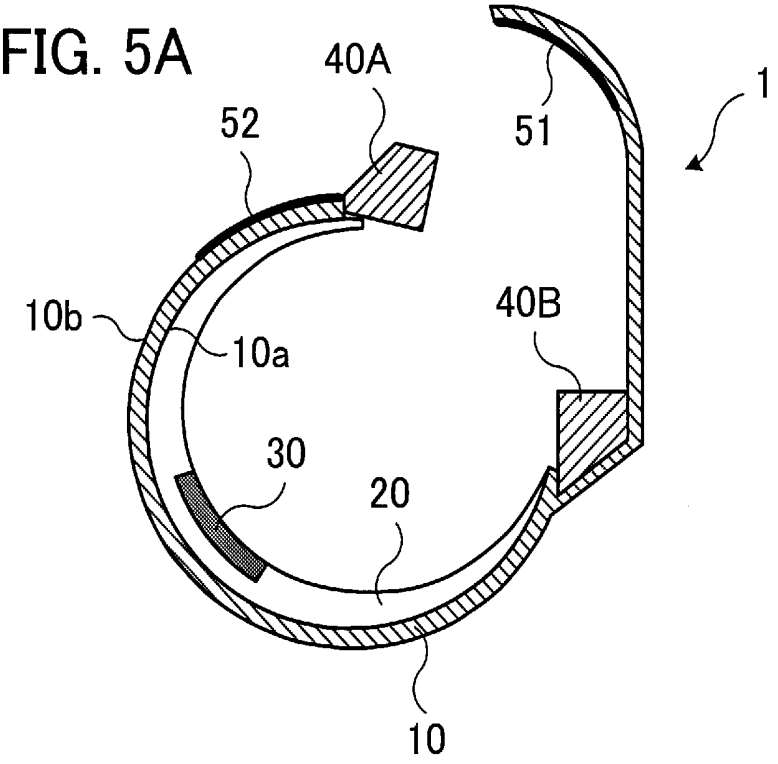


FIG. 5B

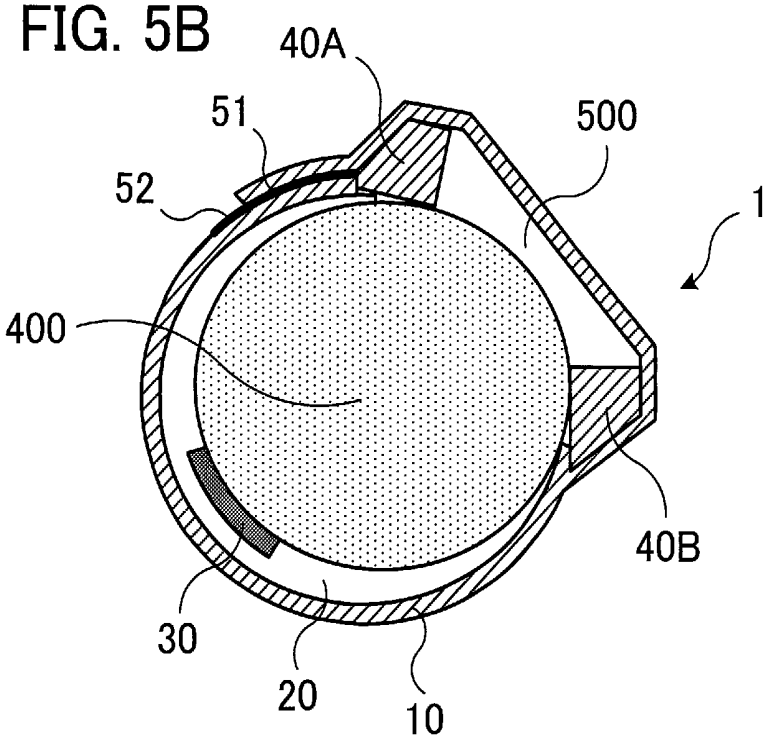


FIG. 6A

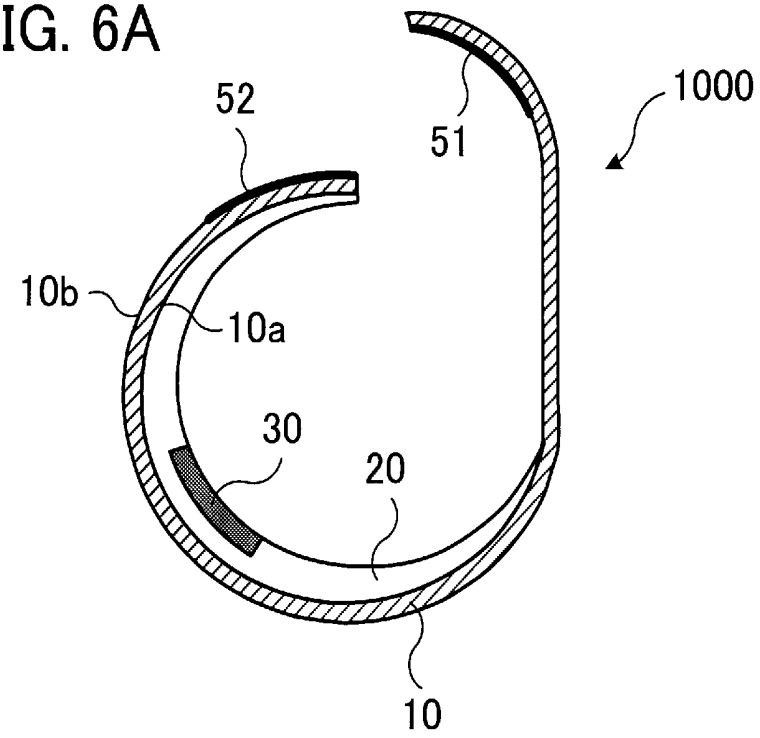


FIG. 6B

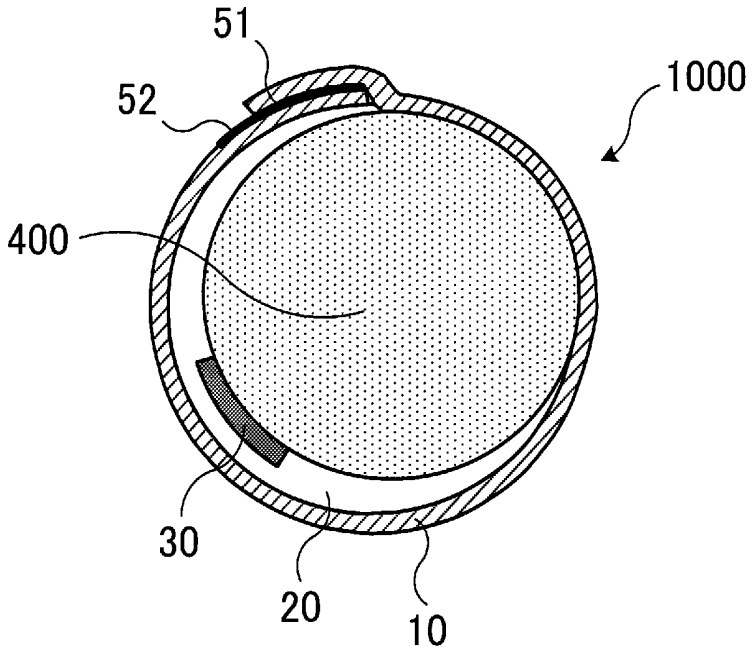


FIG. 7A

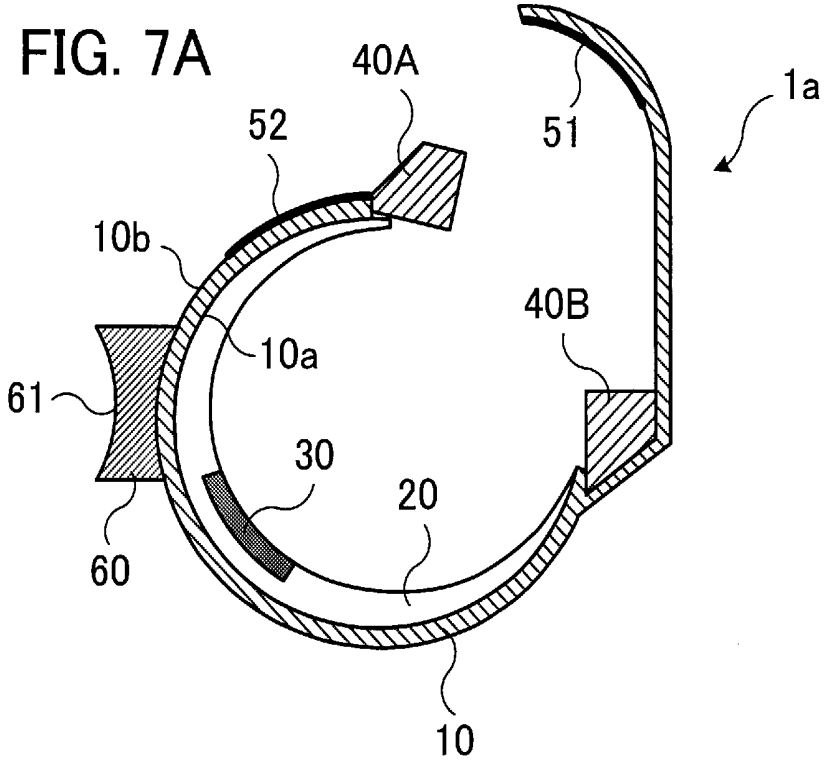

40A
52
51
1a
10b
40B
10a
61
30
20
60
10

FIG. 7B

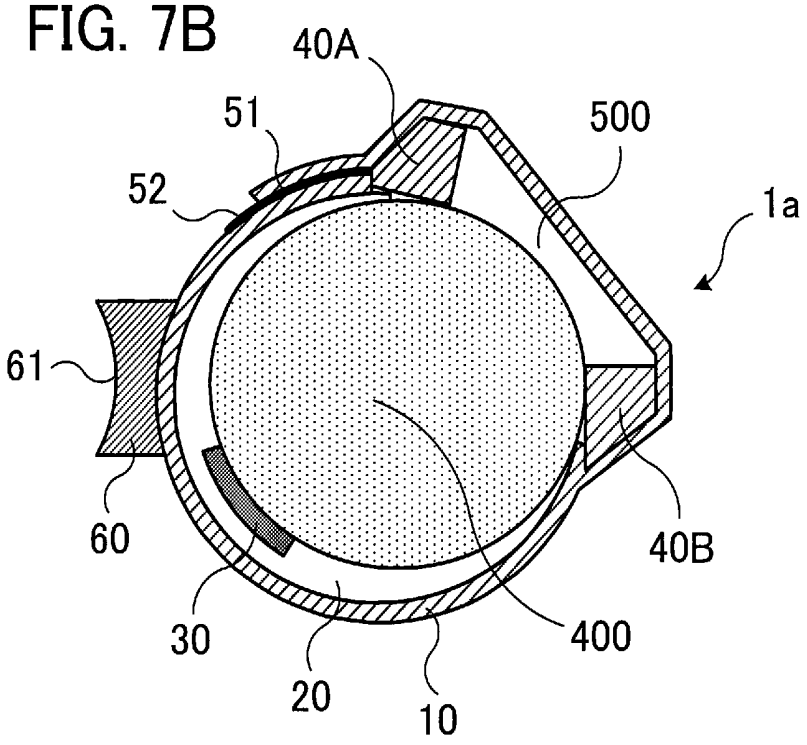

40A
51
500
52
1a
61
60
40B
30
400
20
10

FIG. 8A

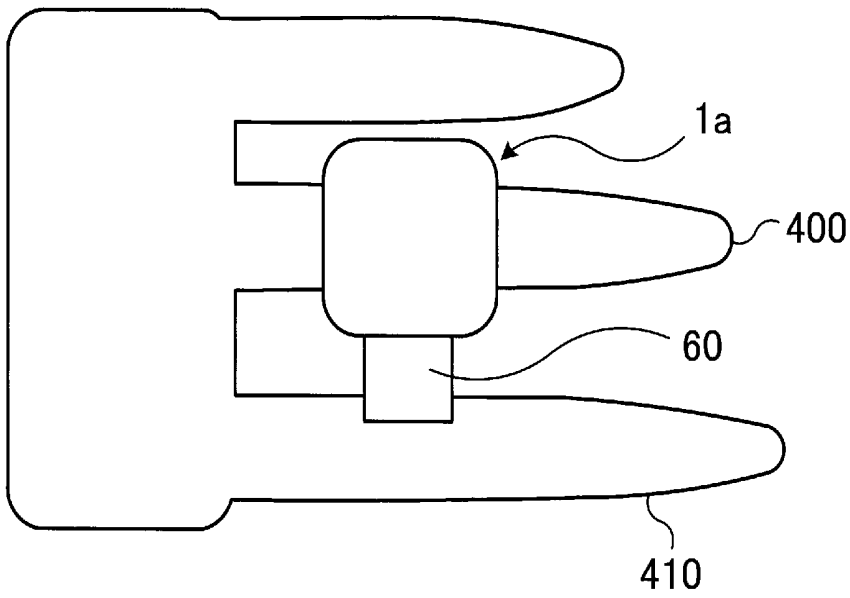


FIG. 8B

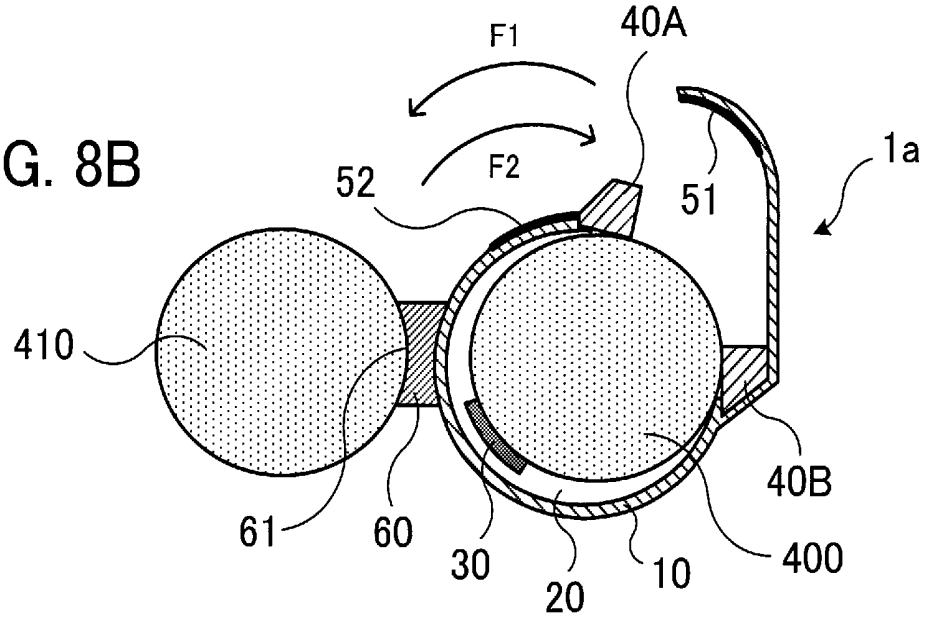


FIG. 8C

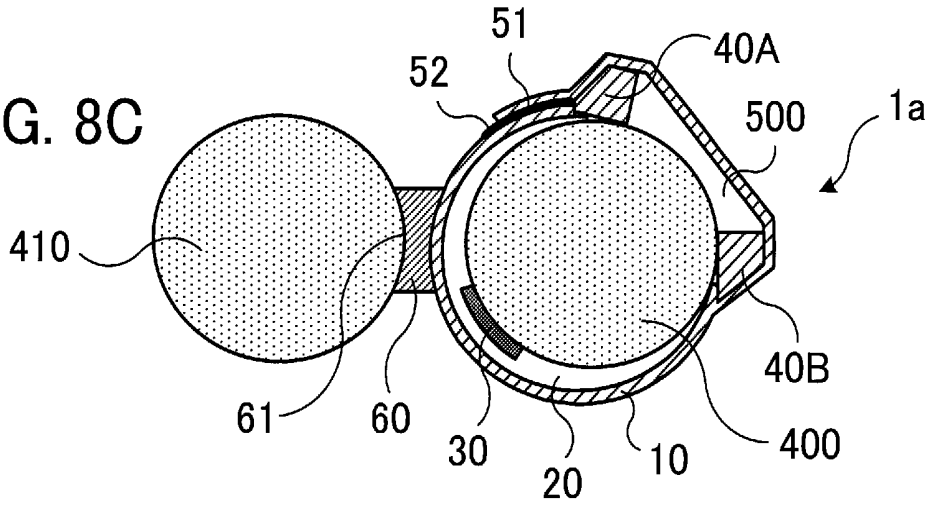


FIG. 9A

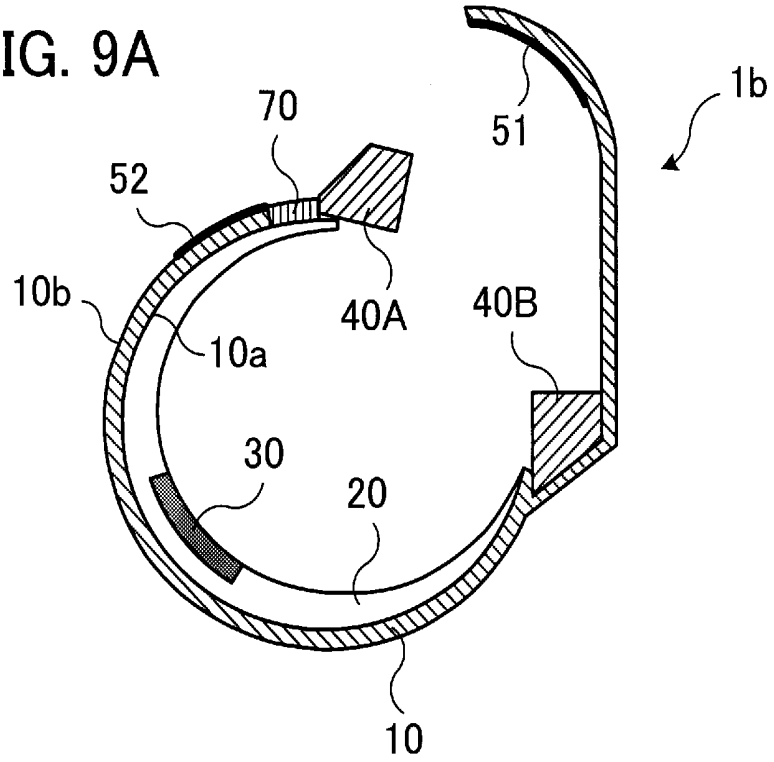
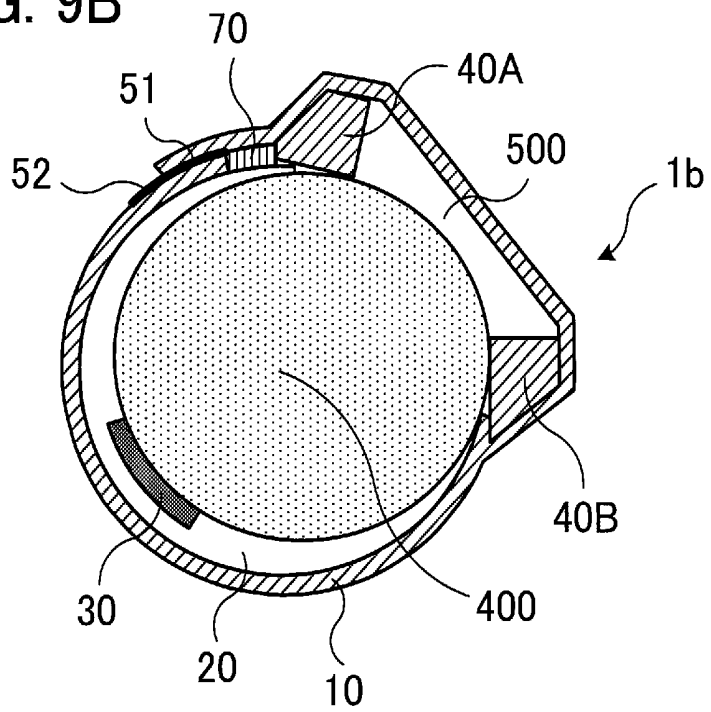

70
51
1b
52
10b
40A
40B
10a
30
20
10

FIG. 9B


70
40A
51
500
52
1b
40B
30
400
20
10

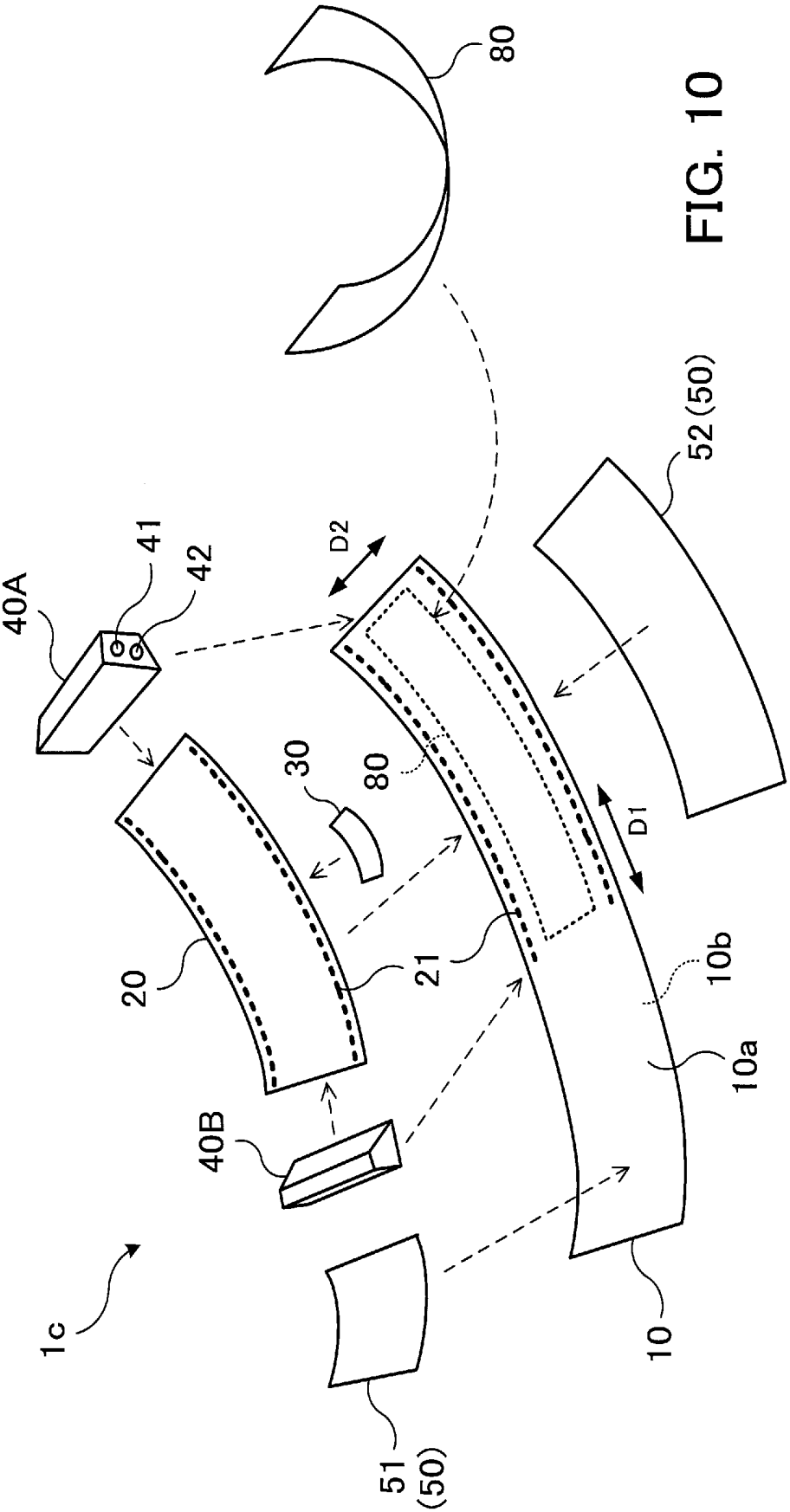


FIG. 10

BLOOD PRESSURE MONITORING CUFF

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation application of International Application PCT/JP2017/014786 filed on Apr. 11, 2017 which designated the U.S., the entire contents of which are incorporated herein by reference.

FIELD

[0002] The embodiments discussed herein are related to a blood pressure monitoring cuff.

BACKGROUND

[0003] Several blood pressure monitoring cuffs, which measure blood pressure by being wound around a measuring position such as the arm, wrist, or finger, are known. Measurement of blood pressure using a cuff is performed by winding the cuff around a predetermined measuring position and pressurizing (i.e., inflating) an air bag (also referred to by terms such as "expansion chamber") provided on the cuff to compress an artery at the measuring position.

[0004] See, for example, the following documents:

[0005] Japanese Laid-open Patent Publication No. 2003-144397; and

[0006] Japanese Laid-open Patent Publication No. S63-77433.

[0007] When blood pressure is measured using a cuff, pressurizing the cuff in a state where the cuff surrounds the entire circumference of the measuring position compresses veins and may cause congestion. Congestion may cause discomfort to the subject and may also affect the blood pressure measurement results.

SUMMARY

[0008] According to an aspect, there is provided a blood pressure monitoring cuff which includes: a band that is wound around a measuring position where blood pressure is measured; an air bag that is provided on a first surface on a measuring position side of the band and whose length in a length direction of the first surface is shorter than an outer circumference of the measuring position; a first spacer and a second spacer that are respectively provided at both ends in the length direction of the air bag; and a fixing portion that is provided on the band and is capable of detachably fixing the band, which has been wound around the measuring position so as to cover the first spacer and the second spacer, to a second surface that is an opposite side to the first surface.

[0009] The object and advantages of the invention will be realized and attained by means of the elements and combinations particularly pointed out in the claims.

[0010] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are not restrictive of the invention.

BRIEF DESCRIPTION OF DRAWINGS

[0011] FIG. **1** depicts an example configuration of a blood pressure monitor;

[0012] FIG. **2** depicts one example of a blood pressure monitor that uses a cuff according to a first embodiment;

[0013] FIG. **3** depicts one example of the cuff according to the first embodiment;

[0014] FIGS. **4**A and **4**B depict examples of a spacer provided in the cuff according to the first embodiment;

[0015] FIGS. **5**A and **5**B depict an example of the cuff according to the first embodiment;

[0016] FIGS. **6**A and **6**B depict a cuff that is a comparative example;

[0017] FIGS. **7**A and **7**B depict an example of a cuff according to a second embodiment;

[0018] FIGS. **8**A to **8**C depict how the cuff according to the second embodiment is wound;

[0019] FIGS. **9**A and **9**B depict an example of a cuff according to a third embodiment; and

[0020] FIG. **10** depicts an example of a cuff according to a fourth embodiment.

DESCRIPTION OF EMBODIMENTS

[0021] First, a blood pressure monitor will be described.

[0022] FIG. **1** depicts an example configuration of a blood pressure monitor.

[0023] The blood pressure monitor **100** depicted in FIG. **1** includes a body **200** and a cuff **300** that is connected to the body **200**.

[0024] The body **200** includes a control unit **210**, a pump **220**, and an air flow path **230** that leads from the pump **220** to the cuff **300**. The body **200** further includes a valve **240**, a valve **250**, a pressure sensor **260**, and a pressure sensor **270** provided on the air flow path **230**.

[0025] The cuff **300** includes a compression unit **310** that compresses the measuring position where blood pressure is measured, and a light source **320** and a photoelectric sensor **330** for detecting the state of an artery (for example, the volume of an artery) at the measuring position. The compression unit **310** is connected to the air flow path **230** and is pressurized and depressurized by introducing air from the air flow path **230** and discharging air to the air flow path **230**.

[0026] In the blood pressure monitor **100**, the pump **220** of the body **200** supplies compressed air to the air flow path **230**. The pressure sensor **260** detects the pressure inside the air flow path **230** between the pump **220** and the valve **240**. Based on the pressure detected by the pressure sensor **260**, the control unit **210** controls the supplying of air from the pump **220** and the opening of the valve **240** so that the pressure (or "pumping pressure") inside the air flow path **230** between the pump **220** and the valve **240** is constant.

[0027] The pressure sensor **270** detects the pressure inside the air flow path **230** between the valve **240** and the compression unit **310** of the cuff **300**. The valve **250** is provided on the air flow path **230** between the valve **240** and the compression unit **310** and by opening and closing the valve **250**, the air flow path **230** and the external environment are connected and disconnected. In the cuff **300**, the light source **320** emits light (for example, infrared light) onto an artery at the measuring position, and the photoelectric sensor **330** detects the amount of reflected light produced for the light emitted by the light source **320** and generates an electric signal indicating the amount of reflected light. The control unit **210** of the body **200** controls the light intensity of the light source **320** and controls the opening of the valve **250** based on the amount of reflected light (i.e., the electrical signal indicating the amount) detected by the photoelectric sensor **330**.

[0028] The amount of reflected light detected by the photoelectric sensor **330** varies according to the amount of hemoglobin flowing in the artery at the measuring position, and the amount of hemoglobin flowing in the artery varies with the volume of the artery. The control unit **210** controls the opening of the valve **250** and adjusts the pressure of the compression unit **310** so that the reflected light amount detected by the photoelectric sensor **330** is constant. That is, the artery at the measuring position that expands and contracts with pulsation of the heart is compressed by the compression unit **310** so that the volume of the artery is constant. The control unit **210** controls compression of the artery at the measuring position in this way and detects the pressure (cuff pressure) detected by the pressure sensor **270** as the blood pressure at the measuring position.

[0029] The blood pressure monitor **100** is a blood pressure measuring apparatus that measures blood pressure of an artery at the measuring position using so-called "volume compensation", and is capable of noninvasive measurement of blood pressure which may be performed continuously.

[0030] A cuff of a configuration described in the following embodiments is used as the cuff **300** of the blood pressure monitor **100** described above.

[0031] A first embodiment will be described first.

[0032] FIG. **2** depicts one example of a blood pressure monitor that uses a cuff according to a first embodiment. FIG. **2** is a plan view schematically depicting the principal part of the cuff.

[0033] As one example, assume here that the measuring position for blood pressure is the finger. As depicted in FIG. **2**, the blood pressure monitor **100** includes the body **200** and a cuff **1** (corresponding to the cuff **300** (see FIG. **1**) described above) connected to the body **200**. When measuring the blood pressure at the finger using the blood pressure monitor **100**, the cuff **1** is wound around the finger used as the measuring position.

[0034] The cuff **1** depicted in FIG. **2** includes a band **10**, an air bag **20**, a sensor unit **30**, a spacer **40**A and a spacer **40**B, and a fixing portion **50**.

[0035] When measuring the blood pressure at a finger, the band **10** is wound around the finger. As one example, to match the typical tapered shape of a finger when wound, the band **10** may be curved in the manner of a bow when viewed from above as in FIG. **2**.

[0036] The air bag **20** is provided on a surface **10***a* of the band **10** that is located on the finger side when the band **10** is wound around the finger. As depicted in FIG. **2**, the air bag **20** is provided in a region AR that starts at a first end in the length direction D**1** of the band **10** and is shorter than the outer circumference of the finger at the measuring position. Note that in the example in FIG. **2**, in keeping with the band **10** that is curved into a bow shape when viewed from above, an air bag **20** that is shaped like a bow when viewed from above is provided on the surface **10***a* of the band **10**. The air bag **20** expands when pressurized by the air supplied from an air tube **2** and contracts when depressurized by the air discharged to the air tube **2**. When blood pressure is measured at the finger, the finger is compressed by the expansion and contraction of the air bag **20**. That is, the air bag **20** functions as the compression unit **310** (see FIG. **1**) described above.

[0037] The sensor unit **30** includes a light source and a photoelectric sensor. As one example, a light-emitting element is used as the light source and a light-receiving element is used as the photoelectric sensor. The sensor unit **30** is a so-called "board-mounted sensor" where a light source and a photoelectric sensor are mounted on a board. The light source of the sensor unit **30** functions as the light source **320** described above (see FIG. **1**) and the photoelectric sensor of the sensor unit **30** functions as the photoelectric sensor **330** described above (see FIG. **1**). The sensor unit **30** is provided on the inside of the air bag **20**, as one example, on the inner surface of the air bag **20**.

[0038] The spacers **40**A and **40**B are provided at the respective ends in the length direction D**1** of the air bag **20**. Since the air bag **20** is provided in the region AR that is shorter than the outer circumference of the finger, the spacers **40**A and **40**B provided at both ends of the air bag **20** become separated from each other when the band **10** is wound around the finger. The air tube **2** and an electric cable **3** that connect to the body **200** of the blood pressure monitor **100** are connected to one out of the spacer **40**A and the spacer **40**B, in this example, the spacer **40**A. The air tube **2** corresponds to all or part of the air flow path **230** described above (see FIG. **1**). The electric cable **3** includes wiring **3***a* that transmits a signal for controlling intensity to the light source of the sensor unit **30** and wiring **3***b* that transmits a signal, which has been detected (generated) by the photoelectric sensor of the sensor unit **30**, to the body **200**. The configuration of the spacer **40**A (and the spacer **40**B) is described in more detail later.

[0039] When the band **10** has been wound onto the finger so as to cover the spacer **40**A and the spacer **40**B, the fixing portion **50** detachably fixes a second end in the length direction D**1**, which is opposite the first end where the air bag **20** is provided, to an opposite surface **10***b* to the surface **10***a* where the air bag **20** is provided. As one example, a planar fastener **51** and a planar fastener **52** are respectively provided on the surface **10***a* and the surface **10***b* of the band **10** as the fixing portion **50**. The planar fasteners **51** and **52** are respectively provided at a part of the surface **10***a* and a part of the surface **10***b* that face each other when the band **10** has been wound around the finger to cover the spacers **40**A and **40**B.

[0040] The cuff **1** described above is described in more detail below.

[0041] FIG. **3** depicts one example of a cuff according to the first embodiment. FIG. **3** is an exploded perspective view schematically depicting the cuff.

[0042] A flexible but non-stretchable or relatively non-stretchable (hereinafter simply "non-stretchable") sheet, as one example, a non-stretchable vinyl sheet, is used as the band **10** of the cuff **1**. A flexible and stretchable or relatively stretchable (hereinafter simply "stretchable") sheet, as one example, a stretchable vinyl sheet, is stuck on by thermal bonding or the like to the first end in the length direction D**1** of the band **10**. As one example, as depicted in FIG. **3**, thermal bonding is performed at a location **21** to stick the two sheets together. The air bag **20** is formed by the sheet stuck onto the first end of the sheet of the band **10**.

[0043] The sensor unit **30** is provided inside the air bag **20**. As one example, the sensor unit **30** is attached to the inner surface of the sheet of the air bag **20** which is itself stuck onto the sheet of the band **10**. The sensor unit **30** is provided inside the air bag **20** so that when the band **10** has been wound with the air bag **20** facing the finger, light from the light source is emitted onto the finger and the reflected light is received by the photoelectric sensor. A stretchable mate-

rial that is transparent for the light emitted from the light source and the reflected light is used as the sheet of the air bag **20**. Various non-stretchable materials are used as the sheet of the band **10**, and as one example, a black non-stretchable material is used.

[0044] The spacer **40**A and the spacer **40**B are provided at the respective ends in the length direction D**1** of the air bag **20**. Various materials are used for the spacer **40**A and the spacer **40**B to ensure that a certain shape (here meaning a height from the finger) is maintained when the band **10** has been wound around the finger so as to cover the spacers **40**A and **40**B and the spacers **40**A and **40**B are themselves pressed down onto the finger by the band **10**. As one example, various materials such as resin, cloth, paper, metal, and ceramic are used as the spacers **40**A and **40**B. The spacers **40**A and **40**B are attached to the air bag **20** and the band **10** using methods such as thermal bonding or adhesion using adhesive or adhesive tape.

[0045] The planar fastener **51** (as one example, loops) and the planar fastener **52** (as one example, hooks) are respectively provided at parts of the air bag **20** side surface **10***a* and the opposite surface **10***b* that face each other when the band **10** has been wound around the finger. The planar fasteners **51** and **52** are attached to the band by a method such as adhesion, thermal bonding, or sewing.

[0046] The spacers **40**A and **40**B provided on the cuff **1** will now be described.

[0047] The air tube **2**, which supplies and discharges air to and from the air bag **20**, and the electric cable **3**, which includes the wiring **3***a* and the wiring **3***b* connected to the sensor unit **30** inside the air bag **20**, are provided on one of the spacer **40**A and the spacer **40**B, in this example, the spacer **40**A.

[0048] FIGS. **4**A and **4**B depict examples of a spacer provided in the cuff according to the first embodiment. FIG. **4**A is a plan view schematically depicting a principal part when viewed from an attachment surface side of the spacer. FIG. **4**B is a cross-sectional view schematically depicting the principal part of the spacer. FIG. **4**B is a schematic cross-sectional view along a line L**4**-L**4** in FIG. **4**A.

[0049] As one example, as depicted in FIGS. **4**A, **4**B and FIG. **3** described above, the spacer **40**A includes a hole **41** that forms the air tube **2** or in which the air tube **2** is provided and a hole **42** in which the electric cable **3** is provided. The spacer **40**A is attached so that the hole **41** and the hole **42** pass through to the inside of the air bag **20** provided on the band **10** ("the inside" here meaning the space between the sheet of the band **10** and the sheet of the air bag **20**).

[0050] The hole **41** and the hole **42** respectively have an opening **41***a* and an opening **42***a* that are open to the outside on one side surface **44** at one end in a width direction D**2**, which is perpendicular to the length direction D**1**, out of the two surfaces on the sides when an attachment surface **43** where the spacer **40**A is attached to the air bag **20** (and the band **10**) is regarded as the bottom surface. The hole **41** and the hole **42** extend a certain distance from the opening **41***a* and the opening **42***a* in the width distance D**2**, then bend toward the attachment surface **43**, for example by 90° and pass through to the inside of the air bag **20**.

[0051] Through one of the holes, the hole **41**, that passes through to the inside of the air bag **20**, air is supplied from the air tube **2**, which connects to the body **200**, into the air bag **20** and air is discharged from the air bag **20** to the air tube **2**. Through the other of the holes, the hole **42**, that passes through to the inside of the air bag **20**, the electric cable **3** (that is, the wiring **3***a* and the wiring **3***b*) is inserted inside the air bag **20** and is connected to the sensor unit **30**.

[0052] In this way, by providing the air tube **2** that is used to pressurize and depressurize the air bag **20** and the electric cable **3** used to connect the sensor unit **30** on one spacer **40**A, it is possible to suppress an increase in the number of the members used for the cuff **1**. Also, by providing the air tube **2** and the electric cable **3** on the single spacer **40**A, discomfort experienced by the subject when the cuff **1** is wound around the finger is reduced.

[0053] Next, the winding of the cuff **1** described above on the finger will be described.

[0054] FIGS. **5**A and **5**B depict an example of a cuff according to the first embodiment. FIG. **5**A is a cross-sectional view schematically depicting a principal part of the cuff before winding. FIG. **5**B is a cross-sectional view schematically depicting the principal part of the cuff after winding.

[0055] As depicted in FIG. **5**A, the cuff **1** includes the band **10**, the air bag **20** provided on the finger-side surface **10***a* of the band **10**, the sensor unit **30** provided inside the air bag **20**, and the spacers **40**A and the spacer **40**B provided at both ends of the air bag **20**. The planar fastener **51** and the planar fastener **52** are respectively provided on the air bag **20** side surface **10***a* of the band **10** and the opposite surface **10***b* as the fixing portion **50**.

[0056] When measuring blood pressure, as depicted in FIG. **5**B, the cuff **1** is wound around a finger **400** that is the measuring position for blood pressure. Since the air bag **20** is shorter than the outer circumference of the finger, when the cuff **1** is wound around the finger **400**, the spacer **40**A and the spacer **40**B provided at both ends of the air bag **20** become positioned apart from each other. The finger **400** is therefore exposed between the separated spacers **40**A and **40**B. The planar fastener **51** end of the band **10** (that is the end where the air bag **20** is not provided) is wound around the finger so as to cover the spacers **40**A and **40**B that are positioned apart from each other and the planar fastener **51** is fixed to the planar fastener **52** at the facing position. When the band has been fixed in this way, the spacer **40**A and the spacer **40**B that are positioned apart produce a gap **500** corresponding to the height (thickness) of the spacers **40**A and **40**B between the finger **400** exposed between the spacers **40**A and **40**B and the band **10** that has been wound so as to cover the spacers **40**A and **40**B.

[0057] Since the gap **500** is produced between the finger **400** and the band **10** wound around the finger **400**, during measurement of blood pressure at (an artery of) the finger **400**, even when compression is caused by the air bag **20** expanding due to pressurization, compression of the veins throughout the finger **400** (that is, the position where the cuff **1** is wound) is suppressed. That is, the entire circumference of the finger **400** is not compressed by the cuff **1**, producing a state where the part of the finger **400** between the spacers **40**A and the spacer **40**B is not pressed by the band **10** thanks to the gap **500** and remains unbound. This means that the finger **400** and the veins within the finger are only partially compressed. In this way, with the cuff **1**, when measuring the blood pressure at the finger **400**, by compressing only some of the veins, congestion of the finger **400**, and in particular, congestion during continuous measurement of blood pressure is suppressed.

[0058] For comparison purposes, an example cuff is depicted in FIGS. **6**A and **6**B.

[0059] FIGS. **6**A and **6**B are cross-sectional views schematically depicting a principal part of a cuff that is a comparative example respectively before and after attachment.

[0060] The cuff **1000** depicted in FIGS. **6**A and **6**B differs to the cuff **1** described above in that the spacers **40**A and **40**B are not provided.

[0061] When using a configuration, like the cuff **1000**, where the spacers **40**A and **40**B are not provided, the cuff is wound around the finger **400** and the band **10** is fixed using the planar fastener **51** and the planar fastener **52**. When the air bag **20** expands, the entire circumference of the finger **400** is squeezed by the cuff **1000**. When the entire circumference of the finger **400** is squeezed during measurement of blood pressure in a state where the cuff **1000** is wound around the entire circumference of the finger **400**, there is the risk of veins being excessively compressed, causing congestion. Congestion may cause discomfort to the subject and may affect the measurement results for blood pressure.

[0062] On the other hand, the cuff **1** described above is provided with the spacers **40**A and **40**B, and when the cuff **1** is wound around the finger **400** and fixed, part of the finger **400** becomes exposed between the spacers **40**A and **40**B, with the gap **500** being produced between this part of the finger **400** and the band **10**. By doing so, the entire circumference of the finger **400** is not squeezed during measurement of blood pressure and only some of the veins are compressed, which suppresses congestion. Since congestion is suppressed by the cuff **1** in this way, it is possible to reduce the discomfort experienced by the subject and to measure blood pressure accurately at (an artery of) the finger **400**.

[0063] With the cuff **1**, by using flexible sheets as the band **10** and the air bag **20**, it is possible to miniaturize the cuff **1** and to reduce the discomfort experienced by the subject when the cuff **1** is wound around the finger **400**.

[0064] In addition, with the cuff **1**, by providing the air tube **2** and the electric cable **3** on one spacer **40**A, it is possible to suppress an increase in the number of the members used in the cuff **1** and to reduce the discomfort experienced by the subject when the cuff **1** is wound around the finger **400**.

[0065] With the cuff **1**, the other spacer **40**B may be used as a pressing member or a positioning member when the band **10** is wound onto the finger. That is, when the subject himself or herself winds the band **10** onto the finger **400** of one hand, it is possible for example to hold down the spacer **40**B with the finger of the other hand and grasp and pull the planar fastener **51** side end of the band **10** with the other fingers and fix the planar fastener **51** to the other planar fastener **52**. By using the spacer **40**B in this way as a holding member, it is possible to suppress rotation of the cuff **1** in the circumferential direction of the finger **400**. By suppressing rotation of the cuff **1**, it is possible to guide the cuff **1** so that the sensor unit **30** is located at an appropriate position corresponding to an artery of the finger **400**.

[0066] According to the first embodiment, the cuff **1**, which has superior comfort and attachability on the finger **400**, suppresses congestion, and measures the blood pressure of the finger **400** with high accuracy, and the blood pressure monitor **100** that uses this cuff **1** are realized.

[0067] A second embodiment will now be described.

[0068] FIGS. **7**A and **7**B depict a cuff according to the second embodiment. FIG. **7**A is a cross-sectional view schematically depicting a principal part of the cuff before attachment and FIG. **7**B is a cross-sectional view schematically depicting the principal part of the cuff after attachment.

[0069] The cuff **1***a* depicted in FIGS. **7**A and **7**B differs to the cuff **1** described above in the first embodiment in that a protruding member **60** is provided on a surface of the band **10** that is located on the outside when the cuff **1***a* is wound, that is, the surface **10***b* where the planar fastener **52** is provided.

[0070] It is possible to use the member **60** of the cuff **1***a* as a member for holding down or positioning the cuff **1***a* when the cuff **1***a* is wound on the finger **400** to be measured as depicted in FIG. **7**B. This feature will now be described with reference to FIGS. **8**A to **8**C.

[0071] FIGS. **8**A to **8**C depict how the cuff according to the second embodiment is wound. FIG. **8**A is a plan view schematically depicting a principal part of the hand including the finger where the cuff is to be wound and blood pressure is to be measured. FIGS. **8**B and **8**C are cross-sectional views schematically depicting a principal part of the hand including the finger where the cuff is to be wound and blood pressure is to be measured. FIG. **8**B depicts a state where the cuff is being wound and FIG. **8**C depicts a state after the cuff has been wound.

[0072] As depicted in FIGS. **8**A and **8**B, when the cuff **1***a* where the member **60** is provided on the band **10** is wound onto the finger **400** to be measured, by sandwiching the member **60** between the finger **400** to be measured and an adjacent finger **410**, rotation of the cuff **1***a* is suppressed. In more detail, as depicted in FIG. **8**B, during winding of the cuff **1***a* onto the finger **400** to be measured, when the planar fastener **51** end of the band **10** is pulled and the planar fastener **51** is fixed to the other planar fastener **52**, a rotational force F**1** in the pulling direction (the circumferential direction of the finger **400**) acts upon the cuff **1***a*. Since the member **60** provided on the cuff **1***a* has been sandwiched between the finger **400** to be measured and the adjacent finger **410**, a rotation resisting force F**2** that resists the rotational force F**1** is produced, which makes it possible to suppress rotation of the cuff **1***a* during winding. By doing so, as depicted in FIG. **8**C, it is possible to wind the cuff **1***a* onto the finger **400** to be measured while suppressing rotation of the cuff **1***a*. By suppressing rotation of the cuff **1***a*, it is possible to guide the cuff **1***a* so that the sensor unit **30** becomes located at an appropriate position corresponding to an artery of the finger **400**.

[0073] So long as the member **60** provided on the cuff **1***a* is capable of being sandwiched between the finger **400** to be measured and the adjacent finger **410** and suppressing rotation of the cuff **1***a*, it is possible to use various materials, such as resin, cloth, paper, metal, ceramic, etc. Similarly, the member **60** may be formed in various shapes so long as the member **60** is capable of being sandwiched between the finger **400** to be measured and the adjacent finger **410** and suppressing rotation of the cuff **1***a*. By providing a depression **61** (see FIGS. **8**B and **8**C) that is curved so as to fit the external form of the adjacent finger **410** when the member **60** is sandwiched between the fingers and/or providing protrusion that catches on an upper part of the adjacent finger **410**, it is possible to suppress rotation of the cuff **1***a* more effectively.

[0074] According to the second embodiment, the cuff **1***a*, which has superior comfort and attachability on the finger **400**, suppresses congestion, and measures the blood pressure of the finger **400** with high accuracy due to the spacers **40**A and **40**B in combination with the member **60**, and the blood pressure monitor **100** that uses the cuff **1***a* are realized.

[0075] A third embodiment will now be described.

[0076] FIGS. **9**A and **9**B depict one example of a cuff according to the third embodiment. FIG. **9**A is a cross-sectional view schematically depicting a principal part of the cuff before winding and FIG. **9**B is a cross-sectional view schematically depicting a principal part of the cuff after winding.

[0077] A cuff **1***b* depicted in FIGS. **9**A and **9**B differs to the cuff **1** according to the first embodiment described above in that a mark **70**, which can be identified by the subject or someone else, is provided on a surface of the band **10** that is located on the outside when the cuff **1***b* is wound, that is, the surface **10***b* where the planar fastener **52** is provided.

[0078] The mark **70** of the cuff **1***b* is provided at a predetermined position relative to the sensor unit **30**. As one example, the mark **70** is provided so that when the cuff **1***b* has been wound on the finger **400** to be measured and the mark **70** is positioned on the back side of the hand including the finger **400** as depicted in FIG. **9**B, the sensor unit **30** becomes located at an appropriate position corresponding to an artery of the finger **400**.

[0079] When the cuff **1***b* depicted in FIGS. **9**A and **9**B is wound onto the finger **400**, the planar fastener **51** end of the band **10** is pulled and the planar fastener **51** is fixed to the other planar fastener **52**. During this fixing operation or after fixing, by positioning the mark **70** on the back side of the hand with the finger **400**, the sensor unit **30** that is at a predetermined position from the mark **70** will become located at an appropriate position corresponding to an artery of the finger **400**. By using the mark **70** for guiding so that the sensor unit **30** becomes positioned at an appropriate position corresponding to an artery in the finger **400**, it is possible to accurately measure blood pressure at the finger **400**.

[0080] So long as the mark **70** provided on the cuff **1***b* can be identified by the subject or someone else, there are no particular limitations on the form of the mark **70**. As examples, it is possible to use a mark **70** of a different color to the surface **10***b* of the band **10**, a mark **70** defined by a line on the surface **10***b*, or a mark **70** that is convex or concave with respect to the surface **10***b*.

[0081] According to the third embodiment, the cuff **1***b*, which has superior comfort and attachability on the finger **400** due to the spacers **40**A and **40**B and suppresses congestion and measures blood pressure of the finger **400** with high accuracy due to the spacers **40**A and **40**B in combination with the mark **70**, and the blood pressure monitor **100** that uses the cuff **1***b* are realized.

[0082] Note that the cuff **1***b* according to the third embodiment may be further equipped with the member **60** described above in the second embodiment. By doing so, it is possible to suppress rotation when the cuff **1***b* is wound on the finger **400**, which makes the cuff **1***b* easier to attach and increases the accuracy of measurement due to the sensor unit **30** being guided to an appropriate position.

[0083] Next, a fourth embodiment will be described.

[0084] FIG. **10** is an exploded perspective view schematically depicting a cuff according to the fourth embodiment.

[0085] The cuff **1***c* depicted in FIG. **10** differs to the cuff **1** described above in the first embodiment in that a member **80** is provided on the band **10** to maintain the shape of the band **10**.

[0086] The member **80** uses a sheet that exhibits elasticity, as examples, a variety of resin sheets such as fluorocarbon resin, polyamide resin, and polycarbonate resin. In a solitary state, the member **80** is shaped so as to be curled toward one side. The member **80** is provided on the surface **10***b* or the surface **10***a* of the band **10**, or as an inner layer of the band **10**, so that the curled surface of the member **80** is on the air bag **20** side.

[0087] The cuff **1***c* has the member **80** provided on the band **10** so that before winding on the finger **400**, the cuff **1***c* is curled toward the surface **10***a* of the band **10**, that is, toward the surface **10***a* on which the air bag **20** is provided. When the cuff **1***c* is shaped in advance in this way, when the finger is inserted inside the cuff **1***c*, the cuff **1***c* will substantially follow the shape of the finger. Since the cuff **1***c* substantially follows the shape of the finger, a winding operation of pulling the planar fastener **51** end of the band **10** and fixing the planar fastener **51** to the other planar fastener **52** is performed more easily.

[0088] According to the fourth embodiment, the cuff **1***c*, which has superior comfort and attachability on the finger due to the spacers **40**A and **40**B in combination with the member **80** and is capable of measuring blood pressure at the finger with high accuracy while suppressing congestion due to the spacers **40**A and **40**B, and the blood pressure monitor **100** that uses the cuff **1***c* are realized.

[0089] Note that the member **60** described above in the second embodiment may be provided on the cuff **1***c* according to the fourth embodiment. By doing so, it is possible to suppress rotation when the cuff **1***c* is wound on a finger and possible to make it easier to attach the cuff **1***c* and measure blood pressure with higher accuracy by guiding the sensor unit **30** to an appropriate position. When the member **60** is provided on the cuff **1***c* in this way, the member **60** may be connected to the member **80** or may be integrated with the member **80**.

[0090] The cuff **1***c* according to the fourth embodiment may also be provided with the mark **70** described above in the third embodiment. By doing so, it is possible to guide the sensor unit **30** to an appropriate position corresponding to an artery in the finger and accurately measure the blood pressure of a finger.

[0091] This completes the description of the cuffs **1**, **1***a*, **1***b*, and **1***c* according to the first to fourth embodiments that may be used as the cuff **300** of the blood pressure monitor **100**. Provided that the spacers **40**A and **40**B provided in the cuffs **1**, **1***a*, **1***b*, and **1***c* produce the gap **500** between the band **10** and the finger, which keeps the band **10** at a fixed height from the finger even when the band **10** is pressed and suppresses congestion, the spacers **40**A and **40**B may take any shape. As one example, the spacers **40**A and **40**B are not limited to being trapezoidal in cross section as in the illustrated examples, and it is possible to use spacers that are triangular or semicircular. In addition, protrusions (pressing members) may be additionally provided on the spacers **40**A and **40**B of this shape to make it easier for the spacers **40**A and **40**B to grip the finger during winding. The spacers **40**A and **40**B do not need to have the same shape as each other.

[0092] In the example described above, the air tube **2** and the electric cable **3** are provided on a single spacer, the

spacer **40**A. However, it is also possible to provide the air tube **2** and the electric cable **3** on the other spacer **40**B. Alternatively, one spacer, the spacer **40**A may be provided with the air tube **2** and the other spacer, the spacer **40**B, may be provided with the electric cable **3**, or the spacer **40**A may be provided with the electric cable **3** and the spacer **40**B may be provided with the air tube **2**. By providing the air tube **2** and the electric cable **3** on the spacers **40**A and **40**B, it is possible to suppress an increase in the number of members and decrease discomfort to the subject during winding.

[0093] By adjusting the size of the length direction D**1** of the band **10** and the air bag **20**, it is possible to produce cuffs **1**, **1***a*, **1***b*, and **1***c* that match the different outer circumferential sizes of fingers, such as small, medium, and large sizes.

[0094] The measuring position of blood pressure is not limited to the finger and may be the wrist, the arm, or the foot. It is possible to realize cuffs of different sizes that have the same configurations as the cuffs **1**, **1***a*, **1***b*, and **1***c* and can be wound around different measuring positions of blood pressure.

[0095] According to the embodiments, there is realized a blood pressure monitoring cuff that suppresses congestion during measurement of blood pressure.

[0096] All examples and conditional language provided herein are intended for the pedagogical purposes of aiding the reader in understanding the invention and the concepts contributed by the inventor to further the art, and are not to be construed as limitations to such specifically recited examples and conditions, nor does the organization of such examples in the specification relate to a showing of the superiority and inferiority of the invention. Although one or more embodiments of the present invention have been described in detail, it should be understood that various changes, substitutions, and alterations could be made hereto without departing from the spirit and scope of the invention.

What is claimed is:

1. A blood pressure monitoring cuff comprising:

a band that is wound around a measuring position where blood pressure is measured;

an air bag that is provided on a first surface on a measuring position side of the band and whose length in a length direction of the first surface is shorter than an outer circumference of the measuring position;

a first spacer and a second spacer that are respectively provided at both ends in the length direction of the air bag; and

a fixing portion that is provided on the band and is capable of detachably fixing the band, which has been wound around the measuring position so as to cover the first spacer and the second spacer, to a second surface that is an opposite side to the first surface.

2. The blood pressure monitoring cuff according to claim **1**,

wherein the first spacer has a first hole, which passes through to an inside of the air bag and through which air that pressurizes and depressurizes the air bag flows.

3. The blood pressure monitoring cuff according to claim **2**,

wherein the first hole bends after extending in a width direction of the first surface and passes through to the inside of the air bag.

4. The blood pressure monitoring cuff according to claim **1**, further comprising a sensor unit provided inside the air bag,

wherein the first spacer or the second spacer has a second hole that passes through to the inside of the air bag and in which a wire that is connected to the sensor unit is disposed.

5. The blood pressure monitoring cuff according to claim **1**, further comprising a first member that is provided on the second surface and is capable of being interposed between the measuring position where the band is wound and a different part of a body of a measured subject to the measuring position.

6. The blood pressure monitoring cuff according to claim **1**, further comprising a mark that is provided on the second surface and corresponds to a position that is a predetermined distance in the length direction from the sensor unit.

7. The blood pressure monitoring cuff according to claim **1**, further comprising a second member that is provided on the band and holds the band in a certain shape before winding on the measuring position.

8. A blood pressure monitoring cuff comprising:

a band that is wound around a measuring position where blood pressure is measured;

an air bag that is provided on a first surface on a measuring position side of the band; and

a first spacer that is provided at one end of the air bag in a length direction of the first surface and has a first hole that passes through to an inside of the air bag and through which air that pressurizes and depressurizes the air bag flows.

9. A blood pressure monitoring cuff comprising:

a band that is wound around a measuring position where blood pressure is measured;

an air bag that is provided on a first surface on a measuring position side of the band; and

a first member that is provided on a second surface, which is an opposite side to the first surface, and is capable of being interposed between the measuring position where the band is wound and a different part of a body of a measured subject to the measuring position.

* * * * *

专利名称(译)	血压监测袖套		
公开(公告)号	US20190387980A1	公开(公告)日	2019-12-26
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[标]申请(专利权)人(译)	株式会社索思未来		
申请(专利权)人(译)	SOCIONEXT INC.		
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摘要(译)

袖带包括：带，其缠绕在测量血压的测量位置周围；以及气囊，其设置在带的测量位置侧，并且其长度方向上的长度短于测量位置的外周。 在气囊的长度方向的端部分别设置有第一垫片和第二垫片。 该带缠绕在测量位置上，以覆盖第一间隔物和第二间隔物，并通过固定部可拆卸地固定在与测量位置侧相反的一侧的表面上。