Appeal Decision

Appeal No. 2020-11889

Appellant TOYOBO CO., LTD.

Patent Attorney U'sfi Patent Attorneys International Office

The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2018-41816, entitled "CLOTHING FOR ELECTROCARDIOGRAM MEASURING AND MANUFACTURING METHOD THEREOF" (the application published on June 14, 2018, Japanese Unexamined Patent Application Publication No. 2018-89446) has resulted in the following appeal decision:

Conclusion

The appeal of the case was groundless.

Reason

No. 1 History of the procedures

The present application is a divisional application filed on March 8, 2018 from Japanese Patent Application No. 2015-232291 filed on November 27, 2015. A notice of reasons for refusal was issued on October 29, 2019, and despite submission of a written opinion and a written amendment on January 7, 2020, an examiner's decision of refusal was issued on May 19, 2020. Against this, an appeal against an examiner's decision of refusal was filed on August 26, 2020 and a written amendment was submitted on the same day.

No. 2 The Invention

The inventions according to Claims 1 to 8 of the present application are specified by the matters recited in Claims 1 to 8 of the scope of claims amended by the written amendment on August 26, 2020, and the invention according to Claim 1 (hereinafter, referred to as "the Invention") among them is as follows.

"[Claim 1]

An electrocardiogram measuring clothing for men, comprising:

a 2-way tricot fabric;

a sheet with a first hot melt having a first hot melt layer and a first insulating layer;

a conductive sheet with a hot melt having a conductive layer, and a second hot melt layer laminated on the conductive layer; and

a sheet with a second hot melt having a third hot melt layer and a second insulating layer,

wherein the 2-way tricot fabric, the sheet with the first hot melt, the conductive sheet with the hot melt, and the sheet with the second hot melt are laminated in this order to form an electrode and wiring for measuring an electrocardiogram, and

wherein the thickness of the 2-way tricot fabric is 300 μm to 1200 μm".

No. 3 Reasons for refusal stated in the examiner's decision

Of the reasons for refusal in the examiner's decision (the examiner's decision of refusal dated May 19, 2020), the summary of Reason 2 (requirements for support) is as follows.

In the detailed description of the invention in the specification of the present application, it aims for providing an electrocardiogram measuring garment that can measure an electrocardiogram with reduced noise even during walking and exercise motions, and as a means for solving the problem, there is described an electrocardiogram measuring garment that adheres first to third sensors to a back side of the garment so that sensors come into contact with three specific places of a human body. However, in Claims 1 to 9 of the scope of claims, there is no specification about the arrangement of electrodes in relation to a human skeleton, and no means for solving the problem of the invention relating to the application, which is described in the detailed description of the invention, is reflected, so that the inventions according to Claims 1 to 9 exceed a range described in the detailed description of the invention.

Therefore, the inventions according to Claims 1 to 9 are not described in the detailed description of the invention, and thus do not satisfy the requirement stipulated in Article 36(6)(i) of the Patent Act.

No. 4 Matters described in the detailed description of the invention

1 The detailed description of the invention of the specification attached to the application

of the present application (hereinafter, referred to as "the detailed description of the invention of the case") describes the following matters (The underlines were made by the body.).

[Technical Field]

[0001]

The present invention relates to a method for measuring an electrocardiogram with less noise, and to an electrocardiogram measuring garment capable of measuring an electrocardiogram by wearing it as a garment.

[Background Art]

[0002]

Conventionally, as a method of measuring an electrocardiogram, a method of detecting an electric signal emitted by a human body by fixing electrodes at two or more places on the surface of the human body in a resting state is common. In this method, it was necessary to apply a gel or paste between the electrodes and a skin surface or to use an adhesive tape to fix the electrodes. For this reason, in continuous measurement for a long period of time, discomfort due to sweating, itching occur, and when the adhesive tape is used, dermatitis may also occur.

[0003]

On the other hand, in recent years, there has been an increasing demand for knowing what the state of the heart is during exercise, but the conventional method using gel or paste has a weak adhesive force and the electrodes fall from the human body during exercise motions such as walking or running. Further, in the method using the adhesive tape, since the amount of perspiration increases, there is a problem that the discomfort due to perspiration becomes more remarkable.

[0004]

For these reasons, in the medical field and the health monitoring field, a wearable biometric information measuring device that can easily measure biometric information such as an electrocardiogram by wearing a garment, a belt, or a strap with electrodes is drawing attention. For example, in a wearable measuring device that measures an electrocardiogram, it is expected that by spending daily life while wearing it as a garment, it is possible to easily grasp biological information such as fluctuations in heartbeat in various daily situations.

[0005]

However, when actually trying to measure biometric information using a wearable biometric information measuring device to which electrodes are attached, especially

when a person to be measured is performing an exercise motion such as walking or running, the present inventors have newly found the problem that the target information cannot be obtained due to increased noise of measured biological information.

[0006]

In the measurement of the electrocardiogram, FIG. 1 of Patent Document 1 describes that electrodes are attached to three places on an abdomen on the front surface of a human body and one place near the base of a neck, and FIG. 1 of Patent Document 2 describes that electrodes are attached to two places near the bottom of the left and right ends of left and right clavicles on the front surface of a human body and two places near the height of left and right lowermost ribs on a left and right axillary lines. However, the above-mentioned problems during walking motion and exercise motion had not been solved even by applying these electrode attachment positions to a wearable biometric information measuring device.

[Citation List]

[Patent Documents]

[0007]

[Patent Document 1] National Publication of International Patent Application No. 2012-519561

[Patent Document 2] Japanese Unexamined Patent Application Publication No. 2006-61446

[Summary of Invention]

[Problem to be solved by the invention]

[0008]

In consideration of the above problems, the present invention has set the subject of providing a measuring method capable of measuring an electrocardiogram with reduced noise and providing an electrocardiogram measuring garment capable of measuring such an electrocardiogram.

[Means for solving the problem]

[0009]

The present invention that has solved the above problems is a method for measuring an electrocardiogram of a human body, characterized in that

a first sensor is brought into contact with on any position within a region surrounded by the center line of a sternum in front surface of a human body, a left anterior axillary line, an upper end of a fifth rib, and a lower end of an eighth rib,

a second sensor is brought into contact with any position within the region surrounded by the center line of the sternum in front surface of the human body, the right

anterior axillary line, the upper end of the fifth rib, and a lower end of an eighth rib, and

a third sensor is brought into contact with any position on a vertical line drawn from a midpoint of a line connecting the center of the first sensor and the center of the second sensor toward a head direction of the human body vertically with respect to the line connecting the center of the first sensor and the center of the second sensor, thereby measuring an electrocardiogram.

[0010]

In this case, it is preferable to bring the third sensor into contact with the left and right second ribs on the front surface of the human body and the sternum. Also, it is also preferable to make a distance between the first sensor and the right anterior axillary line shorter than a distance between the first sensor and the center line of the sternum, and to make a distance between the second sensor and the left anterior axillary line shorter than a distance between the second sensor and the center line of the sternum. It is also preferable that the areas of the first sensor to the third sensor are 1 cm^2 or more.

[0011]

It is preferable that electrodes having wiring are used as the first sensor to the third sensor, and the wiring and the conductive layer of the electrode are formed of the same conductive composition.

It is also preferable to have a wearer wear a garment provided with the first sensor to the third sensor to measure an electrocardiogram.

[0012]

The present invention also includes an electrocardiogram measuring garment,

the electrocardiogram measuring garment adhering a first sensor to a third sensor on the back side of the garment so that

the first sensor is brought into contact with on any position within the region surrounded by the center line of the sternum in the front surface of the human body, the left anterior axillary line, the upper end of the fifth rib, and the lower end of the eighth rib,

the second sensor is brought into contact with any position within the region surrounded by the center line of the sternum in front surface of the human body, the right anterior axillary line, the upper end of the fifth rib, and a lower end of an eighth rib, and

the third sensor is brought into contact with any position on the vertical line drawn from a midpoint of the line connecting the center of the first sensor and the center of the second sensor toward the head direction of the human body vertically with respect to the line connecting the center of the first sensor and the center of the second sensor, when the wearer wears the garment.

[Advantage of the Invention]

[0013]

The method of measuring an electrocardiogram of the present invention can measure an electrocardiogram with reduced noise even during exercise, and in particular, can reliably obtain an R wave, by bringing the first sensor to the third sensor into contact with a specific place on the human body. In addition, the electrocardiogram measuring garment of the present invention is configured so that the first to third sensors come into contact with the specific position of the human body just by wearing the electrocardiogram measuring garment, and can measure an electrocardiogram with reduced noise even during exercise just by wearing the garment.

[Brief description of drawings]

[0014]

[FIG. 1] is an explanatory drawing for demonstrating the axillary line on the right side of a human body.

[FIG. 2] is an explanatory drawing for demonstrating the contact positions of the first sensor to the third sensor.

[FIG. 3] (a) is an explanatory drawing showing the electrode arrangement of the electrocardiogram measuring garment used in Comparative Example 1, (b) is an explanatory drawing showing the electrode arrangement of the electrocardiogram measuring garment used in Comparative Example 2, and (c) is an explanatory drawing showing the electrode arrangement of the electrocardiogram measuring garment used in Embodiment 1.

[FIG. 4] shows a measurement result of an electrocardiogram when the wearer is in a resting standing state.

[FIG. 5] shows a measurement result of an electrocardiogram when the wearer walks at 4 km/h.

[FIG. 6] shows a measurement result of an electrocardiogram when the wearer runs at 8 km/h.

[FIG. 7] shows a measurement result of an electrocardiogram when the wearer runs at 16 km/h.

[Description of Embodiments]

[0015]

Method of measuring an electrocardiogram

The present invention relates to a method of measuring an electrocardiogram. An electrocardiogram refers to information that can be recorded as a waveform by detecting changes in potential caused by heart activity via electrodes on the surface of a

living body. Generally, it is recorded as a waveform plotting time on the horizontal axis and potential difference on the vertical axis. The waveform that appears on the electrocardiogram for each heartbeat is mainly composed of five typical waves, P wave, Q wave, R wave, S wave, and T wave. In addition to this, there is a U wave, and a period from the beginning of the Q wave to the end of the S wave may be referred to as a QRS wave. It is preferable to provide an electrode capable of detecting at least an R wave of these waves. The R wave shows the excitement of both left and right ventricles and becomes the wave with the largest potential difference depending on the electrode position. The time between the peak of the R wave and the peak of the next R wave is generally referred to as the R-R time, but using the formula (heart rate) = 60/(R-R time (seconds)), the heart rate per second can be calculated. That is, the heart rate can be known by detecting the R wave with an electrode capable of detecting the R wave. In the present invention, unless otherwise specified, the QRS wave is also included in the R wave.

[0016]

The method for measuring an electrocardiogram of the present invention is a method using three sensors consisting of a first sensor, a second sensor, and a third sensor. The number of electrodes is smaller than that of the conventional method, and the electrocardiogram can be measured inexpensively and efficiently.

In the following description, a direction connecting the head and the foot is the vertical direction, and the direction connecting the abdomen and the back is the anterior-posterior direction (the abdomen side is the front).

[0017]

Then, in the measuring method of the present invention, the positional relationship between the first sensor and the third sensor is important, and these positional relationships will be described with reference to FIGS. 1 and 2. It is necessary to bring the first sensor 1 into contact with any position within the region surrounded by the center line of the sternum in front surface of the human body, the right anterior axillary line, the upper end of the fifth rib, and the lower end of the eighth rib; to bring the second sensor 2 into contact with any position within the region surrounded by the center line of the sternum in front surface of the human body, the left anterior axillary line, the upper end of the fifth rib, and the lower end of the eighth rib; and to bring the third sensor 3 into contact with any position on the vertical line drawn from a midpoint of the line connecting the center of the first sensor 1 and the center of the second sensor 2 toward the head direction of the human body vertically with respect to the line connecting the center of the first sensor 1 and the center of the second sensor 2. That is, the first sensor 1, the

second sensor 2, and the third sensor 3 draw an isosceles triangle on which the third sensor 3 is the top. This makes it possible to measure an electrocardiogram with reduced noise, as will be described later.

[0018]

FIG. 1 shows the right anterior axillary line. The (middle) axillary line is an imaginary vertical line connecting the axilla to the waist. A parallel line drawn 1 inch forward (abdomen) of the (middle) axillary line is referred to as the anterior axillary line, and a parallel line drawn 1 inch rearward is referred to as the posterior axillary line.

[0019]

It is preferable that the first sensor 1 and the second sensor 2 are displaced (shifted) toward the axillary line side so that a distance to each axillary line is shorter than a distance to the center line of the sternum. Although it is difficult to determine a specific distance, because it depends on the physique of a person to be measured, it is preferable to bring the first sensor 1 and the second sensor 2 into contact with a position shifted from each axillary line side to the center line of the sternum by about 3 to 12 cm (preferably about 4.5 to 7 cm). The shift distance may be different between the first sensor 1 and the second sensor 2, but is preferably the same. That is, it is preferable that a distance between the first sensor 1 and the sternum center line and a distance between the second sensor 2 and the sternum center line are the same. In FIG. 2, the first sensor 1 and the second sensor 2 are brought in contact with each other on the clavicle center line.

[0020]

The vertical position of the first sensor 1 and the second sensor 2 is between the fifth rib and the eighth rib. The vertical positions of the first sensor 1 and the second sensor 2 are preferably between the lower end of the fifth rib and the upper end of the eighth rib, and more preferably between the upper end of the sixth rib and the upper end of the eighth rib. In FIG. 2, although the first sensor 1 and the second sensor 2 are brought into contact with each other on the seventh rib, it may be between the upper and lower positions within the above preferable range.

[0021]

On the other hand, the third sensor is brought into contact with any position on the vertical line drawn from the midpoint of a line connecting the center of the first sensor 1 and the center of the second sensor 2 toward a head direction of the human body vertically with respect to the line connecting the center of the first sensor 1 and the center of the second sensor 2. When the distance between the first sensor 1 and the sternum center line and the distance between the second sensor 2 and the sternum center line are the same, this vertical line becomes the sternum center line. The third sensor 3 may be located on

the sternum center line, but if there is a certain distance between the third sensor 3 and both the first sensor 1 and the second sensor 2, the effect of reducing a noise of an electrocardiogram is increased. Therefore, it is preferable that the third sensor 3 is brought into contact with a part where the left and right second ribs and the sternum are in contact with each other (a part straddling the sternum stalk and the sternum).

[0022]

The first to third sensors preferably have an area of 1 cm^2 or more. Although the shape is not particularly limited, a circular shape, an elliptical shape, a square shape, a rectangular shape, or the like is preferable. In the case of a rectangle, it is advisable to round the four corners (add R). Further, in the case of an ellipse or a rectangle, the longitudinal axis or the longitudinal side may be oriented in either the vertical direction or the direction orthogonal to the vertical direction.

[0023]

The noise-reduced electrocardiogram can be measured by bringing the first to third sensors into contact with the above specific positions and subtracting the potential difference of the first sensor from the potential difference of the second sensor with respect to the third sensor. That is, the third sensor acts as a ground electrode.

[0024]

Specifically, the first to third sensors consist of an electrode (dry electrode) and wiring. Hereinafter, the electrodes and wiring will be described. In the present invention, it is preferably that the electrode includes a conductive layer capable of detecting electrical information of a living body, and further includes an insulating layer. In addition, it is preferable to have elasticity so that it can follow the exercise motions of a person to be measured. For example, by making a fibrous electrode containing a conductive polymer in which a base fiber is coated with a conductive polymer by impregnation or the like, or a sheet-shaped electrode formed from a conductive composition containing a conductive filler such as a metal powder and a resin containing elasticity, it is possible to obtain an electrode having elasticity. Of these, a sheet-shaped electrode formed from the conductive composition can use a highly conductive component such as metal powder, and therefore has a lower electrical resistance value than when a conductive polymer is used. Hence, it is preferable, since a weak electric signal can be detected.

[0025]

The electrical resistance value of the electrode surface is preferably 1000 Ω/cm or less, more preferably 300 Ω/cm or less, further preferably 200 Ω/cm or less, and particularly preferably 100 Ω/cm or less. In the sheet-shaped electrode formed from the

conductive composition, the electrical resistance value of the electrode surface can be suppressed to a range of 300 Ω/cm or less.

[0026]

Further, since the electrode formed from the conductive composition has a low electrical resistance value, it is possible to make the wiring and the electrode of the same conductive composition, which is a preferable embodiment of the present invention. When the wiring and the electrode have the same conductive composition, the wiring width may be 1 mm or more, and is more preferably 5 mm or more and 10 mm or less.

[0027]

The method for measuring an electrocardiogram of the present invention can be carried out by using an electrocardiogram measuring garment. The garment is provided with electrodes and wiring on the back side, and is configured so that each sensor (electrode) comes into contact with the wearer's body at the above-mentioned specific position just by wearing the garment. Hereinafter, the electrocardiogram measuring garment will be described.

[0028]

The electrodes used in the electrocardiogram measuring garment in the present invention preferably have an insulating layer. For example, a sheet-shaped material including the first insulating layer and the conductive layer can be used. Further, as the wiring used in the present invention, for example, a sheet-shaped wiring including a first insulating layer, a conductive layer, and a second insulating layer can be used. Hereinafter, an example in which a sheet (elastic wiring sheet) integrated with electrodes and wiring is manufactured from the same material, which is a preferable embodiment of the present invention, will be described.

[0029]

(First Insulating Layer)

In the present invention, it is preferable that the first insulating layer is formed on the back side of garment. The first insulating layer is an adhesive surface when the electrodes and the wiring sheet are laminated on the garment, and prevents moisture from the outside of the garment from reaching the conductive layer through the cloth when the garment is worn. Further, the conductive layer described later in the present invention has good extensibility, but when the garment is a material having a high extensibility exceeding the extensibility of the conductive layer, the conductive layer is stretched following the garment, and as a result, cracks may occur. The first insulating layer also plays a role of a stretch stopper that suppresses the stretching of garments and prevents excessive stretching of the conductive layer.

[0030]

The resin forming the first insulating layer is not particularly limited so long as it is a resin having an insulating property (insulating resin), and for example, a polyurethane resin, a silicone resin, a vinyl chloride resin, or an epoxy resin, etc. can be preferably used. Of these, a polyurethane resin is preferable from the viewpoint of adhesiveness to the conductive layer. The resin forming the first insulating layer may be of only one type or of two or more types.

[0031]

In the first insulating layer in the present invention, the insulating resin is dissolved or dispersed in a suitable solvent (preferably water) and coated or printed on a release paper or a release film to form a coating film, and then the solvent contained in the coating film is volatilized and dried to form the first insulating layer. In addition, a commercially available sheet or film having appropriate physical properties, which will be described later, may also be used.

[0032]

The film thickness of the first insulating layer is preferably 20 to 200 μm, more preferably 50 to 150 μm. If the first insulating layer is too thin, an insulating effect and a stretch-preventing effect will be insufficient, while if it is too thick, the elasticity of the fabric may be hindered and the thickness of the entire electrode and wiring becomes thicker, which may make a wearer uncomfortable, in the aspect of being laminated on the garment.

[0033]

(Conductive layer)

In the present invention, it is preferable that a conductive layer is formed on the first insulating layer. Conductivity is ensured by this conductive layer. The conductive layer preferably contains a conductive filler and a resin.

[0034]

The conductive filler forming the conductive layer is preferably a metal powder. Further, if necessary, a conductive material other than the metal powder or metal nanoparticles can be used as the conductive filler.

[0035]

Examples of metal powders include precious metal powders such as silver powder, gold powder, platinum powder, and palladium powder; base metal powders such as copper powder, nickel powder, aluminum powder, and brass powder; and plating powder obtained by plating dissimilar particles made of inorganic substances such as base metals and silica with precious metals such as silver, and base metal powders alloyed with

precious metals such as silver, etc. Among these, silver powder and copper powder are preferable in terms of easily exhibiting high conductivity and price, and it is desirable that silver powder and/or copper powder is the main component (50% by mass or more). The conductive filler may be of only one type or of two or more types.

[0036]

Preferred shapes of the metal powder include known flake-shape (phosphorus-shape), spherical, dendritic (dendrite-shape), aggregated (three-dimensionally aggregated spherical primary particles), and the like. Of these, flake-shape, spherical, and agglomerated metal powders are particularly preferable.

[0037]

The average particle size of the metal powder is preferably 0.5 to 10 μm. If the average particle size is too large, it may be difficult to form a desired pattern shape when trying to form a wiring with a fine pattern. On the other hand, if the average particle size is too small, the metal powder tends to aggregate when the conductive layer is formed, and the raw material cost increases as the particle size decreases, which is not preferable.

[0038]

The ratio of the metal powder in the conductive filler is preferably 80% by volume or more, more preferably 85% by volume or more, and further preferably 90% by volume or more. If the content of the metal powder is too small, it may be difficult to develop sufficiently high conductivity. In the present invention, the volume % of each component is obtained by measuring the mass of each solid content of each component contained in the paste and calculating (mass of each solid content/specific gravity of each solid content) to calculate the volume of the solid content of each component.

[0039]

An example of other conductive materials preferably includes carbon nanotubes, and in particular, it is preferable that the surface has a mercapto group, an amino group, and a nitrile group, or is surface-treated with a rubber containing a sulfide bond and/or a nitrile group. In general, the conductive material itself has a strong cohesive force, and as will be described later, a conductive material having a high aspect ratio has low dispersibility in the resin, but the surface has a mercapto group, an amino group, or a nitrile group, or is surface-treated with a rubber containing a sulfide bond and/or a nitrile group, so that the affinity for the metal powder is increased. Consequently, an effective conductive network can be formed together with metal powder, and high conductivity can be achieved.

[0040]

The ratio of the conductive material in the conductive filler is preferably 20% by

volume or less, more preferably 15% by volume or less, still more preferably 10% by volume or less. If the content ratio of the conductive material is too large, it may be difficult to disperse uniformly in the resin, and since the above-mentioned conductive material is generally expensive, it is desirable to keep the amount used within the above range.

[0041]

Examples of the metal nanoparticles include silver, bismuth, platinum, gold, nickel, tin, copper, zinc, and the like, and the average particle size thereof is preferably 2 to 100 nm. In particular, from the viewpoint of conductivity, copper, silver, platinum, and gold are preferable, and those containing silver and/or copper as a main component (50% by mass or more) are more preferable. When the metal nanoparticles are contained, the conductivity can be expected to be improved, the rheology of the conductive paste used for forming the conductive layer can be adjusted, and printability can be improved.

[0042]

The ratio of the metal nanoparticles in the conductive filler is preferably 20% by volume or less, more preferably 15% by volume or less, still more preferably 10% by volume or less. If the content ratio of the metal nanoparticles is too large, they may easily aggregate in the resin, and since the metal nanoparticles having a small particle size as described above are generally expensive, it is desirable to suppress the amount used within the above range.

[0043]

The amount of the conductive filler in the conductive layer (in other words, the amount of the conductive filler in the total solid content of the conductive paste for forming the conductive layer) is preferably 15 to 45% by volume, more preferably 20 ~ 40% by volume. If the amount of the conductive filler is too small, the conductivity may be insufficient, while if it is too large, the elasticity of the conductive layer tends to decrease, and when the obtained electrocardiogram measuring garment is stretched, cracks or the like may occur in the conductive layer. As a result, good conductivity may fail to be maintained.

[0044]

The resin forming the conductive layer preferably contains at least a rubber containing a sulfur atom and/or a rubber containing a nitrile group. Sulfur atoms and nitrile groups have a high affinity for metals, and rubber has high elasticity and can avoid the occurrence of cracks even when stretched, so even if a garment is stretched, the conductive filler is maintained in a uniformly dispersed state, and excellent conductivity can be exhibited. From the viewpoint of the defect rate described later, rubber

containing a nitrile group is more preferable. The resin forming the conductive layer may be of only one type or of two or more types.

[0045]

The rubber containing sulfur atoms is not particularly limited so long as it is a rubber containing sulfur or an elastomer. Sulfur atoms are contained in the form of sulfide bonds and disulfide bonds in the main chain of the polymer, side chains, and terminal mercapto groups. Specific examples of the rubber containing sulfur atoms include polysulfide rubber, polyether rubber, polyacrylate rubber, and silicone rubber containing a mercapto group, a sulfide bond, or a disulfide bond. In particular, polysulfide rubber, polyether rubber, polyacrylate rubber, and silicone rubber containing a mercapto group are preferable. Further, a resin containing a sulfur-containing compound such as pentaerythritol tetrakis (S-mercaptobutyrate), trimethylolpropane tris (S-mercaptobutyrate), or mercapto group-containing silicone oil in a rubber having no sulfur atom may be used. As a commercially available product that can be used as a rubber containing sulfur atoms, 'Tiocol (registered trademark) LP' manufactured by Toray Fine Chemicals Co., Ltd., which is a liquid polysulfide rubber, is preferably mentioned. The content of sulfur atoms in the rubber containing sulfur atoms is preferably 10 to 30% by mass.

[0046]

The rubber containing a nitrile group is not particularly limited so long as it is a rubber containing a nitrile group or an elastomer, but acrylonitrile-butadiene copolymer rubber, which is a copolymer of butadiene and acrylonitrile, is preferably mentioned. As a commercially available product that can be used as a rubber containing a nitrile group, 'Nipol (registered trademark) 1042' manufactured by Zeon Corporation is preferably mentioned. The amount of nitrile groups in the rubber containing a nitrile group (particularly, the amount of acrylonitrile in the acrylonitrile-butadiene copolymer rubber) is preferably 18 to 50% by mass, more preferably 28 to 41% by mass. When the amount of bonded acrylonitrile in the acrylonitrile-butadiene copolymer rubber is large, the affinity with metals increases, but the rubber elasticity that contributes to elasticity decreases.

[0047]

The resin forming the conductive layer is preferably composed only of rubber containing sulfur atoms and/or rubber containing a nitrile group, but so long as it does not impair conductivity, elasticity, coatability when forming the conductive layer, and the like, a resin other than rubber containing sulfur atoms and rubber containing a nitrile group may be included. When other resins are also included, the total amount of rubber

containing sulfur atoms and/or rubber containing a nitrile group in the total resin is preferably 95% by mass or more, more preferably 98% by mass or more, and further preferably 99% by mass or more.

[0048]

The amount of the resin in the conductive layer (in other words, the amount of the resin solid content in the total solid content of the conductive paste for forming the conductive layer) is preferably 55 to 85% by volume, more preferably 60 to 80% by volume. If the amount of resin is too small, the conductivity tends to be high, but the elasticity tends to be poor. On the other hand, if the amount of the resin is too large, the elasticity tends to be good, but the conductivity tends to be low.

[0049]

The conductive layer in the present invention can be formed by applying or printing a composition (conductive paste) in which each of the above components is dissolved or dispersed in an appropriate organic solvent, directly on the first insulating layer in a desired pattern (electrode and subsequent wiring pattern) to form a coating film, and then by volatilizing and drying the organic solvent contained in the coating film. Alternatively, a conductive paste is applied or printed on a release sheet and the like to form a coating film, and then the organic solvent contained in the coating film is volatilized and dried to form a sheet-shaped conductive layer in advance. Then, it may be laminated on the first insulating layer in a desired pattern.

[0050]

The conductive paste can be prepared by uniformly dispersing a conductive filler in a resin by appropriately adopting a conventionally known method of dispersing powders in a liquid. For example, metal powders, dispersion liquid of a conductive material, and a resin solution may be mixed and then uniformly dispersed by an ultrasonic method, a mixer method, a three-roll mill method, a ball mill method, and the like. It is also possible to use a plurality of these means in combination.

[0051]

The method of applying or printing the conductive paste on the first insulating layer is not particularly limited, and a printing method such as a coating method, a screen printing method, a flat plate offset printing method, an inkjet method, a flexo printing method, a gravure printing method, or a gravure offset printing method, a stamping method, a dispensing method, and a squeegee printing may be adopted.

[0052]

After forming the coating film with the conductive paste, in order to volatilize and dry the organic solvent, for example, heating may be performed in an atmosphere, a

vacuum atmosphere, an inert gas atmosphere, a reducing gas atmosphere, and the like. The heating temperature may be selected in a range of, for example, 20 to 200°C, in consideration of required conductivity, the heat resistance of a fabric used for the electrocardiogram measuring garment or the insulating layer, and the like.

[0053]

The film thickness of the conductive layer is preferably 40 to 150 μm, more preferably 50 to 100 μm. If the conductive layer is too thin, it is likely to deteriorate due to repeated expansion and contraction of the wiring sheet including the electrodes, and continuity may be hindered or interrupted, while if it is too thick, the elasticity of the fabric may be hindered and the thickness of the entire electrode and wiring becomes thicker, which may make a wearer uncomfortable.

[0054]

(Second Insulating Layer)

In the present invention, a second insulating layer is formed on the conductive layer in the wiring part. This prevents moisture such as rain and sweat from coming into contact with the conductive layer of the wiring, for example, when wearing an electrocardiogram measuring garment made of an elastic wiring sheet. A second insulating layer is not required for the electrode part.

[0055]

Examples of the resin forming the second insulating layer include the same resins as those forming the first insulating layer described above, and the same applies to preferable resins. The resin forming the second insulating layer may be of only one type or of two or more types. The resin forming the first insulating layer and the resin forming the second insulating layer may be the same or different, but it is preferable that they are the same in terms of the covering property of the conductive layer and the reduction of damage to the conductive layer due to the bias of stress during expansion and contraction of the wiring sheet. The second insulating layer can be formed in the same manner as the first insulating layer as described above.

[0056]

The film thickness of the second insulating layer is preferably 20 to 200 μm, more preferably 20 to 150 μm. If the second insulating layer is too thin, an insulating effect will be insufficient due to repeated expansion and contraction of a garment, while if it is too thick, the elasticity of the wiring sheet may be hindered and the thickness of the entire wiring becomes thicker, which may make a wearer uncomfortable.

[0057]

In a preferred embodiment of the elastic wiring sheet of the present invention, the

thickness of the wiring part is 400 μm or less, more preferably 300 μm or less, still more preferably 200 μm or less. The thickness of the conventional wiring is 400 μm or more, and when it comes into contact with the skin side, it tends to give the wearer a feeling of foreign matter. On the other hand, the elastic wiring sheet of the present invention has a feature that can suppress the thickness to 400 μm or less while having high conductivity, with a conductive layer formed of a conductive filler mainly composed of metal powders and a rubber containing sulfur atoms and/or a rubber containing a nitrile group as a resin.
[0058]

The elastic wiring sheet of the present invention can be laminated on a garment or the like. By laminating the first insulating layer and the conductive layer and the second insulating layer in the wiring part on the back side of the garment, an electrocardiogram measuring garment using the elastic wiring sheet of the present invention can be obtained. It is preferable to laminate the first insulating layer side with respect to the back side of the garment, and the method of laminating is not particularly limited so long as it is a conventionally known laminating method such as laminating with an adhesive or laminating with a hot press. However, from the viewpoint of a fit property to a body when worn for electrocardiogram measuring and followability during exercise/motions, a laminating method that does not hinder the elasticity of the elastic wiring sheet is preferable.
[0059]

The fabric of the garment is not particularly limited, and a woven or knitted fabric or a non-woven fabric composed of various conventionally known natural fibers, synthetic fibers, and semi-synthetic fibers can be used. From the viewpoint of a fit property to a body when worn for electrocardiogram measuring and followability during exercise/motions, a fabric that does not hinder the elasticity of the elastic wiring sheet is preferable. A knitted fabric composed of synthetic fibers is preferable, and a more preferable knitted fabric is a 2WAY tricot. The thickness of the fabric may be appropriately set according to the intended use, but is preferably 300 to 1200 μm, more preferably 500 to 1000 μm. The basis weight of the fabric may be appropriately set according to purposes, but is preferably 150 to 250 g/m^2, more preferably 170 to 220 g/m^2.
[0060]

(Electrocardiogram Measuring Garment)

The electrocardiogram measuring garment of the present invention is configured so that the first to third sensors (electrodes) come into contact with the above-mentioned specific position of the wearer when worn by the wearer. The wiring may be used not only on the inside (body side) of the garment, but also on the outside of the garment.

The means for measuring the first to third sensors (electrodes) electrocardiogram and the mechanism for analyzing the measured information are connected by wiring. As a mechanism for analyzing the measured information, a conventionally known analyzer (heart rate monitor, electrocardiograph, electromyogram, etc.) according to the purpose may be adopted, and a means for transmitting information to an external analyzer is included therein.

[0061]

The electrocardiogram measuring method of the present invention can easily measure an electrocardiogram only when a person to be measured wears the electrocardiogram measuring garment of the present invention. Further, since the first to third sensors (electrodes) are each arranged at a specific place, a noise of an electrocardiogram can be suppressed to a low level even if a wearer exercises violently such as jogging, or running a marathon.

[Embodiments]

[0062]

Hereinafter, the present invention will be described in more detail with reference to embodiments, but the present invention is not limited by the following embodiments, and of course, can be carried out by adding appropriate modifications to the extent that it can be adapted to the gist of the above and the following. All of them are included in the technical scope of the present invention.

[0063]

The insulating layer forming resin and the conductive paste used in the following embodiments and comparative examples were prepared as follows.

[0064]

(Conductive paste)

Resin (Nitrile group-containing rubber 'Nipol (registered trademark) 1042' manufactured by Zeon Corporation, acrylonitrile content 33.3% by volume) was dissolved in diethylene glycol monomethyl ether acetate, and silver particles ('Aggregated silver powder G-35' manufactured by DOWA Electronics Co., Ltd., and an average particle size of 5.9 μm) were dissolved in this solution (70% by volume of resin, 30% by volume of silver particles), and kneaded with a three-roll mill to obtain a conductive paste.

[0065]

(Polyurethane sheet)

The following polyurethane sheets were used.

- Polyurethane sheet with hot melt: Nisshinbo 'MOBIRON (registered trademark) MF-103F'

- Polyurethane hot melt sheet: 'MOBRON (registered trademark) MOB100' by Nisshinbo

[0066]

(Preparation of Conductive Layer)

The conductive paste was applied onto a release sheet and dried in a hot air drying oven at 120°C for 30 minutes or more to prepare a sheet-shaped conductive layer with a release sheet.

[0067]

(Preparation of First Insulation Layer and Conductive Layer)

Next, on the conductive layer with a release sheet, a polyurethane hot melt sheet (MOBIRON MOB100) was laminated (pasted) using a hot press machine under the conditions of a pressure of 0.5 kgf/cm^2, a temperature of 130°C, and a press time of 20 seconds. After laminating the polyurethane hot melt sheet (MOBIRON MOB100), the release film was peeled off to obtain a conductive sheet with a polyurethane hot melt. Then, on the region of the polyurethane sheet with hot melt (MOBIRON MF-103F), electrodes with a diameter of 30 mm and the conductive sheet with polyurethane hot melt cut to the dimensions of wiring with a width of 5 mm having length from each electrode position shown in Table 1 to the hem of a shirt were pasted under the laminating conditions of the hot press machine mentioned above, thereby forming parts equipped with the first insulating layer and the conductive layers (electrodes). Next, the parts equipped with the first insulating layer and the conductive layer were laminated on the back side of the shirt made of 2-way tricot fabric ('KNZ2740' manufactured by Gunsen Co., Ltd., nylon yarn: urethane yarn = 63%: 37% (mixture ratio), basis weight 194 g/m^2).

[0068]

(Preparation of Second Insulating Layer)

Next, the same polyurethane sheet with hot melt that formed the first insulating layer above was laminated in the region covering the wiring portion of the parts equipped with the first insulating layer and the conductive layer to form a second insulating layer on the conductive layer of the wiring portion. A shirt for measuring an electrocardiogram was prepared, in which the electrodes having the structure of the first insulating layer/conductive layer and the wiring having the structure of the first insulating layer/conductive layer/second insulating layer were integrated.

[0069]

(Embodiment 1, Comparative Examples 1 and 2)

A subject (one healthy adult male, 23 years old) was made to wear the shirt for measuring an electrocardiogram, and an electrocardiogram was measured by the method

shown in Table 1. Regarding the arrangement of the electrodes, FIG. 3(a) shows Comparative Example 1, FIG. 3(b) Comparative Example 2, and FIG. 3(c) Embodiment 1. This is an example in which wiring is integrated with a circular electrode. The measurement results of the electrocardiogram are shown in FIGS. 4 to 7. In Comparative Example 2, after the measurement, the commercial power supply noise was removed by a digital filter. From FIGS. 4 to 7, in Embodiment 1, there was no noise during running at 16 km/h, and an electrocardiogram could be measured clearly. In Comparative Example 1, an electrocardiogram could be measured up to running at 8 km/h, but in Comparative Example 2, an electrocardiogram could be measured only in a resting and standing position.

[0070]

[Table 1]

区分		実施例1	比較例1	比較例2
電極の中心位置	第1センサー	左前腋窩線を体表面に沿って胸骨方向に4cm平行移動した線と左第七肋骨との交点	左前腋窩線を体表面に沿って胸骨方向に4cm平行移動した線と左第七肋骨との交点	左前腋窩線を体表面に沿って胸骨方向に4cm平行移動から前方向した線と左第七肋骨との交点
	第2センサー	右前腋窩線を体表面に沿って胸骨方向に4cm平行移動した線と右第七肋骨との交点	右鎖骨中線を胸骨方向に2cm平行移動した線と右鎖骨との交点	右前腋窩線を体表面に沿って胸骨方向に4cm平行移動した線と右第七肋骨との交点
	第3センサー（グラウンド電極）	胸骨の中央線上と第二肋骨との交点	左鎖骨中線を胸骨方向に2cm平行移動した線と左鎖骨との交点	なし
心電図測定方法	誘導方法	CC5誘導双極誘導	第2誘導双極誘導	CC5誘導単極誘導
	増幅	1000倍	1000倍	100倍
	ハイパスフィルタ	5Hz	5Hz	5Hz
	ローパスフィルタ	50Hz	50Hz	50Hz
	サンプリング周波数	100Hz	100Hz	100Hz
R波検出※	安静立位	◎	◎	◎
	歩行（4km/h）	◎	◎	×
	走行（8km/h）	◎	○	×
	走行（16km/h）	◎	×	×

※◎：非常に良好、○：良好、△：普通、×：不良

区分	Section
電極の中心位置	Center position of electrode
心電図測定方法	Electrocardiogram measuring method
Ｒ波検出	R wave detection
第１センサー	First sensor
第２センサー	Second sensor
第３センサー（グラウンド電極）	Third sensor (ground electrode)
誘導方法	Guiding method
増幅	Amplification
ハイパスフィルタ	High pass filter
ローパスフィルタ	Low pass filter
サンプリング周波数	Sampling frequency
安静立位	Resting and standing position
歩行	Walking
走行	Running
実施例１	Embodiment 1

左前腋窩線を体表面に沿って胸骨方向に４ｃｍ平行移動した線と左第七肋骨との交点　Intersection of the line translated from the left anterior axillary line by 4 cm in the sternum direction along the body surface and the left seventh rib

右前腋窩線を体表面に沿って胸骨方向に４ｃｍ平行移動した線と右第七肋骨との交点　Intersection of the line translating from the right anterior axillary line 4 cm in the sternum direction along the body surface and the right seventh rib

肋骨の中央線上と第二肋骨との交点　Intersection of the center line of ribs and the second rib

ＣＣ５誘導	CC5 induction
双極誘導	Bipolar induction
１０００倍	1000 times
比較例１	Comparative Example 1

左前腋窩線を体表面に沿って胸骨方向に４ｃｍ平行移動した線と左第七肋骨との交点　Intersection of the line translated from the left anterior axillary line by 4 cm in the sternum direction along the body surface and the left seventh rib

右鎖骨中線を胸骨方向に２ｃｍ平行移動した線と右鎖骨との交点　Intersection of the line translated from the right clavicle center line by 2 cm in the sternum direction and the right clavicle

左鎖骨中線を胸骨方向に２ｃｍ平行移動した線と左鎖骨との交点

Intersection of the line translated from the left clavicle center line by 2 cm in the sternum direction and the left clavicle

第２誘導　Second induction

比較例２　Comparative Example 2

左前腋窩線を体表面に沿って胸骨方向に４ｃｍ平行移動から前方向した線と左第七肋骨との交点　Intersection of the line translated forward from the left anterior axillary line by 4 cm in the sternum direction along the body surface and the left seventh rib

右前腋窩線を体表面に沿って胸骨方向に４ｃｍ平行移動した線と右第七肋骨との交点　Intersection of the line translated from the right anterior axillary line by 4 cm in the sternum direction along the body surface and the right seventh rib

なし　None

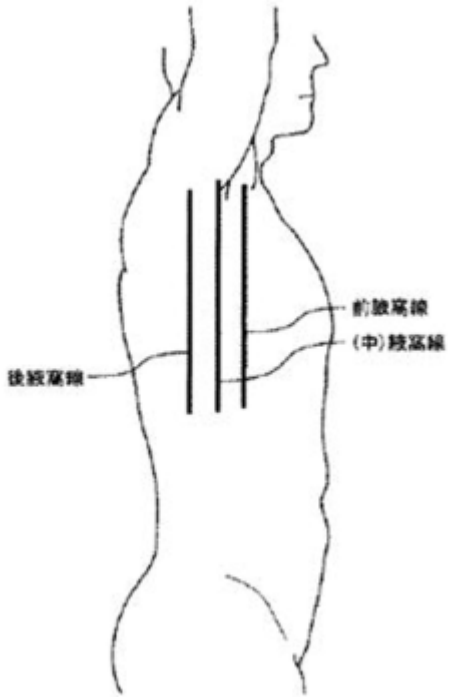
単極誘導　Monopolar

１００倍　100 times

※◎：非常に良好、〇：良好、△：普通、×：不良　◎:Very Good, 〇: Good, △: Usual, ×: Bad

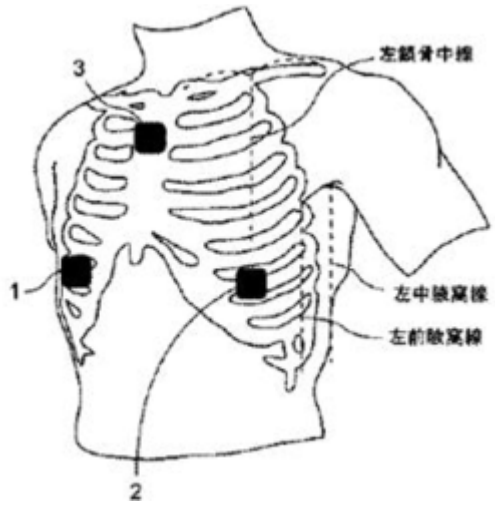
2 [FIG. 1] to [FIG. 3] of the drawings attached to the application of the present application are as follows.

[FIG. 1]



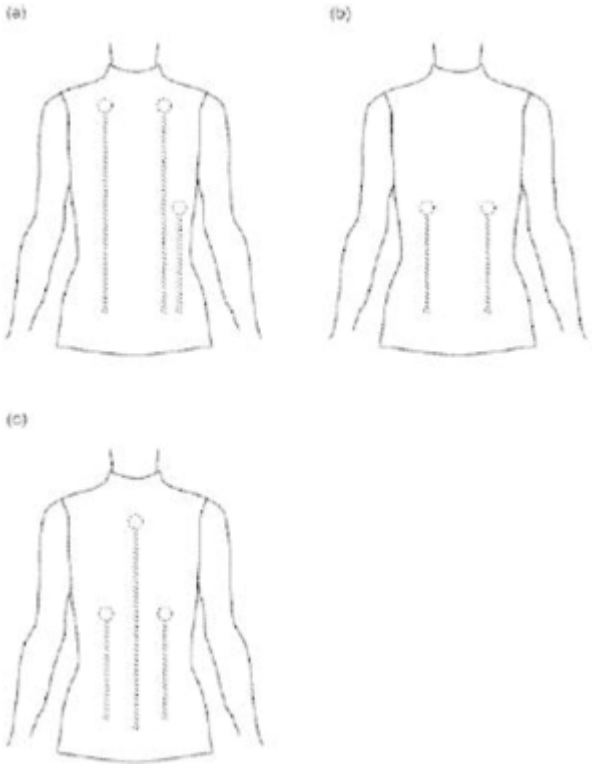
後腋窩線　　Posterior axillary line
前腋窩線　　Anterior axillary line
（中）腋窩線　　(Middle) axillary line

[FIG. 2]



左鎖骨中線　　Left clavicle center line
左中腋窩線　　Left middle axillary line
左前腋窩線　　Left anterior axillary line

[FIG. 3]



No. 5 Judgment by the body

1 Regarding the problem to be solved by the Invention

(1) In Paragraphs [0005] and [0006] relating to [Prior Art] of the detailed description of the invention of the case, it is described that "However, when actually trying to measure biometric information using a wearable biometric information measuring device to which electrodes are attached, especially when a person to be measured is performing an exercise motion such as walking or running, the present inventors have newly found the problem that the target information cannot be obtained due to increased noise of measured biological information," and "In the measurement of the electrocardiogram, FIG. 1 of Patent Document 1 describes that electrodes are attached to three places on an abdomen on the front surface of a human body and one place near the base of a neck, and FIG. 1 of Patent Document 2 describes that electrodes are attached to two places near the bottom of the left and right ends of left and right clavicles on the front surface of a human body and two places near the height of left and right lowermost ribs on left and right axillary lines. However, the above-mentioned problems during walking motion and exercise motions had not been solved even by applying these electrode attachment positions to a wearable biometric information measuring device".

From the descriptions of Paragraphs [0005] and [0006] above, it can be read that there are "problems that a noise increases in biometric information measured in an electrocardiogram measurement during walking or exercise motions and that target information cannot be obtained, in a wearable biometric information measuring device to which electrodes are attached".

(2) Then, in Paragraph [0008] relating to [Problem to be solved by the Invention] of the detailed description of the invention of the case, it is described that "In consideration of the above problems, the present invention has set the subject of providing a measuring method capable of measuring an electrocardiogram with reduced noise and providing such an electrocardiogram measuring garment capable of measuring an electrocardiogram".

Here, it is understood that "the above problems" described in Paragraph [0008] are "problems that a noise increases in biometric information measured in an electrocardiogram measurement during walking or exercise motions and that target information cannot be obtained, in a wearable biometric information measuring device to which electrodes are attached" that can be read from the descriptions of Paragraphs [0005] and [0006].

(3) Accordingly, since the Invention is an invention relating to "an electrocardiogram measuring clothing," it can be said that the problem to be solved by the invention of the case that is described in the detailed description of the invention is "providing an electrocardiogram measuring clothing that can measure an electrocardiogram with reduced noise during walking and exercise motions" (hereinafter, referred to as "the problem of the case").

2 Means for solving the problem of the case

(1) In Paragraph [0012] relating to [Means for solving the problem] of the detailed description of the invention of the case, it is described that "The present invention also includes an electrocardiogram measuring garment,

the electrocardiogram measuring garment adhering a first sensor to a third sensor on the back side of the garment so that

the first sensor is brought into contact with on any position within the region surrounded by the center line of the sternum in front surface of the human body, the left anterior axillary line, the upper end of the fifth rib, and the lower end of the eighth rib,

the second sensor is brought into contact with any position within the region surrounded by the center line of the sternum in front surface of the human body, the right anterior axillary line, the upper end of the fifth rib, and the lower end of the eighth rib, and

the third sensor is brought into contact with any position on the vertical line drawn from a midpoint of the line connecting the center of the first sensor and the center of the second sensor toward the head direction of the human body vertically with respect to the line connecting the center of the first sensor and the center of the second sensor, when the wearer wears the garment".

(2) In [Description of Embodiments] of the detailed description of the invention of the case, there are the following descriptions.

"[0027]

The method for measuring an electrocardiogram of the present invention can be carried out by using an electrocardiogram measuring garment. The garment is provided with electrodes and wiring on the back side, and is configured so that each sensor (electrode) comes into contact with the wearer's body at the above-mentioned specific position just by wearing the garment. Hereinafter, the electrocardiogram measuring garment will be described.

[0028]

The electrodes used in the electrocardiogram measuring garment in the present invention preferably have an insulating layer. For example, a sheet-shaped material including the first insulating layer and the conductive layer can be used. Further, as the wiring used in the present invention, for example, a sheet-shaped wiring including a first insulating layer, a conductive layer, and a second insulating layer can be used. Hereinafter, an example in which a sheet (elastic wiring sheet) integrated with electrodes and wiring is manufactured from the same material, which is a preferable mode of the present invention, will be described".

"[0057]

In a preferred embodiment of the elastic wiring sheet of the present invention, the thickness of the wiring part is 400 μm or less, more preferably 300 μm or less, still more preferably 200 μm or less. The thickness of the conventional wiring is 400 μm or more, and when it comes into contact with the skin side, it tends to give the wearer a feeling of foreign matter. On the other hand, the elastic wiring sheet of the present invention has a feature that can suppress the thickness to 400 μm or less while having high conductivity, with a conductive layer formed of a conductive filler mainly composed of metal powders

and a rubber containing sulfur atoms and/or a rubber containing a nitrile group as a resin.
[0058]

The elastic wiring sheet of the present invention can be laminated on a garment or the like. By laminating the first insulating layer and the conductive layer and the second insulating layer in the wiring part on the back side of the garment, an electrocardiogram measuring garment using the elastic wiring sheet of the present invention can be obtained. It is preferable to laminate the first insulating layer side with respect to the back side of the garment, and the method of laminating is not particularly limited so long as it is a conventionally known laminating method such as laminating with an adhesive or laminating with a hot press. However, from the viewpoint of a fit property to a body when worn for electrocardiogram measuring and followability during exercise/motions, a laminating method that does not hinder the elasticity of the elastic wiring sheet is preferable.

[0059]

The fabric of the garment is not particularly limited, and a woven or knitted fabric or a non-woven fabric composed of various conventionally known natural fibers, synthetic fibers, and semi-synthetic fibers can be used. From the viewpoint of a fit property to a body when worn for electrocardiogram measuring and followability during exercise/motions, a fabric that does not hinder the elasticity of the elastic wiring sheet is preferable. A knitted fabric composed of synthetic fibers is preferable, and a more preferable knitted fabric is a 2WAY tricot. The thickness of the fabric may be appropriately set according to the intended use, but is preferably 300 to 1200 μm, more preferably 500 to 1000 μm. The basis weight of the fabric may be appropriately set according to purposes, but is preferably 150 to 250 g/m^2, more preferably 170 to 220 g/m^2.

[0060]

(Electrocardiogram Measuring Garment)

The electrocardiogram measuring garment of the present invention is configured so that the first to third sensors (electrodes) come into contact with the above-mentioned specific positions of the wearer when worn by the wearer. The wiring may be used not only on the inside (body side) of the garment, but also on the outside of the garment. The means for measuring the first to third sensors (electrodes) electrocardiogram and the mechanism for analyzing the measured information are connected by wiring. As a mechanism for analyzing the measured information, a conventionally known analyzer (heart rate monitor, electrocardiograph, electromyogram, etc.) according to the purpose may be adopted, and a means for transmitting information to an external analyzer is included therein.

[0061]

The electrocardiogram measuring method of the present invention can easily measure an electrocardiogram only when a person to be measured wears the electrocardiogram measuring garment of the present invention. Further, since the first to third sensors (electrodes) are arranged at a specific place, a noise of an electrocardiogram can be suppressed to a low level even if a wearer exercises violently such as jogging or marathon".

(3) In [Embodiment] of the detailed description of the invention of the case, there are the following descriptions.

"[0063]

The insulating layer forming resin and the conductive paste used in the following embodiments and comparative examples were prepared as follows.

[0064]

(Conductive paste)

Resin (Nitrile group-containing rubber 'Nipol (registered trademark) 1042' manufactured by Zeon Corporation, acrylonitrile content 33.3% by volume) was dissolved in diethylene glycol monomethyl ether acetate, and silver particles ('Aggregated silver powder G-35' manufactured by DOWA Electronics Co., Ltd., and an average particle size of 5.9 μm) were dissolved in this solution (70% by volume of resin, 30% by volume of silver particles), and kneaded with a three-roll mill to obtain a conductive paste.

[0065]

(Polyurethane sheet)

The following polyurethane sheets were used.

- Polyurethane sheet with hot melt: Nisshinbo 'MOBIRON (registered trademark) MF-103F'

- Polyurethane hot melt sheet: 'MOBRON (registered trademark) MOB100' by Nisshinbo

[0066]

(Preparation of Conductive Layer)

The conductive paste was applied onto a release sheet and dried in a hot air drying oven at 120°C for 30 minutes or more to prepare a sheet-shaped conductive layer with a release sheet.

[0067]

(Preparation of First Insulation Layer and Conductive Layer)

Next, on the conductive layer with a release sheet, a polyurethane hot melt sheet

(MOBIRON MOB100) was laminated (pasted) using a hot press machine under the conditions of a pressure of 0.5 kgf/cm^2, a temperature of 130°C, and a press time of 20 seconds. After laminating the polyurethane hot melt sheet (MOBIRON MOB100), the release film was peeled off to obtain a conductive sheet with a polyurethane hot melt. Then, on the region of the polyurethane sheet with hot melt (MOBIRON MF-103F), electrodes with a diameter of 30 mm and the conductive sheet with polyurethane hot melt cut to the dimensions of wiring with a width of 5 mm that having a length from each electrode position shown in Table 1 to the hem of a shirt were pasted under the laminating conditions of the hot press machine mentioned above, thereby forming parts equipped with the first insulating layer and the conductive layers (electrodes). Next, the parts equipped with the first insulating layer and the conductive layer were laminated on the back side of the shirt made of 2-way tricot fabric ('KNZ2740' manufactured by Gunsen Co., Ltd., nylon yarn: urethane yarn = 63%: 37% (mixture ratio), basis weight 194 g/m^2).

[0068]

(Preparation of Second Insulating Layer)

Next, the same polyurethane sheet with hot melt that formed the first insulating layer above was laminated in the region covering the wiring portion of the parts equipped with the first insulating layer and the conductive layer to form a second insulating layer on the conductive layer of the wiring portion. A shirt for measuring an electrocardiogram was prepared, in which the electrodes having the structure of the first insulating layer/conductive layer and the wiring having the structure of the first insulating layer/conductive layer/second insulating layer were integrated.

[0069]

(Embodiment 1, Comparative Examples 1 and 2)

A subject (one healthy adult male, 23 years old) was made to wear the shirt for measuring an electrocardiogram, and an electrocardiogram was measured by the method shown in Table 1. Regarding the arrangement of the electrodes, FIG. 3(a) shows Comparative Example 1, FIG. 3(b) Comparative Example 2, and FIG. 3(c) Embodiment 1. This is an example in which wiring is integrated with a circular electrode. The measurement results of the electrocardiogram are shown in FIGS. 4 to 7. In Comparative Example 2, after the measurement, the commercial power supply noise was removed by a digital filter. From FIGS. 4 to 7, in Embodiment 1, there was no noise during running at 16 km/h, and an electrocardiogram could be measured clearly. In Comparative Example 1, an electrocardiogram could be measured up to running at 8 km/h, but in Comparative Example 2, an electrocardiogram could be measured only in a resting and standing position.

[0070]

[Table 1]

区分		実施例1	比較例1	比較例2
電極の中心位置	第1センサー	左前腋窩線を体表面に沿って胸骨方向に4cm平行移動した線と左第七肋骨との交点	左前腋窩線を体表面に沿って胸骨方向に4cm平行移動した線と左第七肋骨との交点	左前腋窩線を体表面に沿って胸骨方向に4cm平行移動から前方向した線と左第七肋骨との交点
	第2センサー	右前腋窩線を体表面に沿って胸骨方向に4cm平行移動した線と右第七肋骨との交点	右鎖骨中線を胸骨方向に2cm平行移動した線と右鎖骨との交点	右前腋窩線を体表面に沿って胸骨方向に4cm平行移動した線と右第七肋骨との交点
	第3センサー（グラウンド電極）	胸骨の中央線上と第二肋骨との交点	左鎖骨中線を胸骨方向に2cm平行移動した線と左鎖骨との交点	なし
心電図測定方法	誘導方法	CC5誘導双極誘導	第2誘導双極誘導	CC5誘導単極誘導
	増幅	1000倍	1000倍	100倍
	ハイパスフィルタ	5Hz	5Hz	5Hz
	ローパスフィルタ	50Hz	50Hz	50Hz
	サンプリング周波数	100Hz	100Hz	100Hz
R波検出※	安静立位	◎	◎	◎
	歩行（4km/h）	◎	◎	×
	走行（8km/h）	◎	○	×
	走行（16km/h）	◎	×	×

※◎：非常に良好、○：良好、△：普通、×：不良

区分	Section
電極の中心位置	Center position of electrode
心電図測定方法	Electrocardiogram measuring method
Ｒ波検出	R wave detection
第１センサー	First sensor
第２センサー	Second sensor
第３センサー（グラウンド電極）	Third sensor (ground electrode)
誘導方法	Guiding method
増幅	Amplification
ハイパスフィルタ	High pass filter

ローパスフィルタ　Low pass filter
サンプリング周波数　Sampling frequency
安静立位　Resting and standing position
歩行　Walking
走行　Running
実施例１　Embodiment 1
左前腋窩線を体表面に沿って胸骨方向に４ｃｍ平行移動した線と左第七肋骨との交点　Intersection of the line translated from the left anterior axillary line by 4 cm in the sternum direction along the body surface and the left seventh rib
右前腋窩線を体表面に沿って胸骨方向に４ｃｍ平行移動した線と右第七肋骨との交点　Intersection of the line translating from the right anterior axillary line 4 cm in the sternum direction along the body surface and the right seventh rib
肋骨の中央線上と第二肋骨との交点　Intersection of the center line of ribs and the second rib
ＣＣ５誘導　CC5 induction
双極誘導　Bipolar induction
１０００倍　1000 times
比較例１　Comparative Example 1
左前腋窩線を体表面に沿って胸骨方向に４ｃｍ平行移動した線と左第七肋骨との交点　Intersection of the line translated from the left anterior axillary line by 4 cm in the sternum direction along the body surface and the left seventh rib
右鎖骨中線を胸骨方向に２ｃｍ平行移動した線と右鎖骨との交点　Intersection of the line translated from the right clavicle center line by 2 cm in the sternum direction and the right clavicle
左鎖骨中線を胸骨方向に２ｃｍ平行移動した線と左鎖骨との交点　Intersection of the line translated from the left clavicle center line by 2 cm in the sternum direction and the left clavicle
第２誘導　Second induction
比較例２　Comparative Example 2
左前腋窩線を体表面に沿って胸骨方向に４ｃｍ平行移動から前方向した線と左第七肋骨との交点　Intersection of the line translated forward from the left anterior axillary line by 4 cm in the sternum direction along the body surface and the left seventh rib
右前腋窩線を体表面に沿って胸骨方向に４ｃｍ平行移動した線と右第七肋骨との交点　Intersection of the line translated from the right anterior axillary line by 4 cm in the sternum direction along the body surface and the right seventh rib

なし　None
単極誘導　　Monopolar
１００倍　　100 times
※◎：非常に良好、〇：良好、△：普通、×：不良　◎:Very Good, 〇: Good, △: Usual, ×: Bad
"

(4) "Intersection of the line translated from the left anterior axillary line by 4 cm in the sternum direction along the body surface and the left seventh rib," "Intersection of the line translating from the right anterior axillary line 4 cm in the sternum direction along the body surface and the right seventh rib," and "Intersection of the center line of ribs and the second rib" that are the center positions of the electrodes of the first to third sensors of "Embodiment 1" described in [Table 1] of Paragraph [0070] are respectively included in "any position within the region surrounded by the center line of the sternum in front surface of the human body, the left anterior axillary line, the upper end of the fifth rib, and the lower end of the eighth rib (hereinafter, referred to as "the first position")," "any position within the region surrounded by the center line of the sternum in front surface of the human body, the right anterior axillary line, and the upper end of the fifth rib, and the lower end of the eighth rib (hereinafter, referred to as "the second position")," and any position on the vertical line drawn from a midpoint of the line connecting the center of the first sensor and the center of the second sensor toward the head direction of the human body vertically with respect to the line connecting the center of the first sensor and the center of the second sensor (hereinafter, referred to as "the third position")" that are described in [0012].

Against this, in "Comparative Example 1", although "Intersection of the line translated from the left anterior axillary line by 4 cm in the sternum direction along the body surface and the left seventh rib" that is the center position of the electrode of the first sensor is included in the first position, both "Intersection of the line translated from the right clavicle center line by 2 cm in the sternum direction and the right clavicle" and "Intersection of the line translated from the left clavicle center line by 2 cm in the sternum direction and the left clavicle" that are the center positions of the electrodes of the second and third sensors are not included in the second position and the third position.

Further, in "Comparative Example 2," although it can be recognized that the center positions of the electrodes of the first and second sensors are the same position as "Embodiment 1," it does not have the third sensor.

(5) According to the descriptions of Paragraphs [0063] to [0069], in "Embodiment 1," "Comparative Example 1," and "Comparative Example 2" it is recognized that the electrodes, the arrangement and material of wiring, and the fabric of the shirt are common, and according to the descriptions of Paragraphs [0069] and [0070], in "Embodiment 1," there is no noise during running at 16 km/h, and an electrocardiogram can be measured clearly, in "Comparative Example 1," an electrocardiogram can be measured up to running at 8 km/h, but cannot be measure at 16 km/h, and in "Comparative Example 2", an electrocardiogram can be measured only in a resting and standing position.

(6) Therefore, it is recognized that the problem of the case can be solved by the electrocardiogram measuring garment that adheres first to third sensors to a back side of the clothing so that electrodes of the first and third sensors come into contact with the first to third positions, respectively while wearing.

3 Judgment

(1) In the Invention, although it is specified that the electrocardiogram measuring clothing is equipped with electrodes for measuring an electrocardiogram, the number or adhering positions of the electrodes are not specified. The Invention contains the electrocardiogram measuring clothing that cannot measure an electrocardiogram with reduced noise during exercise motions, such as "Comparative Example 1" and "Comparative Example 2".

(2) Therefore, it cannot be said that the Invention reflects the means for solving the problem of the case, and that it exceeds the scope described in the detailed description of the invention of the case.

(3) Therefore, the recitation of the scope of claims of the present application does not meet the requirement stipulated in Article 36(6)(i) of the Patent Act, without examining the inventions described in other claims.

4 Appellant's allegation

(1) The Appellant, in the written demand for trial, alleges that
"(A) The above-mentioned recognition by the examiner of the original examination is considered to be unreasonable because it does not comply with the Examination

Guidelines as described below.

Specifically, in the Examination Guidelines, Part II, Chapter 2, Section 2.1 relating to the requirement for support, it is described that '(ii) when the problem explicitly described is unreasonable as the problem of the inventions according to claims in view of other descriptions of the detailed description of the invention and the common general technical knowledge at the time of filing (for example, in the divisional application and the original application (see 1. Of "Part VI, Chapter 1, Section 1, the requirements for division of the patent application"), the problem explicitly described in the detailed description of the invention is the same, and the problem is recognized as unreasonable as the problem of the inventions according to claims of the divisional application, in view of other description of the detailed description of the invention and the common general technical knowledge at the time of filing)', the problem is grasped by considering 'the common general technical knowledge at the time of filing,' in addition to all described matters of the specification and drawings.

That is, in the Examination Guidelines, if a divisional application is filed for another invention other than the invention relating to the original application, the problem described in the specification tends to be unreasonable as the problem of the invention relating to the divisional application, so that it is described that the problem should be grasped by comprehensively considering the matters described in the specifications and 'the common general technical knowledge at the time of filing'.

Here, the present application is a divisional application, and the problem described in Paragraph 0008 of the specification of the present application is exactly the same as the problem described in Paragraph 0008 of the specification of the original application. Furthermore, if the problem of 'providing a measuring method capable of measuring an electrocardiogram with reduced noise and providing an electrocardiogram measuring garment capable of measuring such an electrocardiogram' described in Paragraph 0008 is grasped as the problem of the inventions according to 'a method of manufacturing an electrocardiogram measuring clothing' and 'an electrocardiogram measuring clothing' according to the present application, the subject of the problem and the subject of the invention are different and unreasonable.

That is, the present application corresponds to the case of (ii) above, and thus the problem thereof should be grasped by comprehensively considering the matters described in the specifications and 'the common general technical knowledge at the time of filing'.

Against this, since the above-mentioned recognition by the examiner of the original examination is not comprehensively considered by including 'the common

general technical knowledge at the time of filing,' I think it is an unreasonable recognition. (B) In addition, according to the descriptions of Paragraphs 0067 to 0068 of the present application, it can be easily understood that 'an electrocardiogram measuring clothing, comprising: a 2-way tricot fabric; a sheet with a first hot melt having a first hot melt layer and a first insulating layer; a conductive sheet with a hot melt having a conductive layer, and a second hot melt layer laminated on the conductive layer; and a sheet with a second hot melt having a third hot melt layer and a second insulating layer, wherein the 2-way tricot fabric, the sheet with the first hot melt, the conductive sheet with the hot melt, and the sheet with the second hot melt are laminated in this order to form an electrode and wiring for measuring an electrocardiogram,...' of Claim 1 of the present application can exert the effect of providing an electrocardiogram measuring clothing having a 2-way tricot fabric equipped with electrodes and wiring that can be easily manufactured by hot pressing and the like.

Then, since the electrocardiogram including the configuration of Claim 1 of the present application has not existed in the past, considering the common general technical knowledges at the time of filing, it is possible to grasp the problem of providing an electrocardiogram measuring clothing having a 2-way tricot fabric equipped with electrodes and wiring that can be easily manufactured by hot pressing and the like.

Furthermore, as mentioned above, since the effect corresponding the problem is exerted by the configuration of Claim 1 of the present application, the problem can be solved by the configuration of Claim 1 of the present application.

Furthermore, as mentioned above, regarding 'a method of manufacturing an electrocardiogram measuring clothing' of Claim 7 of the present application in which the same configuration as Claim 1 of the present application is specified, the same problem can be grasped, and it is clear that the problem can be solved by the configuration of Claim 7 of the present application.

As mentioned above, the present application meets the requirement for support".

(2) The Appellant's allegation will be examined.

A "An electrocardiogram measuring clothing" that is a subject of the Invention is merely a little generic concept (including belts and straps) than "an electrocardiogram measuring garment," and by replacing "In consideration of the above problems, the present invention has set the subject of ... providing an electrocardiogram measuring garment capable of measuring an electrocardiogram with reduced noise" described in Paragraph [0008] with "In consideration of the above problems, the present invention has

set the subject of ... providing an electrocardiogram measuring clothing capable of measuring an electrocardiogram with reduced noise," the problem of the Invention can be grasped, so that it cannot be said that the subject of the problem and the subject of the invention are different and unreasonable.

B Further, even considering that the electrodes and wiring of the Invention can be easily manufactured by hot pressing and the like, the problem grasped from that is providing electrodes and wiring capable of easily manufacturing an electrocardiogram measuring clothing or providing a method of manufacturing an electrocardiogram measuring clothing, which can easily manufacture an electrocardiogram measuring clothing, but not providing an electrocardiogram measuring garment equipped with electrodes and wiring easily adhered by hot pressing and like.

C As understood from the description of Paragraph [0004] of the detailed description of the invention of the case, considering the common general technical knowledge at the time of filing of the present application that a wearable biometric information measuring device that measures an electrocardiogram is used for grasping biological information such as fluctuations in heartbeat in various daily situations, the invention described in the detailed description of the invention of the case that can function as an electrocardiogram measuring clothing is only the electrocardiogram measuring clothing that adheres the first to third sensors to the back side of the clothing so that the electrodes of the first to third sensors come into contact with the first to third positions while wearing.

Then, it can be recognized that in order for the Invention, which does not specify the position of electrodes, to function as an electrocardiogram measuring clothing, some technical matters not disclosed in the detailed description of the invention of the case are required (although it shows the suitability of the divisional application, see 2009 (Gyo-Ke) 10049).

Therefore, it cannot be said that the Invention is described in the detailed description of the invention of the case.

D Therefore, the Appellant's allegation cannot be accepted.

No. 6 Closing

As described above, since the recitation of the scope of claims of the present application does not meet the requirement stipulated in Article 36(6)(i) of the Patent Act,

the present application should be rejected.

Therefore, the appeal decision shall be made as described in the conclusion.

March 10, 2021

Chief administrative judge: MORI, Ryosuke

Administrative judge: WATADO, Masayoshi

Administrative judge: ITO, Yoshihito