

## Description

### Title of Invention: STATIC DISSIPATIVE SMOCK WITH CONDUCTIVE WRIST BAND

#### Technical field

- [1] The present invention relates generally to electrostatic discharge field, and most specifically to a conductive wrist band and a static dissipative smock provided with such conductive wrist band.

#### Background of invention

- [2] A static dissipative or ESD smock is commonly used in electronic devices manufacturing environment to drain static charges from the operation personnel. It is also important that such ESD smock ideally is groundable so as to enable any static charge that may be floating or residing on the ESD smock generated through the personnel's movement or transferred from the inner clothing by static charge induction be drained away when the ESD smock is grounded.
- [3] Existing prior art demonstrated how a human body is electrically connected to a smock through the skin contact at the wrist region in various means with the objective of draining away the static charge from body to ground as cited in US Patent No. 4596053 , Japanese Patent Publication No. 2000-178810, Japanese Utility Model Publication No. S59-100814.
- [4] All these prior art cited has one thing in common - the sleeve opening becomes loosen over time due to the weakening of the stretchable elastomeric material - this pose a problem because the whole ESD smock need to be replaced making it a high maintenance cost to a typical highly labour intensive electronics manufacturing operations.
- [5] US Patent Application Publication No. US2012/0036621 A1 highlights a solution in overcoming the above problem by modifying the design at the opening sleeve of the smock to accommodate a replaceable band.
- [6] However, the timing of replacing the elastic band still needs to be ascertained. Therefore users still need to monitor of the useful life of the band prior to replacement. Monitoring the useful life of the band will need reliable system of control thereby adding more work to the static control program to check loosen band to ensure grounding integrity.
- [7] There exists a further need to find a better solution to improve the smock-to-body electrical contact design so as to minimize or eliminate the requirement of frequent monitoring procedure.
- [8] Accordingly, the problem of maintaining a continuous reliable electrical path per-

manently in a simple, quick and easy way has existed since the emergence of the static dissipative or ESD smock. Such problem is considered as the technical problem which was desired to be solved for a long time but not successfully solved in the present technical field.

### **Summary of Invention**

- [9] The primary objective of this application is to provide a conductive wrist band comprising a conductive coiled spring wrist band and a snap-on button. The conductive coiled spring wrist band is attached to a sleeve opening rim region of a static dissipative smock via the snap-on button for providing a body-to-smock electrical connection to allow dissipation of static charges from a human body to the static dissipative smock or from the static dissipative smock to the human body whenever a person put on the static dissipative smock.
- [10] Optionally, the conductive coiled spring wrist band further comprises a protective stretch-limit elastic fine cord permanently installed inside a hollow centre path of the conductive coiled spring wrist band to achieve a deformation-free conductive coiled spring wrist band.
- [11] The secondary objective of this application is to provide a static dissipative smock comprising a conductive coiled spring wrist band attached to a sleeve opening rim region of the static dissipative smock via a snap-on button for providing a body-to-smock electrical connection to allow dissipation of static charges from a human body to the static dissipative smock or from the static dissipative smock to the human body whenever a person put on the static dissipative smock, wherein, a protective stretch-limit elastic fine cord is permanently installed inside a hollow centre path of the conductive coiled spring wrist band to achieve a deformation-free conductive coiled spring wrist band.
- [12] Optionally, the conductive coiled spring wrist band has a diameter in a range from 1mm to 10mm.
- [13] Optionally, the conductive coiled spring wrist band has a diameter in a range from 4mm to 6mm.
- [14] Optionally, a metallic wire of the conductive coiled spring wrist band has a diameter in a range from 0.1mm to 1.0 mm.
- [15] Optionally, a metallic wire of the conductive coiled spring wrist band has a diameter in a range from 0.2mm to 0.3mm.
- [16] Optionally, the protective stretch-limit elastic fine cord is made of polymeric material, plastic, stainless steel, brass, copper, iron, aluminium or alloy or a combination thereof.
- [17] The third objective of this application is to provide a static dissipative smock comprising an elastic conductive wrist band attached to a sleeve opening rim region of

the static dissipative smock for providing a body-to-smock electrical connection to allow dissipation of static charges from a human body to the static dissipative smock or from the static dissipative smock to the human body whenever a person put on the static dissipative smock.

- [18] Optionally, the elastic conductive wrist band is attached to the sleeve opening rim region of the static dissipative smock by a snap-on button, by stitching, sewing, riveting or plugging-in.
- [19] Optionally, the elastic conductive wrist band is a conductive coiled spring wrist band with a protective stretch-limit elastic fine cord permanently installed inside a hollow centre path of the conductive coiled spring wrist band to achieve a deformation-free conductive coiled spring wrist band.
- [20] The coiled spring wrist band positioned around the sleeve opening rim of the smock electrically connects the smock to the wrist of a human body in eliminating or minimizing the risk of a loosen wrist band.
- [21] The present application provides an unusual alternative grounding means at the sleeve opening rim of a static dissipative smock without the need to monitor the useful life of the band for electrical contact integrity due to loosen or weaken grip and poor electrical contact in a simple, quick and easy way to electrically connect the body to the static dissipative smock or from the static dissipative smock to a human body.
- [22] The present application has successfully solved the technical problem which was desired to be solved for a long time but not successfully solved in present technical field.

### **Brief Description of the Drawings**

- [23] So as to further explain the application, an exemplary embodiment of the present application will be described with reference to the below drawings, wherein:
- [24] Fig. 1 is a diagram of the static dissipative smock according to present application;
- [25] Fig. 2 is a diagram of the conductive wrist band according to present application.

### **Detailed Description of the Preferred Embodiments**

- [26] These and other advantage, aspect and novel features of the present application, as well as details of an illustrated embodiment thereof will be more fully understood from the following description and drawings, while various embodiments of the present application are presented by way of examples only, not limitation.
- [27] Fig. 1 is a diagram of the static dissipative smock according to present application. As shown in Fig.1, the static dissipative smock 1 comprises an elastic conductive wrist band 4 attached to a sleeve opening rim region 2 of the static dissipative smock 1 for providing a body-to-smock electrical connection to allow dissipation of static charges from a human body to the static dissipative smock 1 or from the static dissipative

smock 1 to the human body whenever a person put on the static dissipative smock 1.

[28] The elastic conductive wrist band 4 is extremely reliable in retracting ability to its original physical state even at a much higher stretching ratio. As shown in Fig.1, the elastic conductive wrist band 4 is a conductive coiled spring wrist band attached onto the opening rim region of the sleeve to provide a continuous electrical path permanently to allow free flow of static charge from the conductive coiled spring wrist band 4 to the Static dissipative smock and vice versa by a snap-on button. One skilled in the art knows that, the elastic conductive wrist band 4 also can be attached onto the opening rim region of the sleeve by stitching, sewing, riveting, plug-in or any other fastening means in other embodiments.

[29] The diameter of the metallic wire of the conductive coiled spring wrist band 4 is from 0.1mm to 1.0 mm, more specifically from 0.2mm to 0.3mm. The diameter of the conductive coiled spring wrist band 4 is from 1mm to 10mm, more specifically from 4mm to 6mm. The conductive coiled spring wrist band 4 is made of stainless steel, brass, copper, iron, aluminium or any other metal or alloy, but stainless steel material is preferred in ensuring a clean, durable and a permanent conductor to withstand human sweating, machine washing, machine drying and daily wear and tear.

[30] To prevent the mis-use or accidental over stretching of the conductive coiled wrist band 4 that may result in permanent physical deformation affecting the grip and electrical contact to the skin, an unique protective stretch-limit elastic fine cord (such as protective stretch-limit elastic fine cord 25 in Fig.2) is permanently installed inside the hollow centre path of the conductive coiled spring wrist band 4 as a part of the design to achieve a deformation-free coiled spring wrist band.

[31] The present application provides a ground-able static dissipative smock with a conductive coiled spring wrist band that is attached using a snap-on button onto a smock at the sleeve opening rim region in providing a body-to-smock electrical connection to allow the dissipation of static charge from the body to the static dissipative smock or from the smock to the body whenever a person put on the static dissipative smock.

[32] Fig. 2 is a diagram of the conductive wrist band according to present application. As shown in Fig.2, the conductive wrist band 20 comprises a conductive coiled spring wrist band 24 and a snap-on button 23. Via the snap-on button 23, the conductive coiled spring wrist band 24 is attached to a sleeve opening rim region of a static dissipative smock for providing a body-to-smock electrical connection to allow dissipation of static charges from a human body to the static dissipative smock or from the static dissipative smock to the human body whenever a person put on the static dissipative smock.

[33] In present embodiment, to prevent the mis-use or accidental over stretching of the

conductive coiled wrist band 24 that may result in permanent physical deformation affecting the grip and electrical contact to the skin, an unique protective stretch-limit elastic fine cord 25 is permanently installed inside the hollow centre path of the coiled spring wrist band 24 as a part of the design to achieve a deformation-free coiled spring wrist band.

- [34] The diameter of the metallic wire of the coiled spring wrist band is from 0.1mm to 1.0 mm, more specifically from 0.2mm to 0.3mm. The diameter of the coiled spring wrist band is from 1mm to 10mm, more specifically from 4mm to 6mm. The coiled spring wrist band is made of stainless steel, brass, copper, iron, aluminium or any other metal or alloy, but stainless steel material is preferred in ensuring a clean, durable and a permanent conductor to withstand human sweating, machine washing, machine drying and daily wear and tear.
- [35] Interestingly, it is found that a full coiled spring is extremely reliable in retracting ability to its original physical state even at a much higher stretching ratio thus eliminating the risk of deformation unlike stressed rubber band or stressed elastomer materials used in an elastic groundable wrist band which loosen or deformed quickly after in a state of prolong stretching.
- [36] Surprisingly, metallic coiled wrist band with wire diameter of 0.2mm to 0.3mm and with coiled wrist band diameter of 4mm to 6 mm is so soft in stretchability and so tender in feeling that one does not feel anything even when it is put on. It feels nothing on the wrist. Its unique "no-feel" stretchability, light weight and the airy ventilation design make it extremely comfortable to a production operator who needs to wear it for a continuous long working hours in a production work environment.
- [37] Accordingly, another unique property of a coiled spring wrist band is its excellent electrical contact with the skin of our body. Its direct round-the-wrist electrical contact provides a very effective means of electrical connection from body to the smock. Years of Industrial experience tells us that the integrity of the body-to-smock electrical connection is the most critical control factor for a successful grounding of a production operator in a typical electrostatic protected area (EPA).
- [38] The application provides an unusual alternative grounding means at the sleeve opening rim of a smock without the need to monitor the useful life of the band for electrical contact integrity due to loosen or weaken grip and poor electrical contact in a simple, quick and easy way to electrically connect the body to the smock or from the smock to a human body .When a person sits on an ESD chair, the smock electrically connects to the chair; to the ESD wheels or ESD castors; to the ESD floor and subsequently to the ground as a body-to-ground system grounding solution.

## Claims

- [Claim 1] 1. A static dissipative smock comprising a conductive coiled spring wrist band attached to a sleeve opening rim region of the static dissipative smock via a snap-on button for providing a body-to-smock electrical connection to allow dissipation of static charges from a human body to the static dissipative smock or from the static dissipative smock to the human body whenever a person put on the static dissipative smock, wherein, a protective stretch-limit elastic fine cord is permanently installed inside a hollow centre path of the conductive coiled spring wrist band to achieve a deformation-free conductive coiled spring wrist band.
- [Claim 2] 2. The static dissipative smock according to claim 1, wherein, the conductive coiled spring wrist band has a diameter in a range from 1mm to 10mm.
- [Claim 3] 3. The static dissipative smock according to claim 2, wherein, the conductive coiled spring wrist band has a diameter in a range from 4mm to 6mm.
- [Claim 4] 4. The static dissipative smock according to claim 1, wherein, a metallic wire of the conductive coiled spring wrist band has a diameter in a range from 0.1mm to 1.0 mm.
- [Claim 5] 5. The static dissipative smock according to claim 4, wherein, the metallic wire of the conductive coiled spring wrist band has a diameter in a range from 0.2mm to 0.3mm.
- [Claim 6] 6. The static dissipative smock according to claim 4, wherein, the protective stretch-limit elastic fine cord is made of polymeric material, plastic, stainless steel, brass, copper, iron, aluminium or alloy or a combination thereof.
- [Claim 7] 7. A conductive wrist band comprising a conductive coiled spring wrist band and a snap-on button via which the conductive coiled spring wrist band is attached to a sleeve opening rim region of a static dissipative smock for providing a body-to-smock electrical connection to allow dissipation of static charges from a human body to the static dissipative smock or from the static dissipative smock to the human body whenever a person put on the static dissipative smock, wherein, the conductive coiled spring wrist band further comprises a protective stretch-limit elastic fine cord permanently installed inside a hollow centre path of the conductive coiled spring wrist band to achieve a de-

formation-free conductive coiled spring wrist band.

[Claim 8] 8. A static dissipative smock comprising an elastic conductive wrist band attached to a sleeve opening rim region of the static dissipative smock for providing a body-to-smock electrical connection to allow dissipation of static charges from a human body to the static dissipative smock or from the static dissipative smock to the human body whenever a person put on the static dissipative smock.

[Claim 9] 9. The static dissipative smock according to claim 8, wherein, the elastic conductive wrist band is attached to the sleeve opening rim region of the static dissipative smock by a snap-on button, by stitching, sewing, riveting or plugging-in.

[Claim 10] 10. The static dissipative smock according to claim 8, wherein, the elastic conductive wrist band is a conductive coiled spring wrist band with a protective stretch-limit elastic fine cord permanently installed inside a hollow centre path of the conductive coiled spring wrist band to achieve a deformation-free conductive coiled spring wrist band.

## **Abstract**

A coiled spring wrist band positioned around the sleeve opening rim of a smock electrically connects the smock to the wrist of a human body in eliminating or minimizing the risk of a loosen wrist band. A ground-able smock with a metallic coiled spring wrist band that is attached using a snap-on button onto a smock at the sleeve opening rim region in providing a body-to-smock electrical connection to allow the dissipation of static charge from the body to the smock or from the smock to the body whenever a person put on the smock.



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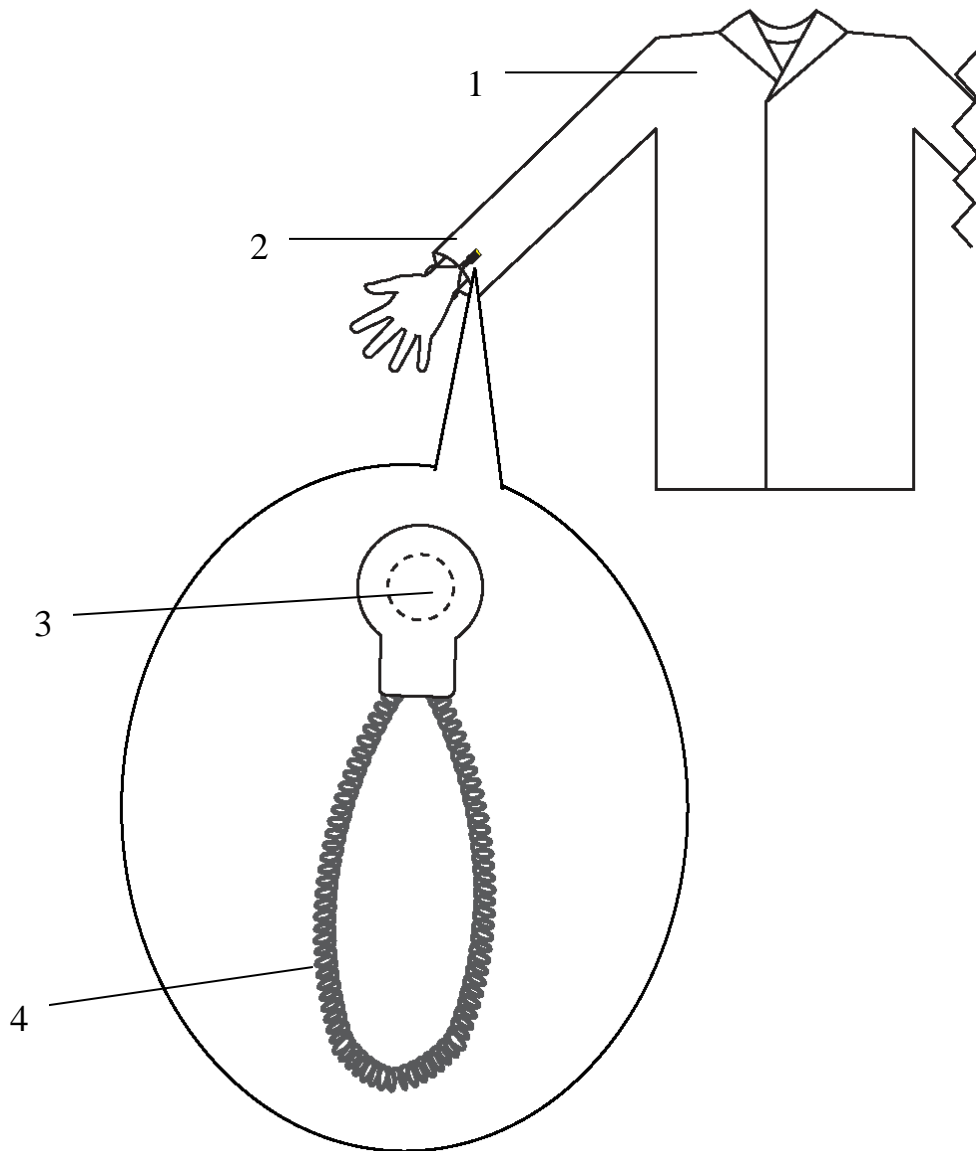


Fig.1

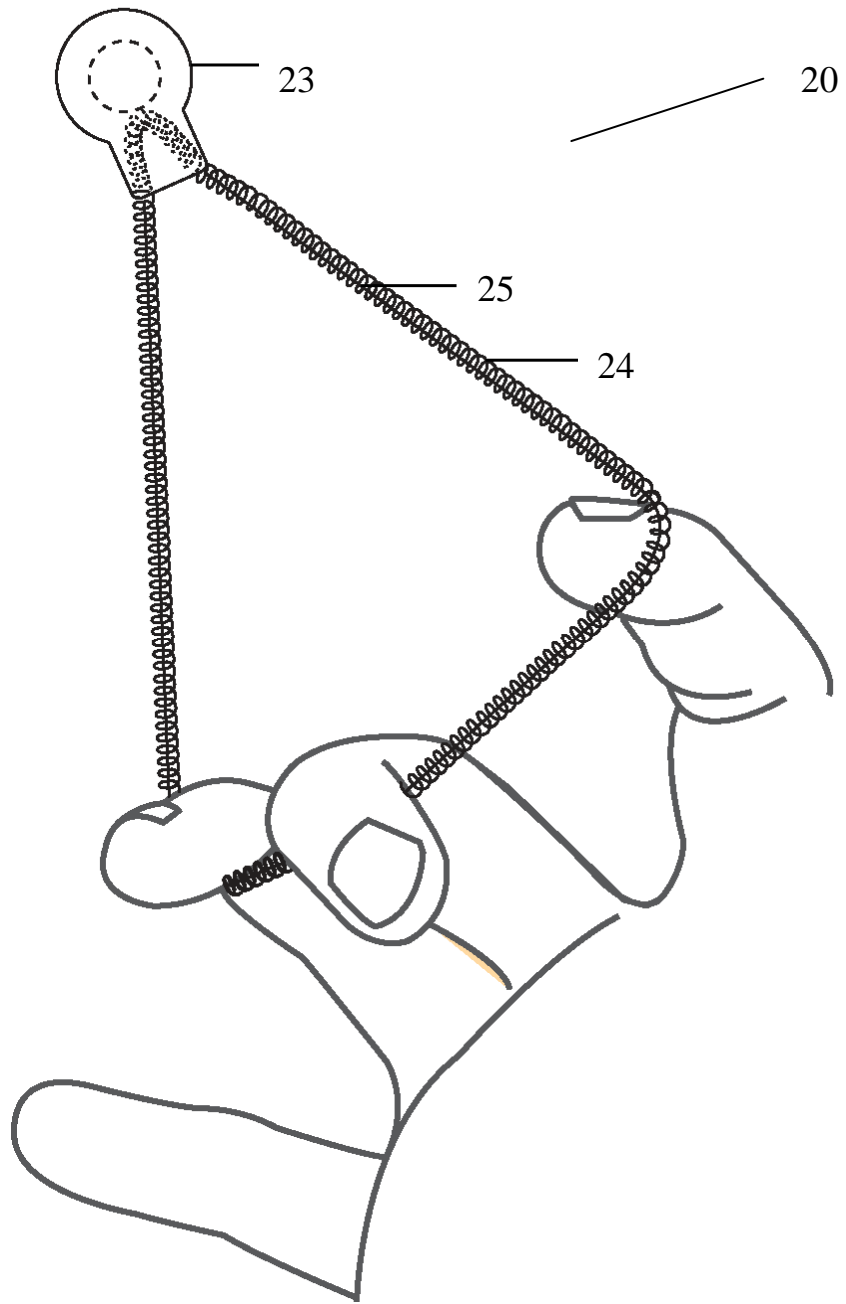


Fig.2

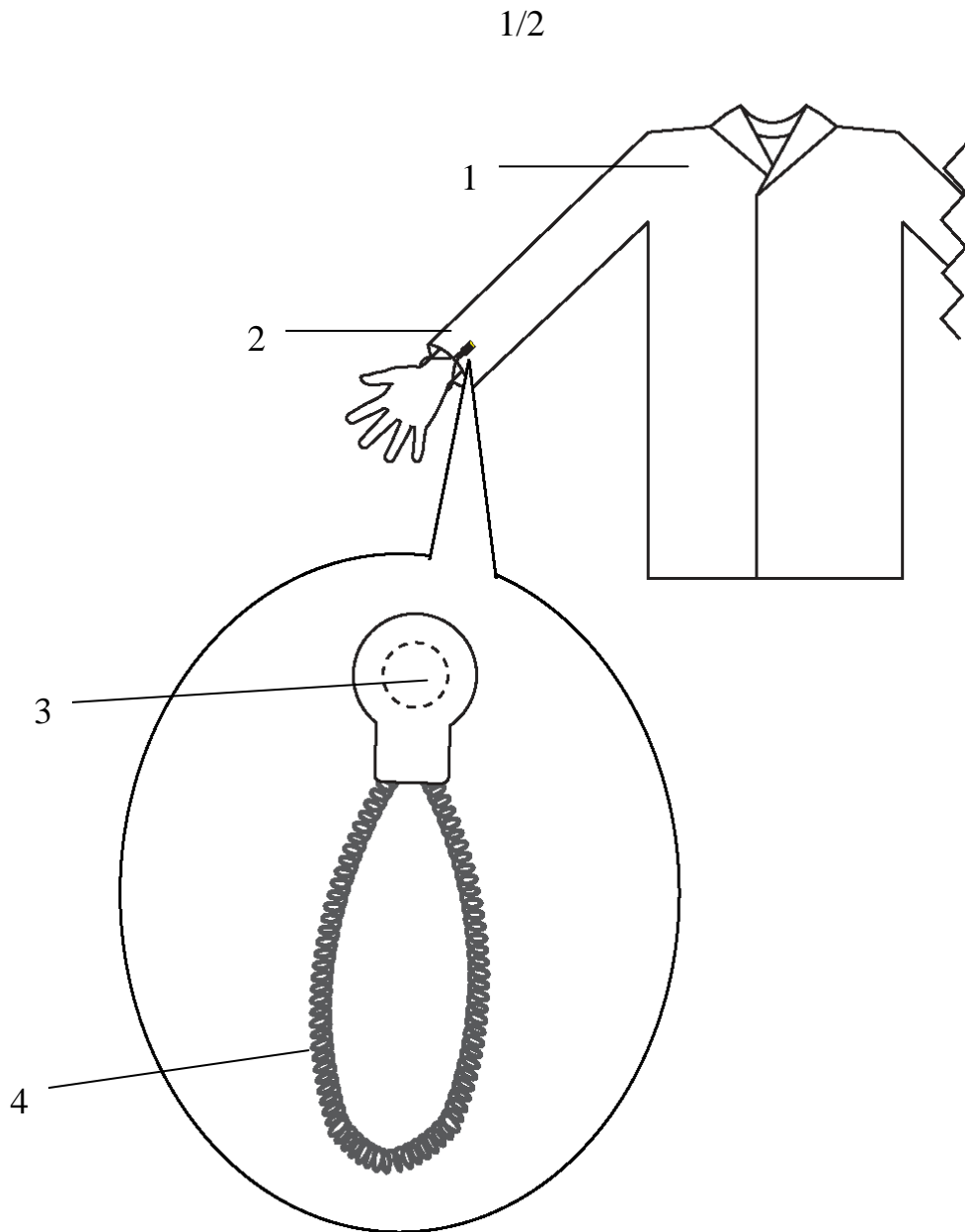


Fig.1

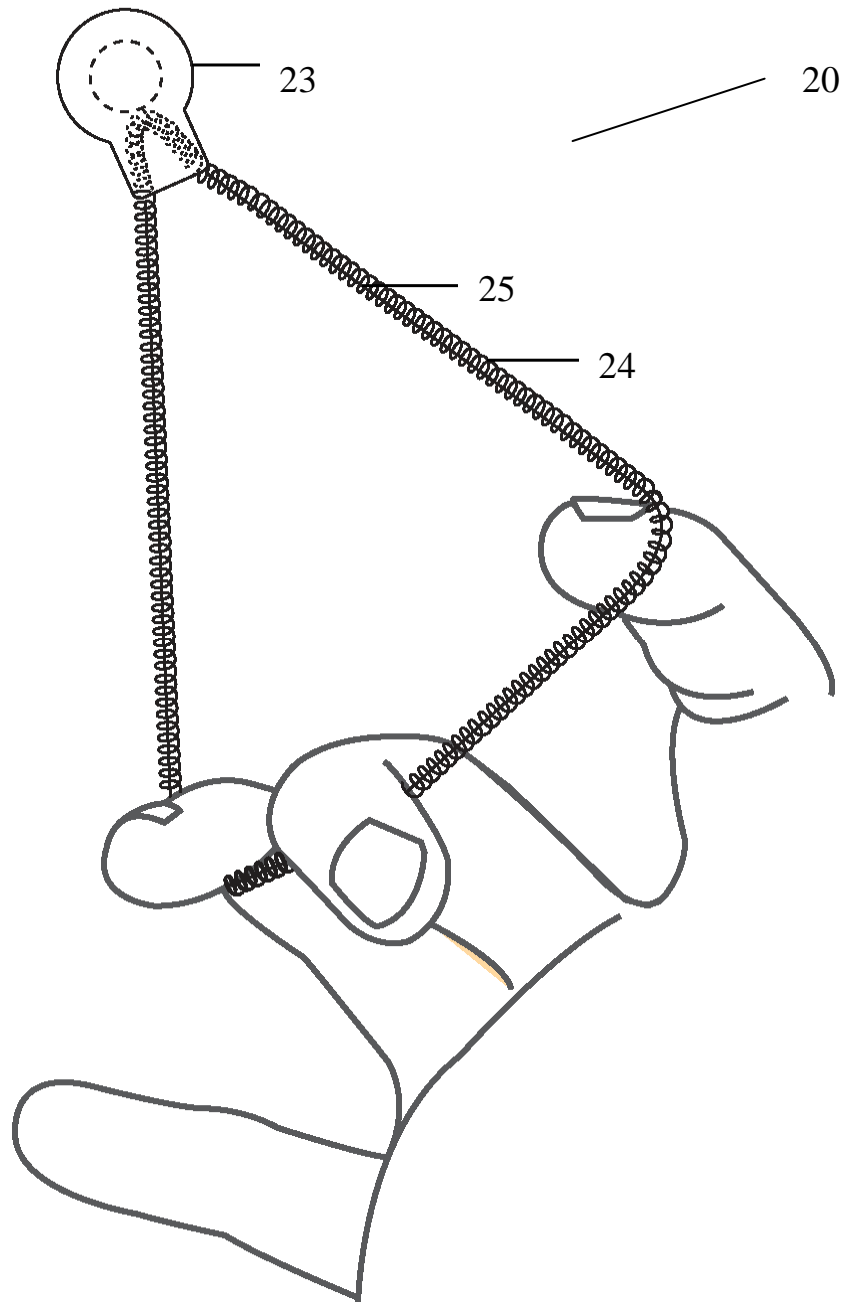


Fig.2