(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 315 037 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
14.08.2019 Bulletin 2019/33

(21) Application number: **16195711.3**

(22) Date of filing: **26.10.2016**

(51) Int Cl.:
G01S 17/08 *(2006.01)* ***A41D 19/015*** *(2006.01)*

(54) PROTECTIVE GLOVE, ESPECIALLY FOR FIREFIGHTERS

SCHUTZHANDSCHUH, INSBESONDERE FÜR FEUERWEHRLEUTE

GANT DE PROTECTION, EN PARTICULIER POUR LES POMPIERS

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(43) Date of publication of application:
02.05.2018 Bulletin 2018/18

(73) Proprietors:
- **Holik International s.r.o.**
  763 14 Zlin, Stipa (CZ)
- **Západoceská univerzita v Plzni**
  30614 Plzen - Jizni Predmesti (CZ)
- **Applycon s.r.o.**
  334 41 Dobrany (CZ)

(72) Inventors:
- **Pekar, Tomas**
  763 14 Zlin (CZ)
- **Mlckova, Marcela**
  763 14 Zlin (CZ)
- **Ponizilova, Cecilie**
  763 14 Zlin (CZ)
- **Blecha, Tomas**
  330 33 Mesto Touskov, Pnovany (CZ)
- **Hamacek, Ales**
  337 01 Rokycany (CZ)
- **Kaspar, Petr**
  326 00 Plzen (CZ)
- **Reboun, Jan**
  337 01 Rokycany (CZ)
- **Soukup, Radek**
  326 00 Plzen (CZ)
- **Baxa, Milan**
  336 01 Blovice (CZ)
- **Brasna, Vaclav**
  336 01 Blovice (CZ)

(74) Representative: **Musil, Dobroslav**
Zabrdovicka 801/11
615 00 Brno (CZ)

(56) References cited:
EP-A2- 2 407 039
WO-A1-93/14472
DE-U1-202010 004 348
GB-A- 2 460 430
US-A1- 2009 222 973
WO-A1-00/62633
DE-U1- 9 401 951
FR-A1- 2 882 433
KR-U- 20150 001 872

EP 3 315 037 B1

Description

Technical field

[0001] The invention relates to a protective glove, especially for firefighters, which comprises an electronic part with a system of temperature sensing devices, which are connected to a power module and a control unit, which is coupled to a communication unit, whereby the control unit is located on the back side of the glove.

Background art

[0002] Members of rescue services and emergency services, especially firefighters, often work in dangerous conditions that threaten their health or even lives. Beside other protective equipment, such as helmets, respiratory masks, special footwear, shields, etc., they also use special protective clothing, which is resistant not only to mechanical damage, but it is particularly resistant to heat and heat penetration to the wearer's body (the firefighter's body). This is convection heat and radiant heat. Protective clothing or garments are made of different materials and consist of different layers of materials that perform various protective functions and which result in a synergistic effect of complex protection of the wearer (the firefighter). On the other hand, the protective clothing or a garment must provide the wearer with sufficient opportunity for mobility and, if possible, give the wearer some comfort to be able to carry out their activities for the required time.

[0003] One of the essential elements of protection, especially for firefighters, are gloves, which must provide the wearer with a sufficient level of protection and at the same time must ensure sufficient mobility of the hand and particularly the fingers.

[0004] EP 2407039 A2 discloses an article to be worn on the body, particularly a garment, equipped with a sensor device which can be used to monitor at least one physical and/or chemical and/or physiological property of the person wearing the object and/or to monitor the surroundings of the person and with evaluation electronics, which converts the signals of the sensor device into radio signals. This article to be worn is preferably designed as a protective glove with a sensor device, with which at least one physical and/ or chemical and/or physiological characteristic of the person wearing the protective glove and/or the person's surroundings can be detected. The evaluation electronics converts the signals of the sensor device into radio signals, which are then transmitted by means of a transmission device to a receiver for the radio signals of the protective gloves worn on the bodies of other persons, and/or to the control center. The sensor device comprises at least a temperature sensor, which measures the temperature of the surface of the person's body or which measures the temperature of the person's environment. The sensor device may also comprise an acceleration sensor, a positioning system, a barometer and/or an altitude meter, etc. Also, the glove can give an acoustic, optical and/or haptic signal. On the back side of the protective glove is integrated a temperature sensor to detect the temperature of the skin, a temperature sensor to detect the temperature of the environment, at least one sensor of acceleration and the evaluation electronics. The radio network created by the gloves is created as an "ad hoc" wireless network, through which is transmitted the data of the sensor devices of the protective gloves and/or of the control center, whereby the individual protective gloves constitute nodes of the communication network.

[0005] Other protective equipment, especially for firefighters, is known, for example, from DE 20 2005 021140 U1, US 2006/022882, DE 100 47 533 A1 and DE 103 50 869.

[0006] However, the disadvantage of the solution according to EP 2 407 039 A2 is over-automation in the functioning of the glove and its electronic elements, which limit the possibilities of the firefighter in action on the scene to use at least some sensors of the glove on the basis of their personal decision while maintaining the functions of automatic monitoring the status, data transmission, etc. Another drawback is the formation of an ad-hoc wireless network, which can be affected by radio interference around the area of the emergency action, where everyone communicates with everyone else. What is more, such ad-hoc networks are not, as a rule, secured against attacks, etc. Moreover, the disadvantage of the described solution is the fact that only the temperature in the immediate vicinity of the glove is measured and the solution in no way allows the measurement of the temperature of the distant objects. The method of displaying the measured temperatures is not described in the invention, nor is described the specific technical solution of displaying the data.

[0007] FR2882433 discloses an infrared laser pointer sensing device that is attached to a fireman helmet to measure the temperature of distant objects. WO9314472 discloses an infrared laser pointer sensing device that is attached to a glove to scan patterns.

[0008] The goal of the invention is to remove or at least to minimize the disadvantages of the background art.

Principle of the invention

[0009] The goal of the invention is achieved by a protective glove, especially for firefighters, whose principle consists

in that one temperature sensing device is a temperature sensor of the glove surface, located on the back side of one of the fingers of the glove, and a second temperature sensing device is an infrared sensor, arranged on the back side of the glove along with an optical pointer which is assigned to it, whereby on the back side of the glove is further disposed a switch of operation modes of the glove electronics and a color optical indicator showing the temperature, the glove status or the operation mode of the electronics of the glove, wherein both the switch of modes and the color optical indicator are connected to a control unit.

[0010] The advantage of the protective glove according to the invention is a high degree of protection it provides despite the incorporated electronic elements, which are, however, universally and easily exploitable and whose information is displayed directly on the glove in a very simple and clear manner. At the same time, the glove is capable of providing information about temperatures directly to the user on the scene without the need for another display device, as well as to a remote observer, e.g., the commander of the emergency action, etc. Simultaneously, the data showing the temperature development is automatically stored. Another advantage of this solution is the fact that the glove enables to measure the temperature of distant areas. This solution also enables to create a glove which is easily washable by ordinary washing means (a common washing machine and an ordinary detergent). Another advantage is the fact that by integrating all the electronic and mechanical parts directly into the design of the glove, the glove is safe because the incorporated electronics and other elements do not protrude through anywhere and do not get caught. The electronics and other elements do not interfere with the use of gloves even in challenging conditions. Another advantage of this solution is the fact that the glove can be used either alone or in combination with a superior system, e.g. a smart firefighter suit, etc. Another indisputable benefit is easy data transmission to common communication means, such as smart phones, and then through them on to the internet (cloud solutions and the like), which allows to record and analyze data, etc. Another advantage is the fact that the glove user can set the limits of signaling (e.g. changing signaling colors, etc.) according to their own preferences and needs.

Description of drawings

[0011] The invention is schematically represented in the drawing, where Fig. 1 shows a top view of the arrangement of the protective glove, Fig. 2 shows a view of the upper side of the protective glove, Fig. 3 shows a detail of the interior space of the glove to accommodate a battery, Fig. 4 shows an exemplary embodiment of the glove according to the invention with advanced visual displaying the status and Fig. 5 illustrates an embodiment of the glove according to the invention with a control unit, an infrared sensor, an optical pointer and an optical indicator arranged entirely under the outer layer of the glove, i.e. without a silicone protective cover.

Examples of embodiment

[0012] The invention will be described on an embodiment of a whole-textile protective glove for firefighters, which is composed of an outer layer and a system of inner layers. All the layers together ensure a synergistic effect both in terms of mechanical resistance of the glove and in terms of its thermal and heat resistance.

[0013] The protective glove, especially for firefighters, is further equipped with an electronic part, which ensures the sensing and communication functions of the glove. The electronic part of the glove comprises a system of sensing devices of physical quantities. The sensing devices are connected to a power module **1** and to a control unit **2.** The control unit **2** is provided with a communication unit **21** of paired radio data transmission in unlicensed waveband, which is most conveniently formed by a wireless communication module with a standardized pairing and communication protocol, e.g. Bluetooth.

[0014] The power module **1** is composed of an accumulator of electrical energy, which is provided with a connector **10,** with which is aligned a connector **20** of the control unit **2,** whereby the connectors **10, 20** can be repeatedly disconnected and reconnected. The accumulator is mounted in the inner pocket **11** of the glove, in which it is enclosed, e.g. by means of a zipper or Velcro. Most preferably, the accumulator is located on the side of the wrist of the wearer's hand in the cuff of the glove, as is apparent from Fig. 3. The accumulator can be repeatedly charged by disconnecting the connectors **10** and **20,** and by connecting the connector **10** to a suitable external charger, whereby the accumulator can be charged directly in the glove or after being removed from the glove. The accumulator is preferably of the Li-Ion type, which is a kind of technology enabling to produce tailored and thin-profile accumulators of a required capacity and output voltage, particularly accumulators capable of being charged by chargers that are readily available, e.g., by chargers for mobile phones.

[0015] The control unit **2** is arranged in the glove in a suitable place, most suitably on the back side of the glove under at least one, but preferably by at least two layers of the glove, i.e. in the case of a whole-textile glove under at least two textile layers of the glove. The control unit **2** is designed as a flat plate comprising the desired electronic and electric elements to ensure the operation, including the wireless communication with pairing and communication protocol, e.g. Bluetooth, operating in unlicensed waveband from 2.4 GHz to 2.5 GHz.

[0016] The control unit **2** is coupled to a temperature sensor **3** of the surface of the glove, which is located on the back side of one of the fingers of the glove, preferably on the back side of the ring-finger **4** of the glove, where it is relatively well protected from excessive mechanical load when this finger, i.e. the ring-finger, is being used by the user. The temperature sensor **3** is composed of a K type thermocouple, which is overlaid with a cap **30,** made, e.g., of textile material Nomex® and is in contact with the ambient air. The temperatures measured by the K type thermocouple are typically in the range from -200 °C to +1250 °C.

[0017] On the back side of the glove is further arranged an infrared sensor **5,** which is in the illustrated example of embodiment placed in a common holder **7** with an optical pointer **6,** formed, for example, by a laser diode. The infrared sensor **5** is able to measure remotely the temperature of a distant area, whereby it is the optical pointer **6** that enables the infrared sensor **5** to direct towards the required distant surface (potentially dangerous hot spots).

[0018] On the back side of the glove is further arranged a switch **8** of operation modes of the electronics of the glove and an optical indicator **9** of the temperature, the status of the glove or the mode of operation of the electronics of the glove. Both the switch **8** of modes and the optical indicator **9** are connected to the control unit **2,** which ensures their power supply and function. For example, the optical indicator **9** comprises at least one light-emitting diode (LED), most preferably an RGB LED chip with at least three colors of light - green, yellow (orange) and red. In a preferred embodiment, the optical indicator **9** at one moment signals a status detected only by one sensor. The optical indicator **9** also serves to indicate wireless connection to a superior unit, which may be composed of, e.g., the control unit of a smart firefighter suit or of a smart phone of the user (or of some other portable devices). It also serves to indicate the necessity to recharge the accumulator of the power module **1,** etc. Thus, the optical indicator **9** is able to change automatically the color of its light on the basis of the instruction of the control unit **2,** e.g. according to the temperature measured by the temperature sensor **3** on the glove surface, or according to the temperature of a distant surface measured by the infrared sensor **5,** etc. Optionally, the optical indicator **9** is capable of changing the color also when one of the set threshold temperatures is exceeded. The threshold temperatures are set by the user himself.

[0019] The optical indicator **9,** consisting of three color light emitting diodes - green, yellow (orange) and red, enables to signal different temperatures of the temperature being currently measured, e.g., if the measured temperature is below 100 °C, the green LED is flashing, if the measured temperature is in the range between 100 °C and 200 °C, the yellow (orange) LED blinks continuously, and if the measured temperature is above 200 °C, the red LED blinks continuously. The setting of the displayed threshold values can be performed independently for the measurement of the temperature TC of the surroundings of the glove by the temperature sensor **3** (thermocouple) and for the measurement of the temperature IR of a distant area by the infrared sensor **5.**

[0020] The temperatures that have been measured, whether these are the temperatures of a distant area measured by the infrared sensor **5,** or the temperatures in the surroundings of the glove measured by the temperature sensor **3** on the glove surface, are transmitted through a wireless communication unit **21** by means of a standardized pairing and communication protocol to a paired common communication means (a phone, a tablet, a superior unit in a smart firefighter suit, etc.), where they are recorded and/or transmitted on-line to the incident commander of an emergency action. These recorded and transmitted temperatures are temperatures that have been actually measured, which means that this is not just a record of the occurrence of limit values, but a record of the course of temperatures throughout the emergency action. If the wireless communication unit **21,** has a sufficient performance or if during the emergency action each wearer of the glove has a phone, a tablet, a computer or another communication unit paired with his gloves on him, the communication unit being set for online data transmission to the incident commander, then this data is available also to the incident commander. A more detailed analysis of the recorded data can be also performed after the emergency action.

[0021] Figs. 4 and 5 show an exemplary embodiment of the glove according to the invention with advanced visual status display, wherein the glove comprises on its back side an optical indicator **9** created in the form of a display strip (column), which is arranged besides, or, more specifically, along a common holder **7** of the infrared sensor **5** and the optical pointer **6.** The optical indicator **9** comprises three to ten light-emitting diodes, which are either monochromatic, or multicolored for clearer optical signaling. In the illustrated example of embodiment, the display strip comprises five color LEDs, one of which is green, two are yellow and two are red, with the aid of which the temperatures measured by the sensors **3** and **5** are displayed more accurately and the user receives better and more accurate information. The control unit **2** is preferably set in such a manner that only one green diode lights at the lowest temperatures measured, at an elevated temperature always two diodes light. Due to this, the wearer can recognize more temperature stages. Thus, in the illustrated embodiment with five LEDs six temperature stages are recognized in comparison to three temperature stages in an embodiment with three LEDs having the colors of the traffic lights (green, yellow (orange), red). The following table shows an exemplary diagram of temperatures measured and indicated by means of five LEDs:

LED		TC		IR	
		from °C	to °C	from °C	to °C
green			100		100
green	orange 1	100	125	100	150
orange 1	orange 2	125	150	150	200
orange 2	red 1	150	175	200	250
red 1	red 2	175	200	250	300
red 1 flashes	red 2 flashes	200		300	

[0022] In the embodiment in Fig. 4, the glove is on its back side in the area by the switch **8** of modes provided with a separate status LED **80,** which is independent of the optical indicator **9** and which by means of different types of lighting and flashing displays the accumulator charge status (charged, insufficiently charged, discharged), the status of pairing the glove with a superior electronic means (paired, unpaired, connected, unconnected), e.g., with a smart firefighter suit, a mobile phone, etc.

[0023] In the examples of embodiment in Figs. 1 to 4, the individual elements of the electronic equipment of the glove located on the back side of the glove are overlaid with a protective cover **23,** which is attached to the outer layer of the glove. The protective cover is preferably made of a flexible material exhibiting long-term temperature resistance (to temperatures above 150 °C).

[0024] In the embodiment in Fig. 5, the control unit **2,** the infrared sensor **5,** the optical pointer **6** and the optical indicator **9** are arranged entirely under the outer layer of the glove, i.e. are without a silicone protective cover **23.** As a result, the glove has a longer service life and can be used at temperatures higher than those which are allowed by the protective cover **23.** In addition, the integrated electronics is less restrictive in terms of mobility or annoying to the user, since the design of the glove closely resembles a glove without electronics. In this exemplary embodiment, the entire electronic equipment, i.e. the control unit **2** with the optical pointer **6** and the infrared sensor **5,** is designed as one anatomically shaped unit **24,** which corresponds in shape to the back side of the user's hand. This anatomically shaped unit **24** is directly integrated into the backside layers of the glove and is entirely overlaid with a material of the outer layer of the back side of the glove and only on the front side of this anatomically shaped unit **24** and the optical pointer **6** and the infrared sensor **5** are directed out of the glove towards the space in front of the glove. The material of the outer layer of the back side of the glove in the illustrated example of embodiment only comprises windows for the optical indicator **9** in the form of the above-described display strip (column) and a window for the separate status LED **80.** In an unillustrated example of embodiment, in the seam of the index finger edge (or in another seam) of the glove are led out at least three side-emitting fiber optic links (green, yellow (orange), red), which bring the light of the LED of the optical indicator **9** from the inside of the glove to the surface of the glove.

[0025] The electronic equipment of the glove works in such a manner that it is put into operation by pressing the button of the switch of modes **8** disposed on the back side of the glove. With a proper connection, a charged accumulator and ambient temperatures below 100 °C, the status LED indicator lamp **80** flashes green. If the accumulator of the glove is not sufficiently charged, the status LED **8** starts to flash red. The electronics is switched off by a long touch of the button of the switch of modes **8.** During the operation, it is possible to change the current operation mode of the electronics by a short touch on the button of the switch of modes **8.** In the basic operation mode, the electronics is set to measure the temperature by means of the temperature sensor **3** on the surface of the glove. The level of the temperature measured is indicated by the system of LEDs of the optical indicator **9.** After pressing the button of the switch of modes **8,** the electronics switches to another mode in which the temperature of distant surfaces is measured by means of the infrared sensor **5** and, at the same time, the associated optical pointer **6** is actuated. The level of the temperature measured is again indicated by the system of the LEDs of the optical indicator **9.** Pairing the electronics of the glove by means of wireless communication with the control unit of a smart firefighter suit or with a smart phone of the user is carried out in such a manner that after switching on the electronics of the glove, there is an automatic attempt to pair the glove with the superior means which have been already paired before. If the glove has not been paired and at the same time the temperature being measured is below 100 °C and the accumulator is charged, the green light of the status LED **8** is flashing fast. If the glove electronic circuit has been paired and at the same time the temperature being measured is below 100 °C and the accumulator is charged, the status LED **8** is slowly flashing green.

[0026] The electronic circuit of the glove is protected from moisture, so the glove can be routinely washed and dried.

Claims

1. A protective glove, especially for firefighters, which comprises an electronic part with a system of temperature sensor devices (3, 5), which are connected to a power module (1) and to a control unit (2), which is coupled to a communication unit (21), whereby the control unit (2) is located on the back side of the glove, wherein one sensor device of the temperature is a temperature sensor (3) of the glove surface, which is located on the back side of one of the fingers of the glove, whereby on the back side of the glove is further arranged a switch (8) of operation modes of the glove electronics and an optical indicator (9) of the temperature, **status** of the glove or operation mode of the glove electronics, wherein both the switch (8) of modes and the optical indicator (9) are connected to the control unit (2), the protective glove is **characterized in that** a second sensor device of the temperature is an infrared sensor (5), which is along with an optical pointer (6) arranged on the back side of the glove.

2. The protective glove according to claim 1, **characterized in that** the infrared sensor (5) and the optical pointer (6) are arranged in a common case (7).

3. The protective glove according to claim 1, **characterized in that** the optical indicator (9) comprises at least one light-emitting diode.

4. The protective glove according to claim 3, **characterized in that** the optical indicator (9) comprises a display strip with two to ten light-emitting diodes.

5. The protective glove according to claim 1, **characterized in that** the temperature sensor (3) is composed of a thermocouple, which is overlaid with a protective cap (30) and is in contact with the ambient air.

6. The protective glove according to claim 1, **characterized in that** the control unit (2) is coupled to a wireless communication unit (21) with a pairing and communication protocol for transmitting and recording the measured values on the paired device.

7. The protective glove according to claim 1, **characterized in that** on the back side of the glove is disposed a separate status light-emitting diode (80), which is independent of the optical indicator (9) and is used for displaying the **status** of the glove electronics.

8. The protective glove according to any of claims 1 to 7, **characterized in that** the infrared sensor (5), the optical pointer (6), the switch (8) of modes, the optical indicator (9) of the temperature and the status light-emitting diode on the back side of the glove are overlaid with a protective cover (23), which is attached to the outer layer of the glove.

9. The protective glove according to any of claims 1 to 8, **characterized in that** the infrared sensor (5), the optical pointer (6), the switch (8) of modes, the optical indicator (9) of the temperature and the status light-emitting diode on the back side of the glove are arranged completely under the outer layer of the glove.

10. The protective glove according to claim 9, **characterized in that** optical indication is performed by fiber optic links, which are arranged on the surface of the glove.

Patentansprüche

1. Schutzhandschuh, insbesondere für die Feuerwehrleute, der einen elektronischen Teil mit einem System der Temperatursensoren (3, 5) aufweist, die an ein Speisemodul (1) und eine Steuereinheit (2) angeschlossen sind, die mit einer Kommunikationseinheit (21) verkoppelt ist, wobei die Steuereinheit (2) auf der Rückenseite des Handschuhes angebracht ist, wo ein Temperatursensor ein Wärmesensor (3) der Handschuhoberfläche ist, der auf dem Rücken von einem der Finger des Handschuhes angebracht ist, wobei auf der Rückenseite des Handschuhes weiter ein Modusumschalter (8) der Tätigkeit der Elektronik des Handschuhes und ein optischer Melder (9) der Temperatur, des Zustandes des Handschuhes oder des Tätigkeitsmodus der Elektronik des Handschuhes angebracht sind, wo der Modusumschalter (8) sowie der optische Melder (9) an die Steuereinheit (2) angeschlossen sind, der Schutzhandschuh **kennzeichnet sich dadurch, dass** der andere Temperatursensor ein Infrarotsensor (5) ist, der zusammen mit dem optischen Zeiger (6) auf dem Rücken des Handschuhes angebracht ist.

2. Schutzhandschuh nach dem Anspruch 1, **dadurch gekennzeichnet, dass** der Infrarotsensor (5) und der optische

Zeiger (6) in einer gemeinsamen Buchse (7) angeordnet sind.

3. Schutzhandschuh nach dem Anspruch 1, **dadurch gekennzeichnet, dass** der optische Melder (9) mindestens eine Leuchtdiode aufweist.

4. Schutzhandschuh nach dem Anspruch 3, **dadurch gekennzeichnet, dass** der optische Melder (9) einen Abbildungsstreifen mit zwei bis zehn Leuchtdioden aufweist.

5. Schutzhandschuh nach dem Anspruch 1, **dadurch gekennzeichnet, dass** der Wärmesensor (3) durch ein Thermoelement gebildet wird, das mit einer Schutzabdeckung (30) überdeckt wird und mit der Umgebungsluft in Kontakt steht.

6. Schutzhandschuh nach dem Anspruch 1, **dadurch gekennzeichnet, dass** die Steuereinheit (2) mit einer Radiokommunikationseinheit (21) mit dem Paarungs- und Kommunikationsprotokoll zur Übertragung und Erfassung der Messwerte auf die gepaarte Einrichtung verkoppelt ist.

7. Schutzhandschuh nach dem Anspruch 1, **dadurch gekennzeichnet, dass** auf der Rückenseite des Handschuhes eine selbständige Zustandsleuchtdiode (80) angebracht ist, die von dem optischen Melder (9) zur Abbildung des Zustandes der Elektronik des Handschuhes unabhängig ist.

8. Schutzhandschuh nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** Infrarotsensor (5), optischer Zeiger (6), Modusumschalter (8), optischer Melder (9) der Temperatur und Zustandsleuchtdiode auf dem Rücken des Handschuhes mit einer Schutzabdeckung (23) überdeckt sind, die an die äußere Schicht des Handschuhes befestigt ist.

9. Schutzhandschuh nach einem der Ansprüche 1 bis 8, **dadurch gekennzeichnet, dass** Infrarotsensor (5), optischer Zeiger (6), Modusumschalter (8), optischer Melder (9) der Temperatur und Zustandsleuchtdiode auf dem Rücken des Handschuhes vollkommen unter der äußeren Schicht des Handschuhes angeordnet sind.

10. Schutzhandschuh nach dem Anspruch 9, **dadurch gekennzeichnet, dass** die optische Signalisation durch Lichtleiter erfolgt, die auf der Handschuhoberfläche angebracht sind.

Revendications

1. Gant de protection, notamment pour les pompiers, qui comprend un composant électronique avec un ensemble des capteurs de température (3, 5) qui sont connectés à un module d'alimentation (1) et à une unité de commande (2) qui est couplée à une unité de communication (21), tandis que l'unité de commande (2) est située à la face dorsale du gant, tandis que l'un des capteurs de température est l'indicateur de température (3) de la surface du gant qui est situé à la face dorsale de l'un des doigts du gant, tandis qu'à la face dorsale du gant il y a également un commutateur (8) des modes du fonctionnement de l'éctronique du gant et l'appareil de signalisation optique de la température (9), de l'état du gant ou du mode du fonctionnement de l'éléctronique du gant où le commutateur (8) des modes et l'appareil de signalisation optique de la température (9) sont couplés à une unité de commande (2), le gant de protection **est caractérisé en ce que** le deuxième capteur de température est un capteur infrarouge (5) qui est monté à la face dorsale du gant ensemble avec l'indicateur optique (6).

2. Gant de protection selon la revendication 1, **caractérisé en ce que** le capteur infrarouge (5) et le pointeur optique (6) sont disposés dans un boîtier commun (7).

3. Gant de protection selon la revendication 1, **caractérisé en ce que** l'appareil de signalisation optique de la température (9) comprend au moins une diode lumineuse.

4. Gant de protection selon la revendication 3, **caractérisé en ce que** l'appareil de signalisation optique de la température (9) comprend une bande d'affichage avec de deux à dix diodes lumineuses.

5. Gant de protection selon la revendication 1, **caractérisé en ce que** l'indicateur de température (3) est un thermocouple qui est recouvert d'un disdpositif de protection (30) et il est en contact avec l'air ambiant.

6. Gant de protection selon la revendication 1, **caractérisé en ce que** l'unité de commande (2) est couplée à une unité de communication radio (21) avec un protocole d'appariement et de communication pour transmettre et enregistrer les valeurs mesurées au dispositif apparié.

7. Gant de protection selon la revendication 1, **caractérisé en ce qu'**à la face dorsale du gant il y a une diode lumineuse d'état distinct (80), qui est indépendante de l'appareil de signalisation optique de la température (9) pour l'affichage de l'électronique du gant.

8. Gant de protection selon l'une quelconque des revendications de 1 à 7, **caractérisé en ce que** le capteur infrarouge (5), l'indicateur optique (6), le commutateur (8) de mode, l'appareil de signalisation optique de la température (9) et la diode lumineuse sont recouverts par un dispositif de protection (23), qui est attaché à la couche externe du gant.

9. Gant de protection selon l'une des revendications de 1 à 8, **caractérisé en ce que** le capteur infrarouge (5), l'indicateur optique (6), le commutateur de mode (8), l'appareil de signalisation optique de la température (9) et la diode lumineuse d'état sont complètement disposés à la face dorsale du gant sous la couche extérieure du gant.

10. Gant de protection selon la revendication 9, **caractérisé en ce que** la signalisation optique est réalisée par les guides de lumière situés à la surface du gant.

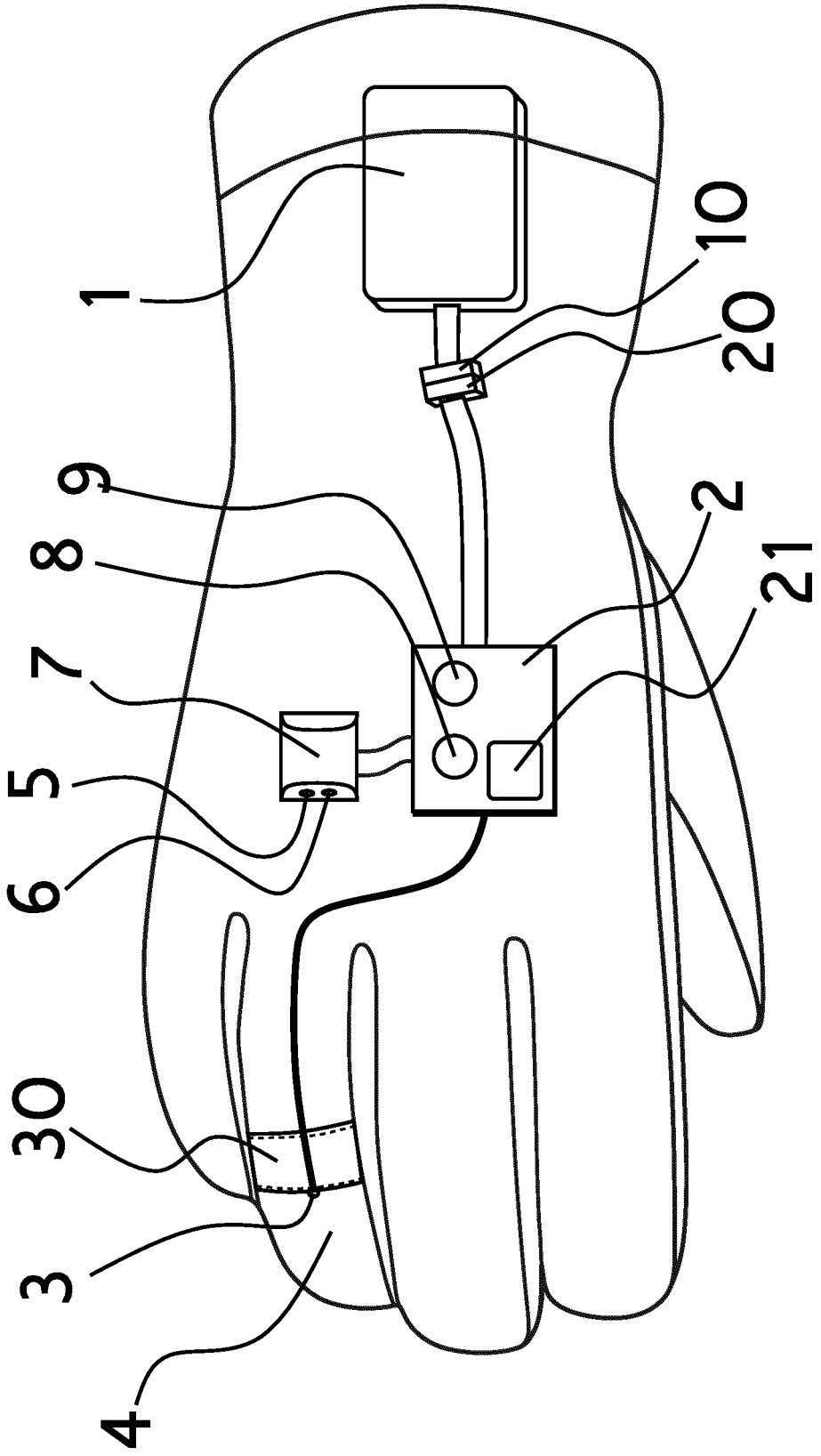

Fig. 1

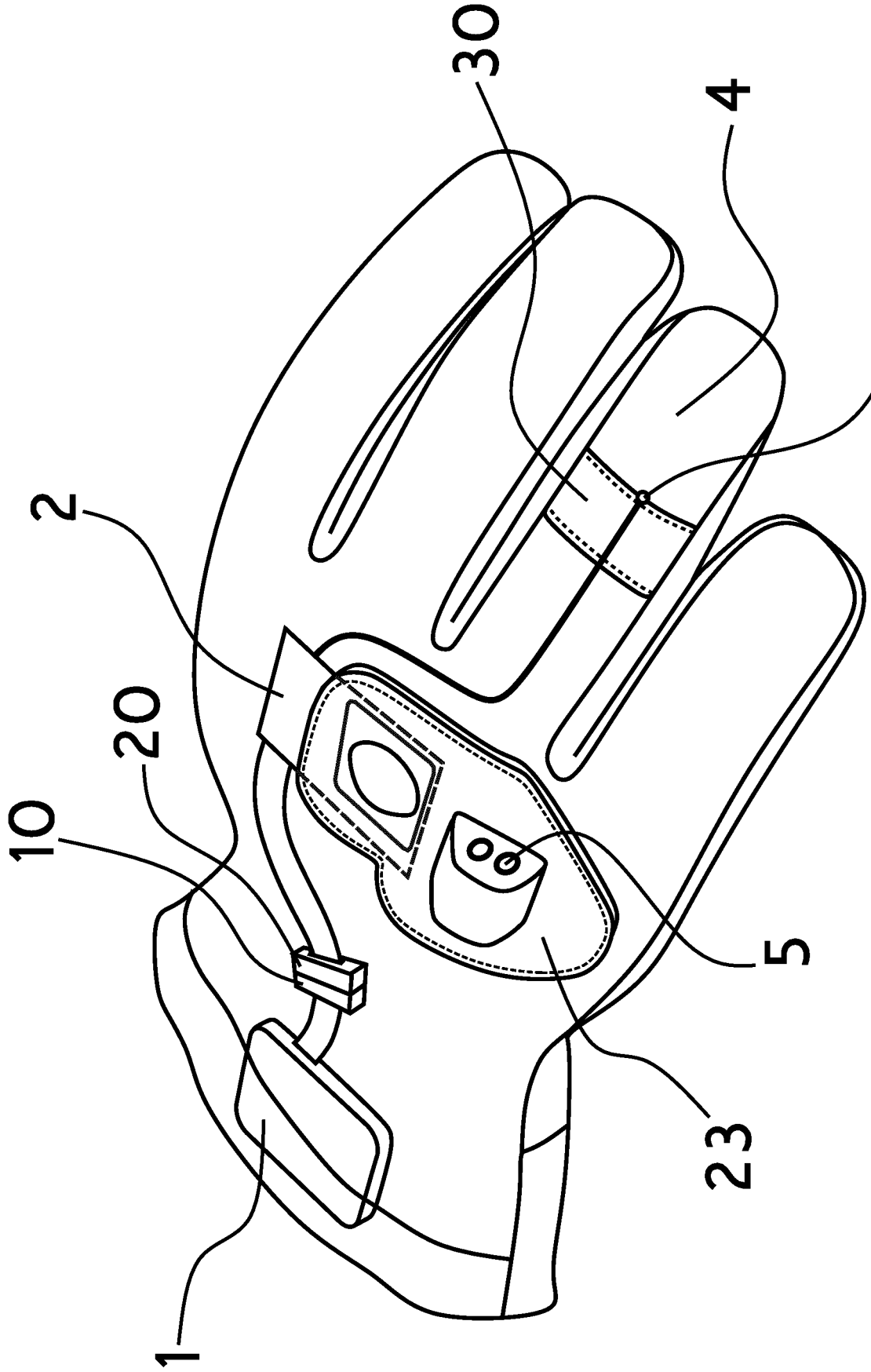

Fig. 2

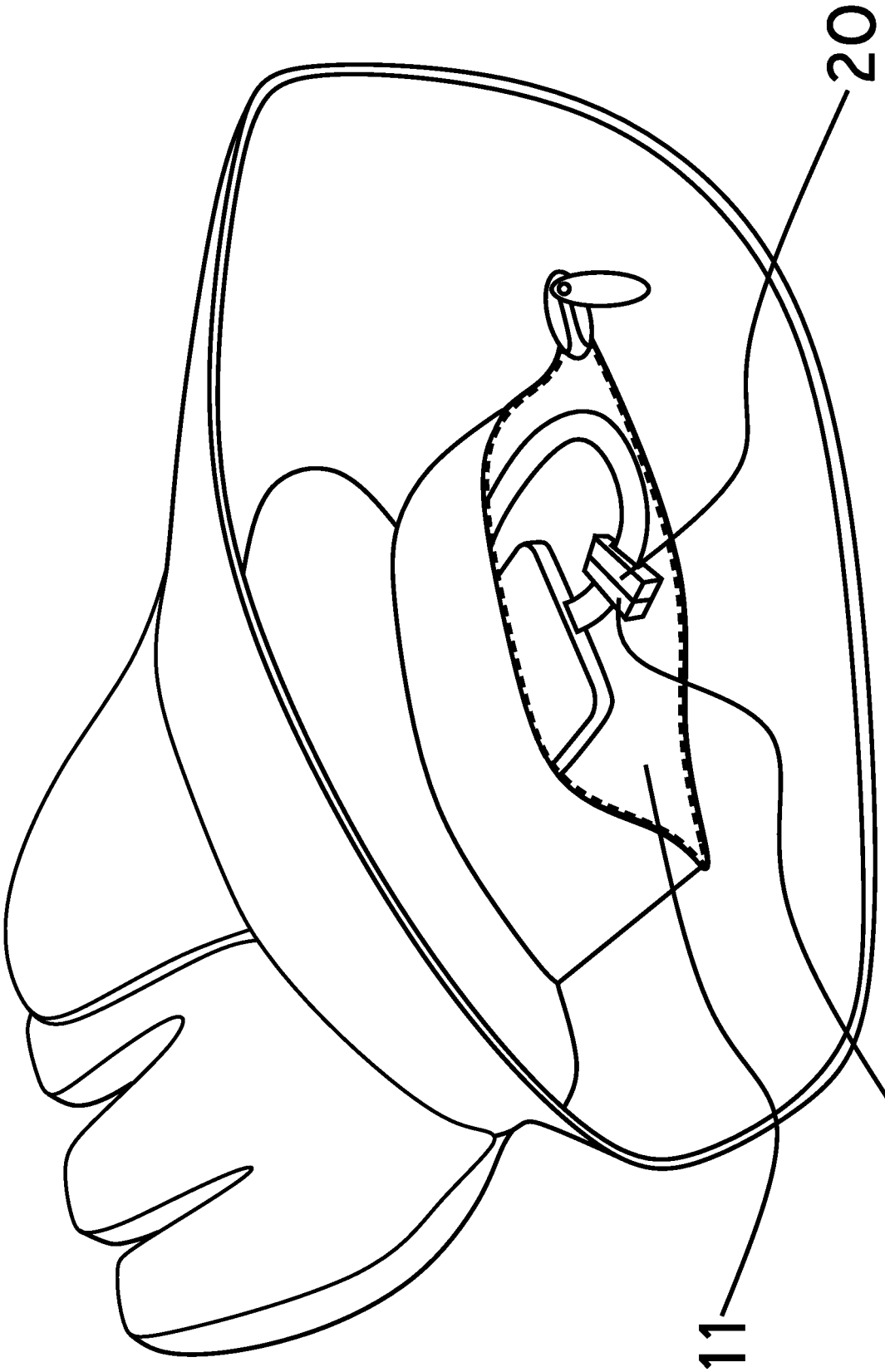

Fig. 3

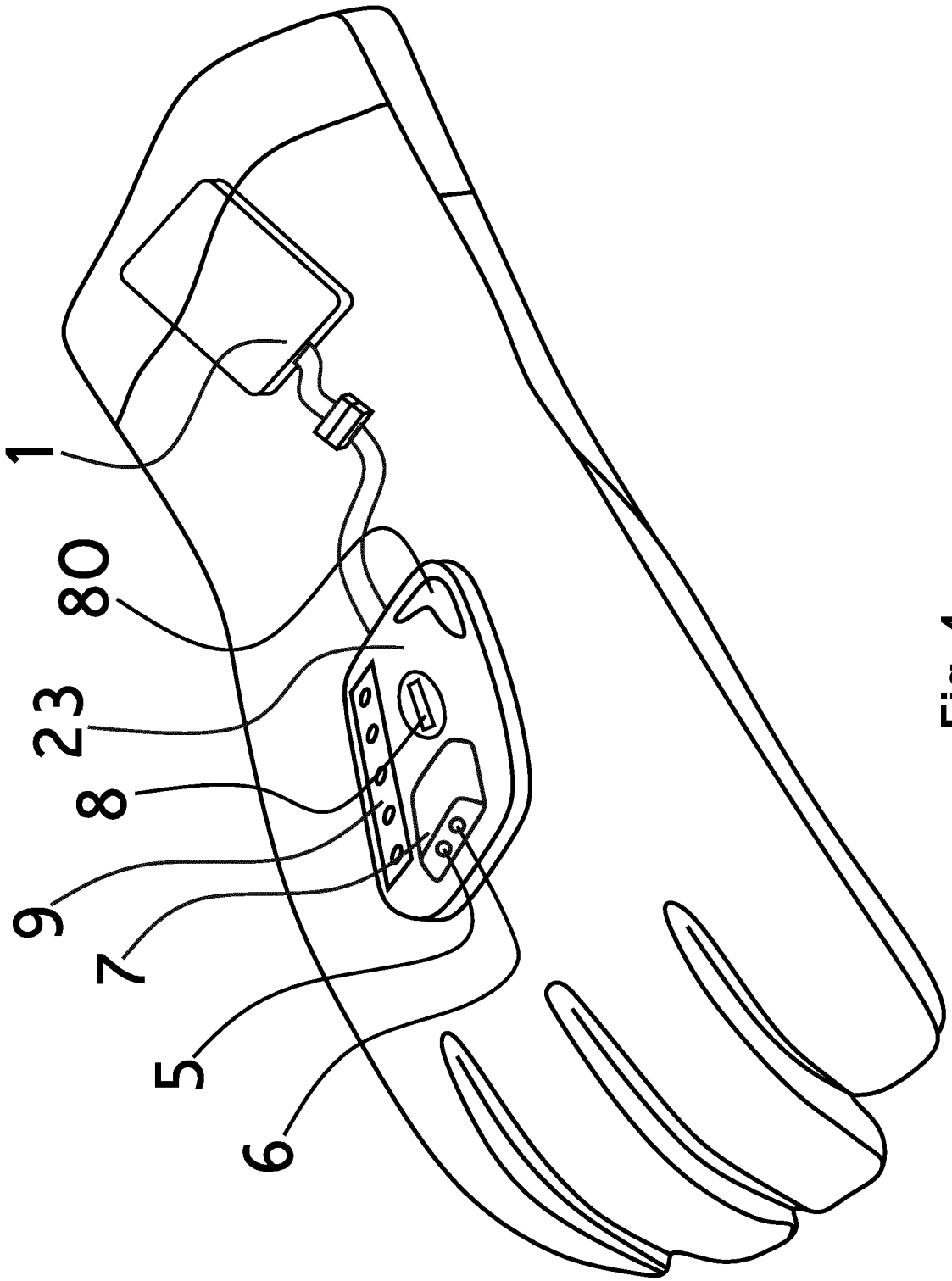

Fig. 4

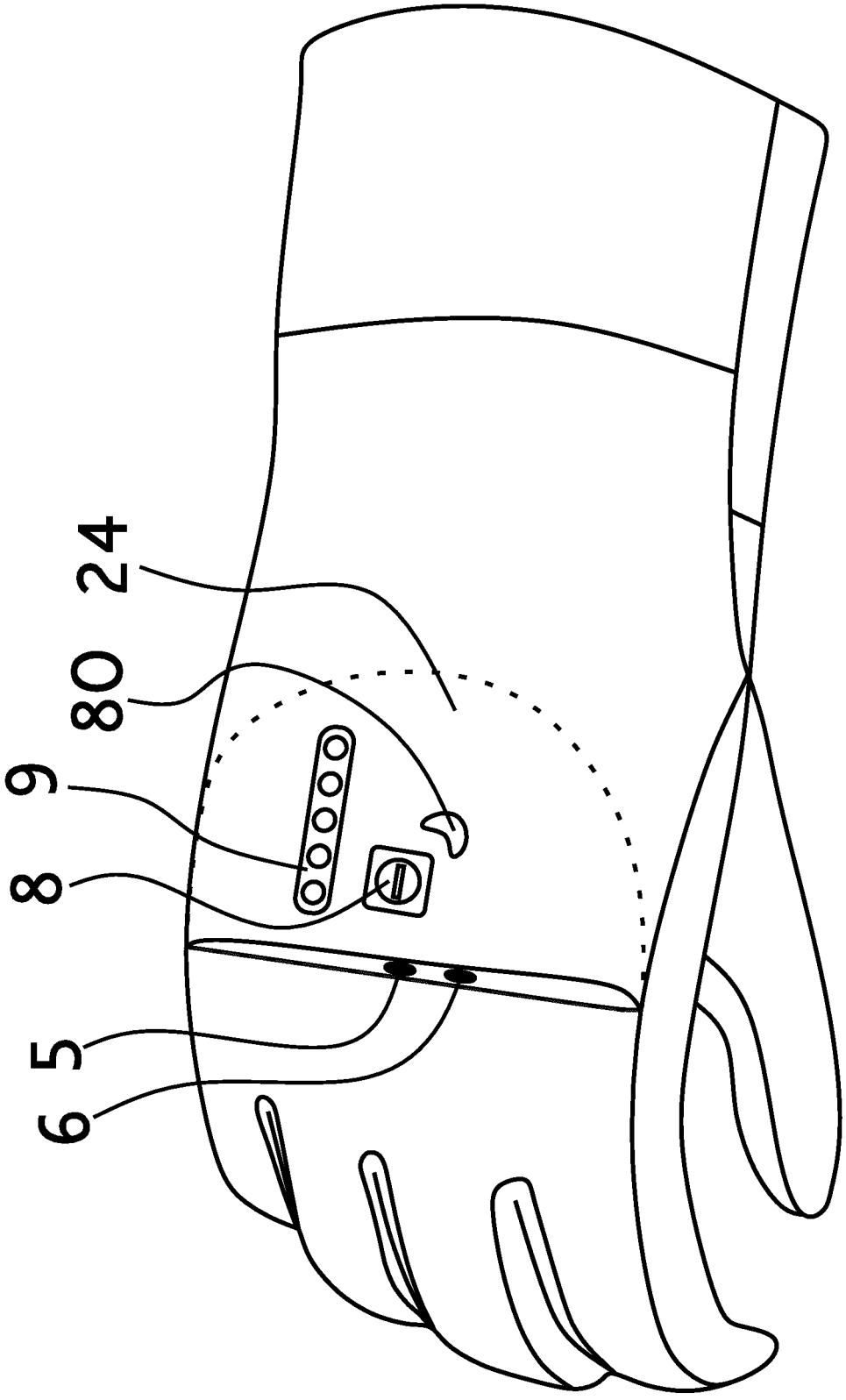

Fig. 5

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 2407039 A2 **[0004] [0006]**
- DE 202005021140 U1 **[0005]**
- US 2006022882 A **[0005]**
- DE 10047533 A1 **[0005]**
- DE 10350869 **[0005]**
- FR 2882433 **[0007]**
- WO 9314472 A **[0007]**