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(54) **GARMENT WITH DATA LOGGERS TO MONITOR PARAMETERS OF THE WEARER**

KLEIDUNGSSTÜCKE MIT DATENERFASSUNGSSYSTEMEN ZUR BEOBACHTUNG VON PARAMETERN DES TRÄGERS

VETEMENT AVEC DES ENREGISTREURS DE DONNEES POUR CONTROLER LES PARAMETRES D'UN UTILISATEUR

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Description

[0001] The present invention relates to the use of a body suit with a so-called "data logger" in order to record data relating to the physical and/or biomedical condition of the persons while actually performing an activity distinguished by high mechanical stresses acting on the body, such as for example a high-speed sport.

[0002] Data loggers associated with means for detecting exclusively biomedical parameters of persons while exerting physical effort are known, such as that disclosed in the patent US-A-6,206,837 where the parameter detected consists in the person's respiration. In order to detect the parameter, however, means are used - in the case in question a mask - which are not compatible with actual carrying out of the activity in real conditions. As a result devices of this kind may only be used in laboratories.

[0003] It is also known that manufacturers of garments for motor sports are attempting to provide maximum protection for the end users of their products by proposing solutions able to counteract and/or eliminate the stresses to which the body is subject, for example during car or motorcycle races, in the event of accidents, the consequences of which may also be of a serious nature.

[0004] In addition to the development of fireproof and highly resistant materials which constitute so-called "passive protection systems", with the aid of electronic technology it has been possible to design so-called "intelligent garments" or "active protection systems". For example, the patent application WO-A-02 19850 describes a garment comprising a motorcyclist's jacket and a waistcoat or "gilet" containing three inflatable bags which form an air cushion or "air-bag" and also containing a rigid protection for the back. The jacket contains acceleration sensors and the data detected by them are sent to a central control unit so as to trigger, in a dangerous event (falling or impact suffered by the pilot), electrically operated valves which connect three gas cylinders to the said inflatable bags which are normally flat and are concealed inside the jacket. It should be noted that the main purpose of this system is to ensure the automatic activation of the protective system during the dangerous event and that this system does not envisage any recording of the motorcyclist's biomedical data during normal use, i.e. in conditions other than accidents. In the same patent application it is envisaged manufacturing the jacket and the waistcoat using composite textile materials incorporating optical-fibre sensors which convey in real time information in relating to mechanical, physical and thermal parameters to a display which is sewn onto the jacket. This information is for exclusive use of the person wearing the garment and is not recorded. No precise indication is given, however, as to the parameters involved, apart from the relative acceleration of pilot and motorcycle.

[0005] Garments equipped with sensors are also known from DE-A-199 27 686 and DE-A-100 05 526 for the purpose is monitoring the health of a patient wearing the garment; from US-A-2001 0024949 for the purpose of detecting a state of emergency which is signaled via a mobile phone upon conversion of the relevant data to speech; WO-A-02 100200 and US-A-2003 0135127 for the purpose of detecting the physical condition of the person wearing the gament which, according to the latter document can also be a person performing an athletic activity.

[0006] The main object of the present invention is to provide, also for other persons situated far away and/or at a later time, an information relating to physical and/or biomedical parameters detected directly during carrying out of the abovementioned demanding activities, i.e. in real conditions, by means of at least one of the garments worn by a person. Said detection is performed not only during a dangerous event (falling, impact, etc), but also for the whole of the time said activities are being performed.

[0007] This object, together with others, is achieved using a body suit in accordance with the characteristic features claimed hereinbelow.

[0008] The particular features of said use and the advantages arising therefrom will emerge more clearly from the following description provided purely by way of a non-limiting example where the activity in which the person is engaged is a motorcycling competition and the garment worn is a bodysuit. In the description reference will be made to the accompanying drawings in which:

Figure 1 shows a block diagram of a system for recording physical and/or biomedical data relating to a person during motorcycle racing;
Figures 2a and 2b show the position of the various sensors which form part of the system, with respect to the person's body, viewed from the front and rear, respectively.

[0009] In a motorcycling competition the pilot assumes various riding positions, depending on a series of variables such as the speed, acceleration, riding posture, the characteristics of the circuit, etc. For each riding position every part of the pilot's body is subject to various forces. These forces are of two types: those which through the bodysuit transfer the movement to the pilot's body and those exerted on the bodysuit, and therefore on the body itself, by the fluid within which the pilot is moving, in this case air.

[0010] According to the invention, the bodysuit comprises (see Figure 1) a data logger 100 housed in a position which is protected, such as the aerodynamic "hump" of the bodysuit. Said data logger:

- is connected by means of connections 120 to a plurality of sensors 10, 12, 16, 18, 20, 22, 30 which are variable in number and situated in various parts of the bodysuit,;
- comprises means 102 for acquiring and processing the information supplied by said sensors;

- comprises memory structures 104 for recording the data relating to the parameters detected by said sensors and preferably also for storing permanent data;
- may comprise means 106 for remote transmission of the data.

[0011] An arrangement of the system according to Figure 1 is shown in Figures 2a and 2b, but in reality the sensors are incorporated in the bodysuit, even though they may be in direct contact with the body of the person.

[0012] Said bodysuit, in the region of the shoulders, knees, elbows and ends of the spinal cord, is provided respectively with sensors 10, 16, 18, 22 for detecting the pressure which is exerted by the bodysuit on the person's body, said pressure being positive or negative depending on the direction of the force from which it is derived. Said sensors, for example, may be chosen from among the models "FlexiForce" manufactured by the firm Tekscan. An alternative solution envisages providing, not a single sensor, but an array of smaller sensors. It is thus possible to increase the surface area to be monitored and at the same time obtain within the data a greater definition for the surface area in question.

[0013] Said bodysuit also comprises a temperature sensor 30 which is situated in the centre of the back, in the lumbar region, an accelerometer 12 situated below the neck and two plates 20 for sensing the heart rate. It is obvious that the position, the type and the number of all the sensors may vary depending on the application.

[0014] Moreover, also depending on the their constructional characteristics and the type of material from which the bodysuit is made (leather, elasticized fabric, meshed fabric, etc.), the sensors may be incorporated into the structure of the bodysuit or may be mounted on the surface in physical contact with the body of the person and/or on the opposite (external) surface.

[0015] The data logger 100 is arranged on the rigid aerodynamic "hump" (not shown) of the racing bodysuit. Obviously, other locations which do not form part of this invention are possible, such as, for example, mounting the data logger 100 on the motorcycle. When it is arranged on the bodysuit, said data logger 100 is connected to the sensors by means of flexible connections 120 which may or may not be incorporated in said bodysuit. Said connections 120 may be of a varying nature, for example leads made of copper, optical fibres, etc., and are chosen in each case depending on the type of signal produced by the sensor (voltage, current, photons, etc.). The conversion of the information into an electrical signal may therefore be performed by means of various systems of transduction (for example from photons to electrical variables or vice versa) and the associated interfaces may be either directly connected to the sensor output or to the input of the data logger 100.

[0016] Owing to the possibility of recording and analysing the pressure exerted on the various parts of the pilot's body, and therefore determining the stresses to which the pilot's body is subjected, many applications of the data logger 100 may be envisaged. For example:

- in the case of a professional racing team it is possible to assess the riding technique of the pilot and therefore correct any defects associated therewith. This results in an improvement in performances of the person and of the driven vehicle, also providing the possibility of planning an effective race strategy adapted to the circuit;
- knowing the stresses it is possible to develop garments which are specifically designed for the individual application. By redefining *ad hoc,* for example, the structure and the position of the protective systems it is possible to provide the pilot with a garment which is optimized for his/her activity, together with the advantages in terms of safety and reliability, resulting therefrom;
- having access to a dynamic recording of the dangerous event as well of its effect on the person's body is of potential interest in the legal sector also; for example, for the purposes of determining civil or criminal responsibility in the case of an accident and preparing evaluations or settling insurance claims;
- the data relating to a dangerous event (or in any case all the data, including those detected during an activity without accident) may be processed and transmitted to monitoring operators. In this way immediate transmission of the data concerning a dangerous event to specific operators, for example to medical staff, allows assistance to be provided as rapidly and efficiently as possible. Even if the data are not transmitted to a base station, it is obvious that the rescue personnel, once they have reached the person suffering the accident, are able to obtain information about his/her condition precisely because said information is stored and can be extracted in a comprehensible form from the data logger 100.

[0017] It is pointed out that the scope of protection of the present patent, as defined by the claims below, also includes other variations and embodiments.

Claims

1. Bodysuit, suitable for being worn by a person who is engaged in a motorcycle sport activity, incorporating in its structure a plurality of sensors for detecting physical parameters (10, 12, 16, 18, 22) and/or sensors for detecting biomedical parameters (20, 30) of the wearing person and comprising an electronic device (100), said electronic device (100) being connected by means of connections (120) to said sensors (10, 12, 16, 18, 22) and comprising means (102) for acquiring and processing the information supplied by said sensors (10, 12, 16, 18, 20, 22, 30) and a memory structure (104) for recording the data re-

lating to the parameters detected by said sensors (10, 12, 16, 18, 20, 22, 30), at least one of said sensors (10, 16, 18, 22) is for detecting the pressure exerted by the garment on the person's body during all the stages of execution of said activity **characterized in that** said bodysuit comprises an aerodynamic hump providing a housing, in a position protected against impacts, for said electronic device (100).

2. Bodysuit according to claim 1, **characterized in that** it houses connection means (120) which ensure transfer of said data from all of said sensors (10, 12, 16, 18, 22, 30) to the said electronic device (100).

3. Bodysuit according to claim 1, **characterized in that** it comprises an array of sensors suitable for detecting the pressure exerted by the bodysuit on the person's body.

4. Bodysuit according to claim 1, wherein at least one of said sensors (12) for detecting physical parameters is a sensor suitable for detecting the relative acceleration between the person wearing the bodysuit and a vehicle on board of which there is the person wearing the bodysuit.

5. Bodysuit according to claim 1, wherein said sensors for detecting biomedical parameters comprise a temperature sensor (30) which is situated in the centre of the back of the user.

6. Bodysuit according to claim 4, wherein said at least one sensor is an accelerometer and it is situated below the neck of the user.

7. Bodysuit according to claim 1, wherein said sensors for detecting physical parameters (10, 12, 16, 18, 22) and/or said sensors for detecting biomedical parameters (20, 30) are mounted on a surface of the bodysuit in physical contact with the body of the wearing person.

Patentansprüche

1. Körperanzug, welcher dazu geeignet ist, von einer mit einer Motorrad-Sportaktivität beschäftigten Person getragen zu werden, aufweisend in seinem Aufbau eine Vielzahl von Sensoren zum Erfassen von physikalischen Parametern (10, 12, 16, 18, 22) und/oder Sensoren zum Erfassen von biomedizinischen Parametern (20, 30) der tragenden Person und aufweisend eine elektronische Vorrichtung (100), wobei die elektronische Vorrichtung (100) durch ein Verbindungsmittel (120) mit den Sensoren (10, 12, 16, 18, 22) verbunden ist und ein Mittel (102) zum Erlangen und Verarbeiten der Informationen aufweist, welche durch die Sensoren (10, 12, 16, 18, 20, 22, 30) bereitgestellt werden und eine Speicheranordnung (104) zum Aufzeichnen der Daten aufweist, welche sich auf die Parameter beziehen, die durch die Sensoren (10, 12, 16, 18, 20, 22, 30) erfasst wurden, wobei wenigstens einer der Sensoren (10, 16, 18, 22) zum Erfassen des Druckes vorgesehen ist, welcher durch die Bekleidung auf den Körper einer Person während allen Phasen des Ausführens der genannten Aktivität ausgeübt wird, **dadurch gekennzeichnet, dass**
der Körperanzug einen aerodynamischen Höcker aufweist, welcher ein Gehäuse in einer vor Einschlägen geschützten Position für die elektronische Vorrichtung (100) aufweist.

2. Körperanzug gemäß Anspruch 1, **dadurch gekennzeichnet, dass**
dieser ein Anschlussmittel (120) unterbringt, welches die Übertragung der Daten von allen der Sensoren (10, 12, 16, 18, 22, 30) zu der elektronischen Vorrichtung (100) gewährleistet.

3. Körperanzug gemäß Anspruch 1, **dadurch gekennzeichnet, dass**
dieser eine Anordnung von Sensoren aufweist, welche zum Erfassen des Druckes geeignet sind, welcher durch den Körperanzug auf den Körper der Person ausgeübt wird.

4. Körperanzug gemäß Anspruch 1,
wobei wenigstens einer der Sensoren (12) zum Erfassen der physikalischen Parameter ein Sensor ist, welcher zum Erfassen der relativen Beschleunigung zwischen der Person, welche den Körperanzug trägt, und einem Fahrzeug, auf welchem sich die den Körperanzug tragende Person befindet, geeignet ist.

5. Körperanzug gemäß Anspruch 1,
wobei die Sensoren zum Erfassen der biomedizinischen Parameter einen Temperatursensor (30) aufweisen, welcher in der Mitte des Rückens des Benutzers liegt.

6. Körperanzug gemäß Anspruch 4,
wobei der wenigstens eine Sensor ein Beschleunigungssensor ist und unterhalb des Genicks des Anwenders liegt.

7. Körperanzug gemäß Anspruch 1,
wobei die Sensoren zum Erfassen der physikalischen Parameter (10, 12, 16, 18, 22) und/oder die Sensoren zum Erfassen der biomedizinischen Parameter (20, 30) auf einer Fläche des Körperanzuges in physikalischem Kontakt mit dem Körper der tragenden Person angebracht sind.

Revendications

1. Maillot, approprié pour être porté par une personne qui est engagée dans une activité sportive de motocyclisme, incorporant dans sa structure une pluralité de capteurs pour détecter des paramètres physiques (10, 12, 16, 18, 22) et/ou de capteurs pour détecter des paramètres biomédicaux (20, 30) de la personne le portant et comprenant un dispositif électronique (100), ledit dispositif électronique (100) étant connecté au moyen de connexions (120) aux dits capteurs (10, 12, 16, 18, 22) et comprenant des moyens (102) pour acquérir et traiter les informations fournies par lesdits capteurs (10, 12, 16, 18, 20, 22, 30) et une structure de mémoire (104) pour enregistrer les données concernant les paramètres détectés par lesdits capteurs (10, 12, 16, 18, 20, 22, 30), au moins l'un desdits capteurs (10, 16, 18, 22) servant à détecter la pression exercée par le vêtement sur le corps de la personne pendant toutes les étapes d'exécution de ladite activité, **caractérisé en ce que** ledit maillot comprend un bossage aérodynamique réalisant un logement, à une position protégée contre les chocs, pour ledit dispositif électronique (100).

2. Maillot selon la revendication 1, **caractérisé en ce qu'**il loge des moyens de connexion (120) qui assurent le transfert desdites données de l'ensemble desdits capteurs (10, 12, 16, 18, 22, 30) au dit dispositif électronique (100).

3. Maillot selon la revendication 1, **caractérisé en ce qu'**il comprend un ensemble de capteurs appropriés pour détecter la pression exercée par le maillot sur le corps de la personne.

4. Maillot selon la revendication 1, dans lequel au moins l'un desdits capteurs (12) pour détecter des paramètres physiques est un capteur approprié pour détecter l'accélération relative entre la personne portant le maillot et un véhicule à bord duquel il y a la personne portant le maillot.

5. Maillot selon la revendication 1, dans lequel lesdits capteurs pour détecter des paramètres biomédicaux comprennent un capteur de température (30) qui est situé au centre du dos de l'utilisateur.

6. Maillot selon la revendication 4, dans lequel ledit au moins un capteur est un accéléromètre et il est situé audessous du cou de l'utilisateur.

7. Maillot selon la revendication 1, dans lequel lesdits capteurs pour détecter des paramètres physiques (10, 12, 16, 18, 22) et/ou lesdits capteurs pour détecter des paramètres biomédicaux (20, 30) sont montés sur une surface du maillot en contact physique avec le corps de la personne qui le porte.

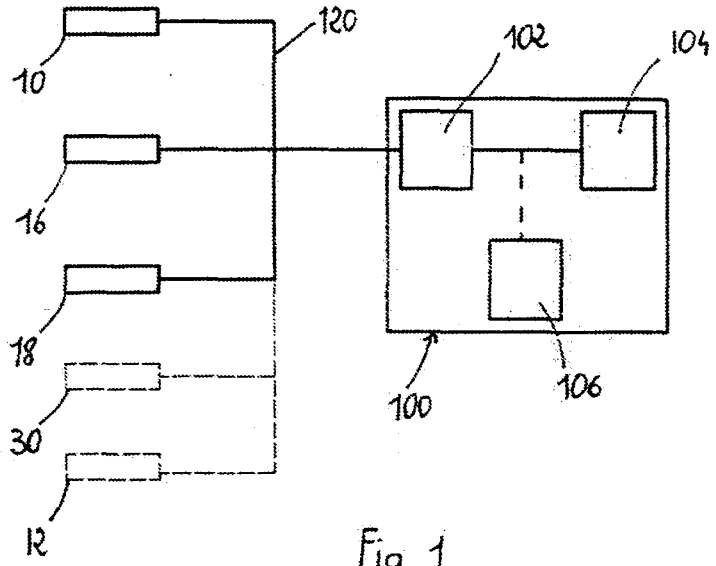

Fig. 1

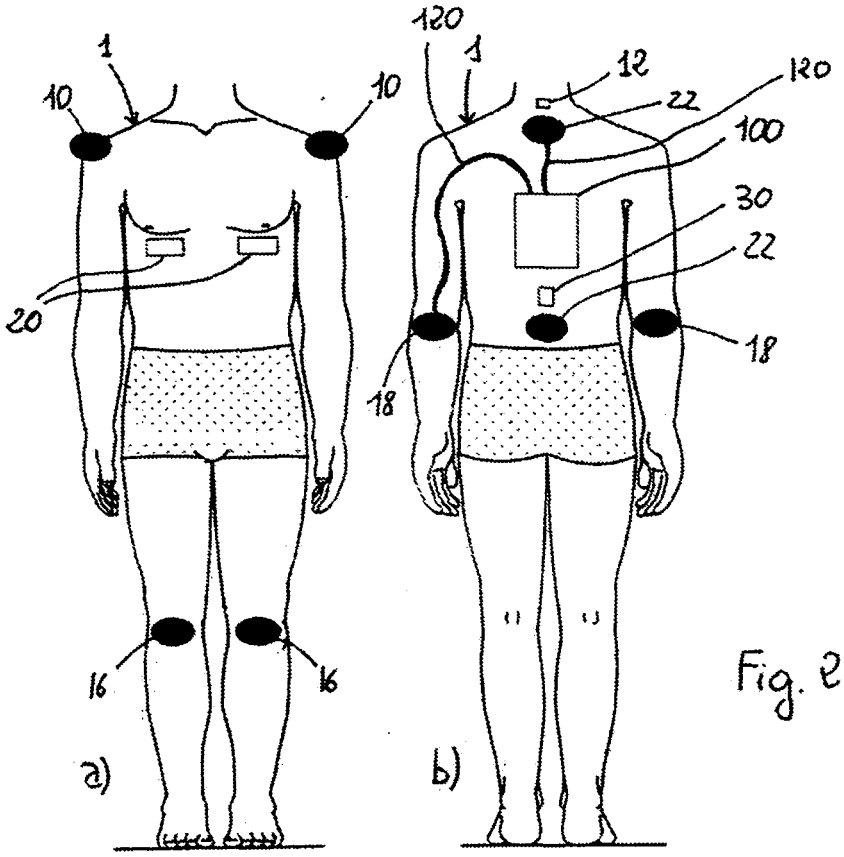

Fig. 2

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.

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专利名称(译)	带有数据记录器的服装，用于监控佩戴者的参数		
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申请(专利权)人(译)	ALPINESTARS研究S.R.L.		
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优先权	102003901133221 2003-07-25 IT		
其他公开文献	EP1648294A1		
外部链接	Espacenet		

摘要(译)

在实际条件下执行由高机械应力区分的活动的人的物理和/或生物医学参数的信息由安装在其上的传感器（10,12,16,18,20,22,30）检测。，或者在进行所述活动时穿着的衣服的一部分。在所述活动的所有阶段期间，该信息被转换成数字格式的数据，该数据存储在电子记录设备（100）或“数据记录器”中。优点：存储的数据可以由远离正在执行活动的位置和/或稍后的其他人使用。

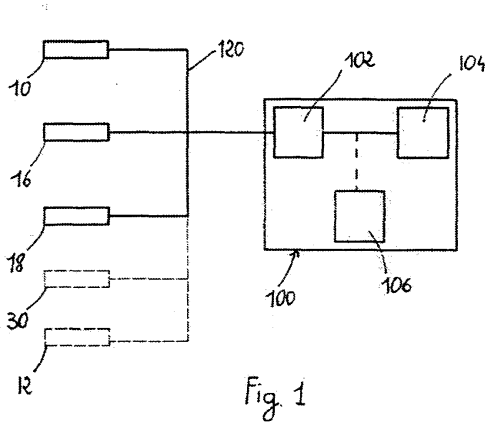

Fig. 1