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(54) **RESPIRATION MONITORING EQUIPMENT**

ATMUNGSÜBERWACHUNGSGERÄT

EQUIPEMENT DE SURVEILLANCE DE LA RESPIRATION

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(56) References cited:
WO-A-01/43804
US-A- 5 311 875
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Description

Field of the Invention

[0001] This invention relates to respiration monitoring equipment particularly, but not exclusively for use with a subject, whether human or animal, potentially susceptible to sleep apnoea, extending also for use with patients in hospitals, ambulances and other paramedic situations. The equipment is equally suitable for veterinary use in the respiratory monitoring of animals.

Background of the Invention

[0002] Sleep apnoea is a major hazard in people of all ages and much innovative thinking has gone to develop various techniques for detecting the occurrence of apnoea. Many complex proposals have been made in efforts to provide suitable equipment. One example is described in EP 0484174, relies on battery power, on contacts and on other components that are subject to failure. Also, the possibility of using the piezoelectric and pyroelectric properties of PVDF (poly vinylidene flouride) films for developing transducers to sense the presence or absence of breathing, is described in US 5311875 which uses the PVDF film to sense the temperature differences between the inspired and expired breaths, and WO 97/05824. It is not known, however, whether any proposals have progressed beyond theory or experimentation.

[0003] Respiratory rate is one of the most important physiological parameters. It is a component of most medical and nursing records and is used in many clinical scoring systems. Extremes of respiratory rate indicate the need for urgent intervention. Even today, in the case of non-intubated patients, the measurement of respiration rate is based on human observation alone, although this is known to be highly inaccurate.

[0004] Pyroelectric sensitive transducers incorporated in a face mask can be used to provide a quantitative measure of the respiratory rate in an easy and affordable manner.

[0005] As breathing could be wholly nasal, wholly oral, or part nasal and part oral, with changes between the modes, particularly during sleep, a problem for all workers in the field is optimum creation of a transducer to ensure that the patients' breath, if breathing, will always impinge upon the transducer, so obviating any false reading.

[0006] US 5857460 describes a face mask and a transducer sensitive to the presence or absence of a respiratory air flow, and a monitoring unit electrically connected to the transducer including means for triggering an alarm signal in circumstances of non-detection of respiratory air flow.

[0007] US 5311875 describes a breathing sensor in which a transducer comprising flexible compliant film, which is both piezoelectric and pyroelectric, is carried by a device which is not a precisely a face mask, but is a device which is located adjacent the patient's nostrils.

Object of the Invention

[0008] A basic object of the present invention is the provision of improved respiration monitoring equipment.

Summary of the Invention

[0009] The invention is defined in Claim 1. Various optional or preferred features are defined in the appended sub-claims.

Preferred or Optional Features of the First Aspect

[0010] The transducer is of a pyroelectric and piezoelectric polymer.

[0011] The polymer is PVDF.

[0012] An encoded connector is provided between the face-mask and the monitor.

[0013] The encoded connector, which assists the monitoring unit to differentiate between patient types, comprises a resistor, typically a 10K resistor being employed for an adult and a 2K resistor for a child. The encoded connector can also be used to differentiate between different locations (adult-forehead and child, cheek, skin); there could be a different algorithm for babies; finally it could also differentiate between different sensor types.

[0014] The transducer is carried by the face mask.

[0015] The face mask incorporates in an adaptor collar comprising a socket, in which socket the transducer is at least in part, housed.

[0016] The adaptor collar is of a synthetic material exhibiting elastomeric characteristics.

[0017] The transducer is a push fit into the socket of an elastomeric adaptor collar.

[0018] An electrical lead extends from the transducer to the monitoring unit.

[0019] In addition to triggering an alarm signal, the monitoring unit also comprises means to emit a "normal operation" signal, when respiratory air flow within the predetermined parameter(s) is sensed by the transducer.

Brief Description of the Drawings

[0020] The invention will now be further described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic side elevation of a first embodiment of equipment in accordance with the invention; and

Figure 2 is a diagrammatic side elevation of a second embodiment of equipment in accordance with the invention.

Detailed Description of the Drawings

[0021] In all Figures, like components are accorded like reference numerals.

[0022] A head 1 of a subject is fitted with a transparent plastics, medical face mask 2 for the delivery of oxygen and/or allied therapy via a supply tube 3, the mask 2 extending over the subject's nose and mouth, and sealing against at least some portions of the subject's face under the influence of elastic loops 4 engaged over the subject's ears.

[0023] In the embodiment of Figure 1, the face mask 2 is provided with an adaptor collar 5 of elastomeric, synthetic plastics material. The adaptor collar 5 is provided with a socket 6, in which is located a transducer in the form of a PVDF sensor 7 responsive to the air flow of the subject's breathing rhythm, the sensor 7 being in close proximity to the subject's nostrils and mouth and the presence of the mask 2 ensuring that air flow resulting from expired breaths of the subject are directed towards, and impinge upon, the transducer/sensor 7. Any electrical output from the sensor 7 resulting from the sensing of the presence and/or absence of respiratory air flow within the predetermined parameter(s) is fed by an electrical lead 8 to a monitoring unit 9 capable of switching to an alarm mode upon the sensor 7 emitting a signal indicative of lack of air flow within a predetermined parameter, such as a prescribed time period, or possibly lack of air flow above or below a predetermined flow rate threshold. The monitor 9 can be powered either by mains electricity or by battery and may emit a local audible and/or visual alarm, when triggered and/or, if required a local alarm eg at a nursing station. An encoded connector 14 is provided between the mask 2 and the monitoring unit 9. The encoded connector 14 comprises a changeable, or switchable resistor of eg 10K for an adult patient and 2K for a child patient. Selection of the resistor can also be used to differentiate between different locations (adult-forehead and child, cheek, skin); there could be a different algorithm for babies; finally it could also differentiate between different sensor types.

[0024] The embodiment of Figure 2 illustrates "cordless" or "wireless" respiration monitoring equipment, in which the sensor 7 is again embedded in adaptor collar 5, but the latter is provided with a transmitter unit 11 for any signals initiated by the sensor, and the monitoring unit 9 is provided with a receiver 12, the transmitter unit 11 being either battery or mains powered.

[0025] Whilst the use of a device in the form of a face mask 2 channels the subjects respiratory air flow to the sensor 7, it is a fact that a generally standard face mask 2 is unsuitable for some subjects, in which case the arrangement illustrated in Figure 3 could provide a less intrusive solution, whereby the device comprises an electrical lead 8 secured eg by tapes 13 to the subjects face, extending from a sensor 7 located on the subjects upper lip to be impinged by air flow from the subjects nostrils and/or mouth, to the monitoring unit 9.

[0026] Output from the sensor 7 of Figure 2 could alternatively follow the teachings of Figure 2, ie by a "wireless" transmitter/receiver system.

Claims

1. Respiration monitoring equipment comprising:

(i) a medical face mask (2) adapted to cover, a subject's nostrils and mouth;
(ii) a transducer (7) adapted to be impinged by the subject's inspired and/or expired breaths, being sensitive to the presence and/or absence of a respiratory air flow, thereby indicating a breath, and being capable of emitting electrical signals in accordance with the presence and/or absence of a respiratory air flow, thereby indicating a breath or no breath respectively, and
(iii) a monitoring unit (9) electrically connected to the transducer (7) and responsive to the presence or absence of signals emitted by the transducer (7), and including means of triggering an alarm signal in the circumstances of non-detection of respiratory air flow, thereby indicating no breath, within one or more predetermined parameters, **characterized in that** the monitoring unit (9) comprises means to provide a prescribed time interval; and means for detecting minimum and maximum air flow rates, the monitoring unit (9) being capable of switching to an alarm mode upon the transducer (7) emitting a signal indicative of respiratory air flow above, or below, a predetermined flow rate threshold.

2. Equipment as claimed in Claim 1, wherein the transducer (7) is of a pyroelectric and piezoelectric polymer.

3. Equipment as claimed in Claim 2, wherein the polymer is PVDF.

4. Equipment as claimed in any preceding claim, comprising an encoded connector (14) between the face mask (2) and the monitoring unit (9).

Patentansprüche

1. Atmungsüberwachungsgerät, mit:

(i) einer medizinischen Gesichtsmaske (2), welche dazu eingerichtet ist, Nasenöffnungen und Mund eines Subjekts abzudecken;
(ii) einem Wandler (7), eingerichtet, um durch eingeatmete und/oder ausgeatmete Atemluft des Subjekts beeinflusst zu werden, wobei der Wandler (7) auf die Anwesenheit und/oder Ab-

wesenheit eines Atmungsluftflusses reagiert und **dadurch** einen Atemzug anzeigt und welcher in der Lage ist, ein elektrisches Signal in Abhängigkeit von der Anwesenheit und/oder Abwesenheit des Atmungsluftflusses auszugeben, so dass eine Atmung oder keine Atmung entsprechend angezeigt wird und
(iii) einer Anzeigeeinheit (9), welche elektrisch mit dem Wandler (7) verbunden ist und auf die Anwesenheit oder Abwesenheit von seitens des Wandlers (7) ausgesandten Signalen reagiert und welche Mittel zur Triggerung eines Alarmsignals unter den Umständen einer Nichterfassung des Atmungsluftflusses beinhaltet, so dass keine Atmung innerhalb einer oder mehrerer vorgegebener Parameter angezeigt wird,

dadurch gekennzeichnet, dass die Anzeigeeinheit (9) Mittel aufweist, um ein vorgegebenes Zeitintervall zur Verfügung zu stellen und Mittel, um minimale und maximale Luftflussraten zu detektieren, und wobei die Anzeigeeinheit (9) in der Lage ist, in einen Alarmmodus umzuschalten, und zwar in Abhängigkeit von einem seitens des Wandlers (7) ausgesandten Signals, welches einen Atmungsluftfluss oberhalb oder unterhalb einer vorgegebenen Schwelle für die Luftflussrate anzeigt.

2. Atmungsüberwachungsgerät nach Anspruch 1, wobei der Wandler aus pyroelektrischem und piezoelektrischem Polymer besteht.

3. Atmungsüberwachungsgerät nach Anspruch 2, wobei das Polymer PVDF ist.

4. Atmungsüberwachungsgerät nach einem der vorhergehenden Ansprüche, mit einem codierten Verbinder (14) zwischen der Gesichtsmaske (2) und der Anzeigeeinheit (9).

Revendications

1. Equipement de surveillance respiratoire comprenant :

(i) un masque facial médical (2) susceptible de recouvrir les narines et la bouche d'un sujet ;
(ii) un transducteur (7) susceptible d'être affecté par les inspirations et/ou expirations du sujet, sensible à la présence et/ou à l'absence d'un courant d'air respiratoire, indiquant ainsi une respiration, et susceptible d'émettre des signaux électriques en fonction de la présence et/ou de l'absence de courant d'air respiratoire, indiquant ainsi, respectivement, une respiration ou une absence de respiration, et
(iii) une unité de surveillance (9) reliée électriquement au transducteur (7) et réagissant à la présence ou à l'absence de signaux émis par le transducteur (7), et comprenant des moyens pour déclencher un signal d'alarme en cas de non-détection de courant d'air respiratoire, indiquant ainsi une absence de respiration, dans les limites d'un ou plusieurs paramètres déterminés, **caractérisé en ce que** l'unité de surveillance (9) comprend des moyens pour fournir un intervalle de temps prescrit ; et des moyens pour détecter des débits d'air minimum et maximum, l'unité de surveillance (9) étant susceptible de passer en mode alarme lorsque le transducteur (7) émet un signal indiquant que le courant d'air respiratoire se trouve au-dessus ou en-dessous d'un seuil de débit prédéterminé.

2. Equipement selon la revendication 1, dans lequel le transducteur (7) est en polymère pyroélectrique et piézoélectrique.

3. Equipement selon la revendication 2, dans lequel le polymère est du PVDF.

4. Equipement selon l'une quelconque des revendications précédentes, comprenant un connecteur (14) codé entre le masque facial (2) et l'unité de surveillance (9).

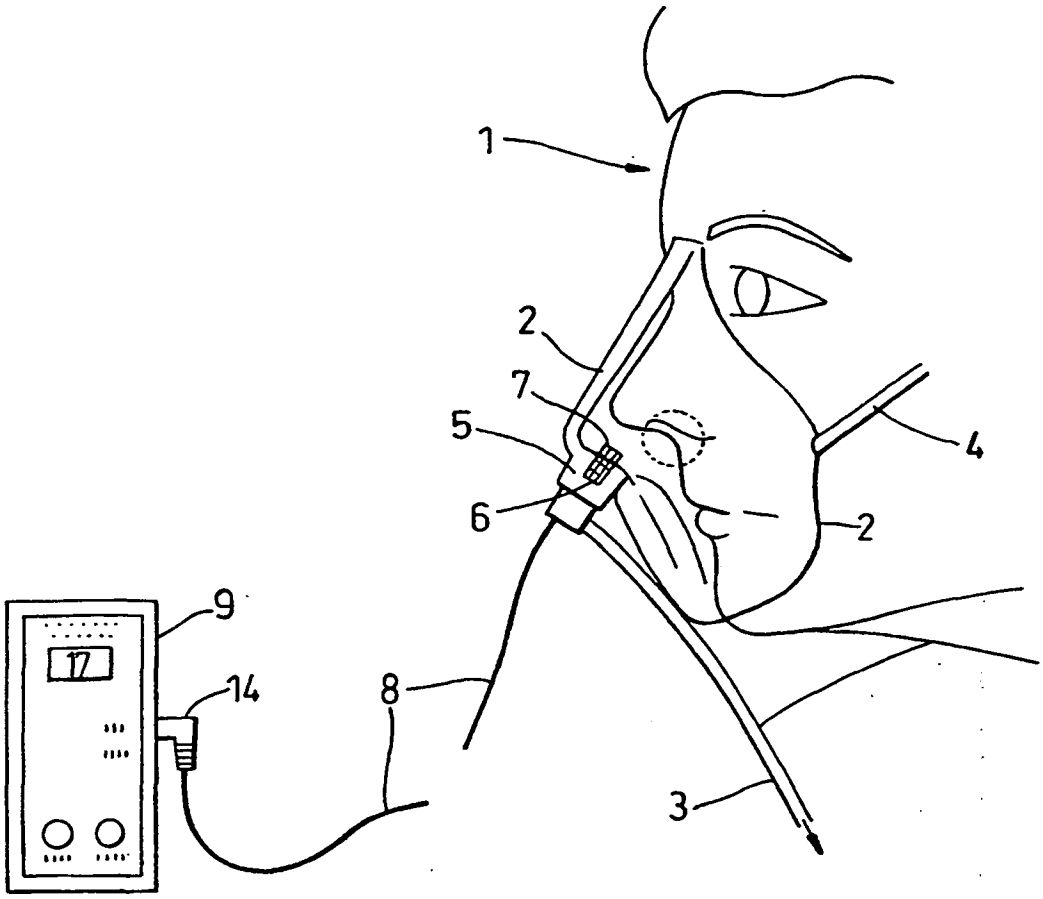

Fig. 1

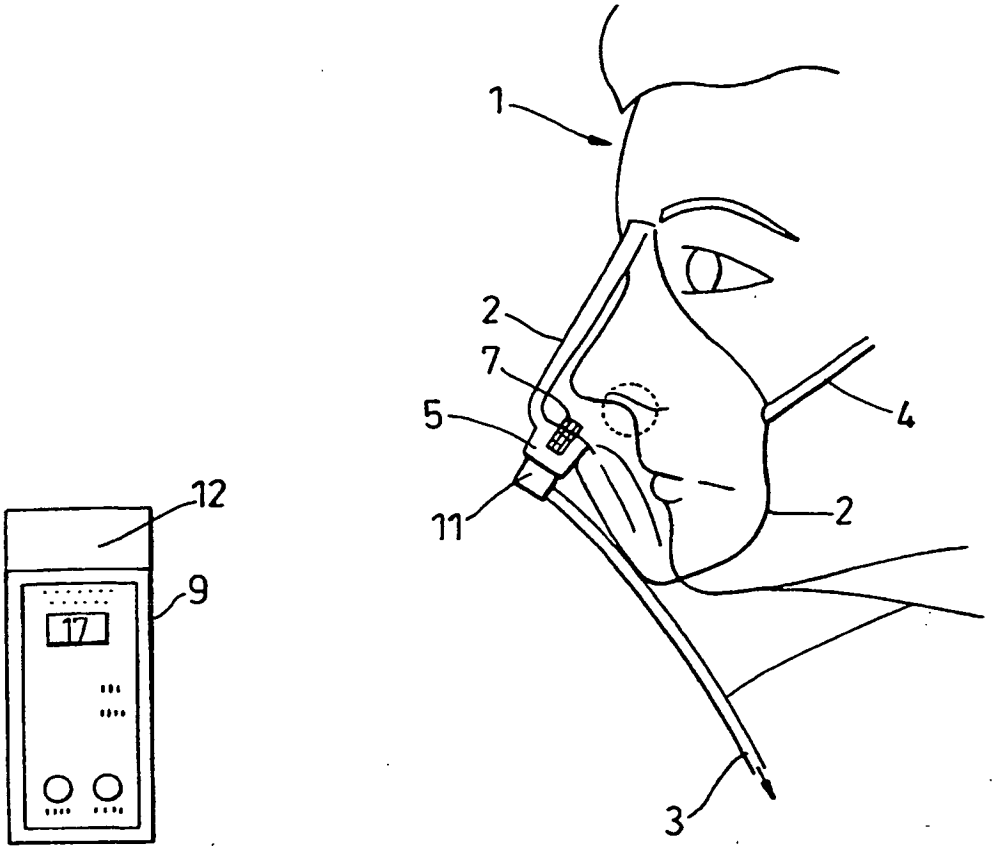

Fig. 2

专利名称(译)	呼吸监测设备		
公开(公告)号	EP1404221B1	公开(公告)日	2007-02-07
申请号	EP2002732968	申请日	2002-06-19
[标]申请(专利权)人(译)	ÇLECT医疗		
申请(专利权)人(译)	C-LECT MEDICAL LTD.		
当前申请(专利权)人(译)	C-LECT MEDICAL LTD		
[标]发明人	DODDS DENNIS		
发明人	DODDS, DENNIS		
IPC分类号	A61B5/087 A61B5/00 A61B5/097		
CPC分类号	A61B5/682 A61B5/0002 A61B5/087 A61B5/0878 A61B5/097		
优先权	2001015528 2001-06-26 GB		
其他公开文献	EP1404221A1		
外部链接	Espacenet		

摘要(译)

在一个实施例中，呼吸监测设备包括医用面罩（2），其适于邻近或覆盖患者的鼻孔和/或口腔;换能器（7），适于受到患者的吸气和/或呼气呼吸的影响，对呼吸气流的存在和/或不存在敏感，并且能够根据是否存在发射电信号呼吸气流;监控单元（9）电连接到换能器（7）并响应换能器（7）发出的信号的存在和/或不存在，并包括在非环境中触发至少一个报警信号的装置检测一个或多个预定参数内的呼吸气流。另一个实施例提供“无线”监视，其中在面罩（2）处具有发射器单元（11）并且在监视单元（9）处具有接收器（12）。

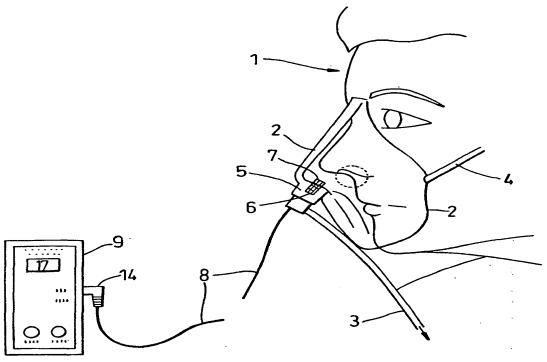

Fig. 1