



(11) **EP 3 045 208 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**20.07.2016 Bulletin 2016/29**

(51) Int Cl.:  
**A62B 33/00 (2006.01) A63B 29/02 (2006.01)**

(21) Application number: **16150839.5**

(22) Date of filing: **12.01.2016**

(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**  
Designated Extension States:  
**BA ME**  
Designated Validation States:  
**MA MD**

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(30) Priority: **13.01.2015 DE 102015200363**

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(54) **AVALANCHE RESCUE SYSTEM**

(57) The present invention relates to an avalanche rescue system 10 comprising an air bag 12 configured to be collapsed in a normal state and to expand in the event of an emergency, an inflation apparatus 16 connected to the air bag 12 to cause inflation and thereby expansion of the air bag 12, a mobile device 26 having wireless voice and data communication functionality and having a notifying means capable of notifying information to a user of the mobile device 26, said inflation apparatus 16 and said mobile device 26 being configured a) to wirelessly transmit from the inflation apparatus 16 to the mobile device 26 at least on data signal representing an operational state of the inflation apparatus 16, b) to notify information about the operational state of the inflation apparatus 16 via the notifying means of the mobile device 26 in the normal state and c) to wirelessly transmit information about the operational state of the inflation apparatus 16 from mobile device 26 to a remote contact in the event of an emergency.

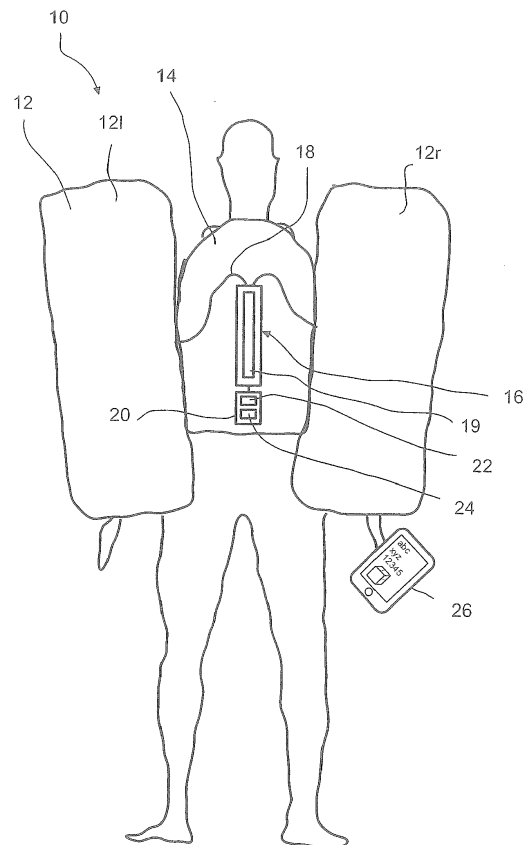


Fig. 1

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## Description

**[0001]** The present invention relates to an avalanche rescue system comprising an air bag configured to be collapsed in a normal state and to expand in the event of an emergency, an inflation apparatus connected to the air bag to cause inflation and thereby expansion of the air bag and a mobile device having wireless voice and data communication functionality and having a notifying means capable of notifying information to a user of the mobile device.

**[0002]** The development of avalanche rescue systems has progressed significantly during the last few years which is mainly induced by increased popularity of different types of alpine activities, in particular ski touring and snowshoe walking. In order to avoid victims of an avalanche to be buried under snow and to ensure reasonable rescue chances, air bag systems are known in the art which comprise inflatable balloon-type air bags attached to a backpack or a harness carried by the user, said air bags being inflated in case of an avalanche accident, for example by means of a gas generator. In addition, conventional avalanche rescue systems are known to utilize a mobile device capable of communicating with a remote contact to wirelessly send an emergency call in case of an emergency, in particular, an avalanche accident.

**[0003]** An avalanche rescue system of the above-mentioned type is for example known from WO 2004/107888 A1 and comprises an air bag, an inflation apparatus connected to the air bag and a mobile device having a GPS sensor for determining positioning information of the user. In case of an avalanche accident, the conventional system detects the emergency situation, automatically triggers the inflation apparatus to expand the air bag and wirelessly transmits the positioning information obtained from the GPS sensor to a remote contact.

**[0004]** Conventional systems have shown progress of technology in view of an automatic expansion of the air bag in the event of an emergency and in view of utilizing a mobile device for transmitting positioning information in the event of an emergency. On the other hand, the conventional systems still have considerable limitations with respect to reliability of the overall system, in particular during long-term use. For example, it can be difficult or even impossible to verify a readiness state of the inflation apparatus and there might be situations where failure of the system is not recognized early enough or at least some amount of uncertainty about the correct function and readiness of the system deteriorates the overall feeling of safety of the user. Recent studies have shown that one of the most frequent causes of death of persons being equipped with an avalanche rescue system is the malfunction or an improper activation of the airbags in the event of being caught in an avalanche.

**[0005]** In addition, there is room for improvement with respect to the behaviour of conventional avalanche rescue systems in the event of an emergency, for example with regard to the accuracy of positioning information

transmitted by the mobile device.

**[0006]** In view of the above-stated circumstances, it was an object of the present invention to provide an avalanche rescue system that operates with high reliability and reports an avalanche accident to a remote contact with high accuracy.

**[0007]** To solve this object, the present invention provides an avalanche rescue system comprising an air bag configured to be collapsed in a normal state and to expand in the event of an emergency, an inflation apparatus connected to the air bag to cause inflation and thereby expansion of the air bag, a mobile device having wireless voice and data communication functionality and having a notifying means capable of notifying information to a user of the mobile device, said inflation apparatus and said mobile device being configured a) to wirelessly transmit from the inflation apparatus to the mobile device at least one data signal representing an operational state of the inflation apparatus, b) to notify information about the operational state of the inflation apparatus via the notifying means of the mobile device in the normal state and c) to wirelessly transmit information about the operational state of the inflation apparatus from the mobile device to a remote contact in the event of an emergency.

**[0008]** According to an important feature of the present invention, the inflation apparatus and the mobile device are configured to wirelessly transmit, in the normal state, i.e. when there is no emergency, from the inflation apparatus to the mobile device at least one data signal representing an operational state of the inflation apparatus and to notify information about the operational state of the inflation apparatus via the notifying means of the mobile device. By virtue of these features, the operational state of the inflation apparatus can be monitored in the normal state and any change can be notified to the user such that the user has an information about the functional status of the avalanche rescue system. In particular, the user can be notified about the operational state of the inflation apparatus during a walk. Thus, in case of an occurrence of a failure in the inflation apparatus, the user can take appropriate actions to keep away from dangerous situations and check the rescue system.

**[0009]** Preferably, the operational state notified to the user by means of the mobile device is a readiness state of the inflation apparatus. Having information about a readiness or decreased readiness of the inflation apparatus can be helpful for the user to increase the overall feeling of safety and to decide on actions to be taken during the tour. For example, a notification information by means of either vibration alarm or a speaker output or the like, which informs the user about decreased readiness state of the inflation apparatus, is envisaged.

**[0010]** In a further embodiment of the invention, the inflation apparatus may comprise a gas generator and a sensor connected to the gas generator for detecting a filling and readiness state of the gas generator, and the at least one data signal received by the mobile device may represent the filling and readiness state of the gas

generator. In this way, for example, a leakage of a gas tank can be detected by the gas generator (for example a pressure sensor) and the reduced filling state of the gas tank and therefore the decreased readiness of the inflation apparatus can be reported to the user.

**[0011]** In general, the system can be configured to automatically notify information about an operational state of the inflation apparatus, for example when the avalanche rescue system is switched on or at any other predetermined point in time. Furthermore, the system may be configured such that a user is allowed to request information about the operational state of the inflation apparatus by inputting a respective command into the mobile device (notification on demand). In a preferred embodiment of the present invention, the system, in the normal state, is configured to detect the operational state of the inflation apparatus continuously or at a plurality of times in temporal sequence, and to report changes in the operational state to the user through the notifying means. Such configuration allows a continuous monitoring of the operational state of the inflation apparatus even during the tour, such that any failure or decreased readiness of the inflation apparatus can be detected sufficiently early to allow the user to take appropriate actions. In order to save energy, a detection of the operational state could be initiated in specific time intervals short enough to guarantee early notification of a change in the operational state and long enough to have an energy saving effect.

**[0012]** In a further preferred embodiment of the present invention, the avalanche rescue system may be characterised in that the mobile device stores at least one contact information of a remote contact, wherein the system is configured to automatically wirelessly transmit, in the event of an emergency, information about a state of the avalanche system through the mobile device to the remote contact based on the contact information. With this feature, the wireless functionality of the mobile device is utilized not only for a communication between the inflation apparatus and the mobile device but also for transmitting information to a remote contact in the event of an emergency, for example to transmit an emergency call or to transmit positioning information of the user. In addition, by means of an automatic transmission, it is ensured that the remote contact, for example a rescue station, is immediately informed about the avalanche accident such that measures for rescue can be initiated promptly. An automatic report does not require the victim to manually initiate the transmission which might be impossible for the user in the particular situation. The transmission of the information could be triggered by either the event of an ignition of the inflation apparatus or any sensor signal detecting typical data characteristic for an avalanche accident (noise sensor, acceleration sensor or the like).

**[0013]** In order to further assist the rescue of the user, the system may further comprise a positioning sensor in the form of a GPS sensor which detects a current position of the user and the information about the state of the

avalanche rescue system may include positioning information retrieved from the positioning sensor. Such GPS sensor could be integrated in the mobile device as conventionally known for smartphones, for example.

**[0014]** In a further preferred embodiment of the present invention, the system may be configured to retrieve, in the event of an emergency, a plurality of positioning records obtained from readings of the positioning sensor in temporal sequence, and to automatically transmit the positioning records to the remote contact. By obtaining a plurality of positioning records in temporal sequence, it is possible to track a path of movement of the user, in particular during the fall when the user gets caught in an avalanche. First, such track represents more reliable and more accurate positioning information than just a single record of the position of the user and allows a better estimation of the final position of the victim for the rescue team. Second, when detecting a plurality of positioning records as a track, it is possible to even estimate the final position of the victim in a case that the mobile device becomes damaged and inoperative during the accident and stops transmission of positioning information at some point in time during the accident.

**[0015]** In particular, it is preferable to obtain at least three positioning records from readings of the positioning sensor at predetermined time intervals such as to have over-determined information about the path of movement which allows particular improvement of accuracy and predictability in determining the final position of the victim. By using predetermined time intervals, an information about the speed of movement can be derived from the positioning records as well.

**[0016]** As a further safety measure, the avalanche rescue system according to the invention may be configured to automatically transmit each positioning record of the number of positioning records within a separate message to the remote contact as soon as the respective positioning record is obtained from the reading of the positioning sensor. With this feature, not only can the positioning information be transmitted to the remote contact promptly but furthermore it is ensured that positioning information are successfully transmitted as long as the mobile device is functioning properly and, for example in a case where the mobile device gets damaged during the accident, the device will be able to at least transmit part of the positioning information successfully before stopping its function.

**[0017]** In a further preferred embodiment of the present invention, the avalanche rescue system may be characterised in that the mobile device stores an emergency-call list containing a plurality of contact information records of a plurality of different remote contacts, wherein the system is configured to automatically transmit, in the event of an emergency, information about a state of the avalanche system through the mobile device to the contact information records of the emergency-call list. Setting up such emergency-call list in the mobile device allows a multiplication of the transmission function in order

to efficiently report the information about the state of the avalanche system to a number of remote contacts at the same time to efficiently initiate rescue. Such list could be managed in a corresponding application run by the mobile device such that the user can edit the list to store therein preferred contacts to be informed in case of the emergency. In particular, the avalanche rescue system may be further characterised in that the mobile device runs an application which stores the emergency-call list and which further stores a user-editable phone-book list containing a plurality of contact information records of a plurality of different remote contacts, wherein the application has user input means allowing a user to define at least one contact information to be in the emergency-call list but not to be in the phone-book list and/or to define at least one contact information to be in the phone-book list but not to be in the emergency-call list. Thus, the user may pick some of the contacts stored in the phone book of the mobile device to be on the emergency-call list. In other words, the application storing the emergency-call list is preferably a dedicated application to control and monitor the functions of the avalanche rescue system and includes features for setting and editing the emergency-call list, features for checking the readiness state of the inflation apparatus and/or features for monitoring the avalanche rescue system and for notifying failures in a suitable manner by means of the notifying means.

**[0018]** In the present invention, the notifying means may comprise at least one of a display device, a speaker or a vibration alarm device. In particular, a status of the system, in particular the inflation apparatus, could be displayed on the display device such that the user can verify the state on demand. Furthermore, a speaker or a vibration alarm device could be used to notify or warn a user about any change of the state of the system such as a failure of the inflation apparatus, which is detected by the application through a continuous or regular monitoring of the avalanche rescue system.

**[0019]** The above-described features of the present invention could be most preferably implemented using a smartphone as a mobile device such that the smartphone functionalities could be efficiently used for the wireless communication between the mobile device and the inflation apparatus or any other parts of the avalanche rescue system as well as for the wireless communication with the remote contact. A speaker and/or a vibration alarm device of the smartphone and/or the display device of the smartphone could be utilized as the notifying means and the integrated micro-controller and electronic devices of the smartphone could be utilized to run a suitable dedicated application for controlling and monitoring the avalanche rescue system as described above.

**[0020]** With reference to the attached figure, a preferred embodiment of the present invention will be described in the following in greater detail, wherein

figure 1 shows a user carrying an avalanche rescue system according to the preferred embodi-

ment of the present invention.

**[0021]** An avalanche rescue system 10 according to the embodiment comprises an air bag 12, for example a left air bag 12l and a right air bag 12r shown in figure 1 in an expanded state. The air bag 12 is part of a backpack 14 in the illustrated embodiment, such as to be carryable on a user's back, but it could be attached to or part of any other carrying system suitable to be carried by the user.

**[0022]** The avalanche rescue system further comprises an inflation apparatus 16 suitably connected to the air bag 12, for example by a tube 18, such as to supply gas to the interior of the air bag to deflate and expand the air bag. For this purpose, the inflation apparatus can have a gas generator, for example a tank containing compressed gas and a valve operable to open in the event of an actuation of the inflation apparatus such as to release the gas into the air bag 12. Preferably, the gas is a breathable gas containing in particular oxygen such that it can be released from the air bags after a certain amount of time after the expansion of the air bag and can support breathing of the user under the snow.

**[0023]** The inflation apparatus 16 further comprises a control unit 20 which includes electronic components to control activation of the inflation apparatus to expand the air bag as well as sensor components including a sensor for detecting a readiness state of the inflation apparatus. For example, control unit 20 comprises a gas sensor 22 detecting a filling state of a gas tank of the inflation apparatus which may be a pressure sensor arranged within the gas tank or any other suitable means for detecting readiness of the gas generator. Furthermore, the control unit 20 includes a wireless transmitting unit 24 which is adapted for wireless data communication with a mobile device 26 to be described below. The wireless transmission and data communication could be established by any suitable means, in particular short-range wireless communication, for example blue tooth.

**[0024]** The avalanche rescue system 10 further comprises a mobile device 26 which preferably is a smartphone featuring input and output means as conventionally known for mobile phones, as well as wireless communication means for voice and data communication. For example, the mobile device 26 may have one or more of the following input and output features: a display unit, a speaker, a microphone, a keypad, a touch screen and a vibration alarm. To establish wireless voice and data communication, the mobile device 26 preferably further comprises one or more of the following features: a GPS positioning unit, a cellphone unit, a WIFI unit and a blue tooth unit. Furthermore, the mobile device 26 may have one or more of the following electronic components and features: a micro-processor, a battery, a RAM, a ROM and a memory unit, such that the mobile device 26 is able to run applications loaded into the RAM and is further able to store and retrieve data into and from the memory unit (for example a flash memory).

**[0025]** The mobile device 26 preferably runs a dedicated application or app which controls and/or monitors the avalanche rescue system and in particular the inflation apparatus 16. Preferably, the application is adapted to determine the operational status of the inflation apparatus 16 and for this purpose may wirelessly receive from the wireless transmitting unit 24 a signal representing a detection result of the gas sensor 22. The application may further be adapted to send to the wireless transmitting unit 24 a command signal requesting a detection result from the sensor 22 to be transmitted back to the mobile device 26 through the wireless transmitting unit 24.

**[0026]** The application may be adapted to continuously receive information about the operational state of the inflation apparatus 16 through the wireless transmitting unit 24 or the application may follow a predetermined schedule of timings at which a request for reporting the operational status of the inflation apparatus 16 is sent from the mobile device 26 to the wireless transmitting unit 24. If the mobile device 26 detects an unexpected brake of the continuous reception of status information from the wireless transmitting unit 24 or if the mobile device 26 does not receive status information from the wireless transmitting unit 24 in direct response to a request signal sent from the mobile device 26 to the wireless transmitting unit 24 requesting the report of status information of the operational status of the inflation apparatus 16 within a predetermined time (time-out-time), the application may determine a failure and may report the same by suitable notification means of the mobile device 26, for example the speaker or the vibration alarm, to the user.

**[0027]** Furthermore, if the status information received by the mobile device 26 from the wireless transmitting unit 24 indicates any failure condition of the ignition apparatus 16, for example an insufficient gas pressure detected by the gas sensor 22, the application will likewise cause the mobile device 26 to notify the user by means of the notification means. In addition, the display device of the mobile device 26 may display information representing the status information received from the wireless transmitting unit 24 and in particular may also display readiness of the system, i. e. the absence of any failure, such that the user can verify that the system is ready or armed, in particular the gas generator is ready to activate the inflation apparatus 16 in the event of an emergency.

**[0028]** The application run by the mobile device 26 may further store at least one contact information editable by the user which contains information necessary to establish contact to a particular remote contact, for example a particular phone number. Preferably, the application stores an emergency-call list of contact information records to which information are to be transmitted simultaneously in the event of an emergency. The application may provide suitable means as conventionally known to edit such emergency-call list and, in particular, to select one or more of the contact information records stored in a separate general phone-book list of the mobile device

26 in order to define that the selected records be records of the emergency-call list. Furthermore, the application preferably allows to input new contact information records and/or to delete certain contact information records from the emergency-call list without deleting them from the general phone-book list.

**[0029]** Preferably, the avalanche rescue system 10 is adapted to recognize the event of an emergency, in particular the event of an avalanche accident, by any suitable detecting means such as an acceleration sensor, a noise sensor or the like. Such detection means could be provided in the inflation apparatus 16 and/or in the mobile device 26. If the detection means for detecting the event of an emergency is included in the inflation apparatus 16, in particular the control unit 20, the control unit 20 initiates a wireless transmission of a signal indicating the event of emergency through the wireless transmitting unit 24 to the mobile device 26 such as to inform the mobile device 26 about this event. Furthermore, upon detection of an emergency, the control unit 20 operates the inflation apparatus 16 to activate the gas generator and to expand the air bag 12.

**[0030]** The application run on the mobile device 26 is further adapted to start an emergency event program as soon as it receives information about the occurrence of an emergency, i. e. an avalanche accident. The emergency program at least reports the occurrence of the emergency and/or positioning information of the current position of the user to a remote contact by using the wireless data communication means of the mobile device 26. Preferably, the application causes the mobile device 26 to send a message, for example a message using the short message service (SMS), to the at least one remote contact immediately after recognizing the event of emergency. In this way the remote contact at least receives the information that the user has an accident and preferably further receives at least one positioning information of the user as soon as possible and rescue can be initiated even if the mobile device 26 gets damaged or destroyed shortly thereafter.

**[0031]** Preferably, after sending a first message of this kind, the mobile device proceeds with sending additional messages in short time intervals, each message reporting a current position of the user by sending current positioning information. The time interval between subsequent messages of this type can be between 0,2 and 5 seconds and preferably, the time interval between subsequent messages is as short as possible to transmit to the remote contact as much positioning information as possible. The remote contact therefore receives a number of positioning information which form a track of movement of the user during the avalanche accident.

**[0032]** Alternatively, the message sent by the mobile device 26 in the event of an emergency can include a number of subsequent readings of the positioning sensor, i. e. may include the track of movement or a part of the track of movement of the user. By sending multiple positioning information records in one message, the

amount of positioning information measured and reported per time can be increased. On the other hand, there is a risk that a number of positioning information records are collected by the mobile device but cannot be transmitted any more to the remote contact because of a damage of the mobile device. As a bit of a balance between the two concepts, it is conceivable to quickly send a message immediately after detection of the event of emergency, wherein the first message includes an information that an accident has occurred and/or only one or a view positioning information records such that the first message can be transmitted at an early point in time and will be transmitted reliably. Subsequent messages can then contain a number of positioning information records in order to increase efficiency of data communication.

**[0033]** The operation of the avalanche rescue system according to the preferred embodiment will be described below using the example of a skier. In a normal state, when the skier starts the tour, she/he starts the dedicated application at the mobile device 26 and may switch-on the avalanche rescue system 10. After a connection has been established between the mobile device 26 and the wireless transmitting unit 24, the user can verify the operational status of the inflation apparatus 16 and the overall avalanche rescue system 10 via the display device such as to verify that the system works properly and is ready for use. The application may then start to monitor the operational state of the system continuously or at predetermined time intervals and the skier starts skiing and may enter dangerous regions of her/his tour. During the skiing, the avalanche rescue system is normally in the normal state in which the air bag 12 is deflated and folded to be stored in the backpack 14 or any other suitable cover. The operational state of the inflation apparatus 16 is monitored during the normal state and any changes of the operational state, in particular any failure of the inflation apparatus 16, is reported to the skier such that appropriate actions can be taken. Furthermore, the user can manually verify the operational state and in particular the readiness of the system by checking the display device of the mobile device 26 at any time she/he wishes to confirm that the system is properly armed.

**[0034]** In the event of an emergency such as an avalanche accident, the user may manually activate the inflation apparatus 16 or the detection unit of the avalanche rescue system 10 may automatically detect this event and activate the inflation apparatus 16 to expand the air bag 12 to help to keep the user above the snow or at least ensure some space around the user when she/he gets under the snow. At the same time, the application runs the emergency event program to send at least one message as described before to report the emergency to a remote contact and to transmit at least one positioning information that assists rescue of the avalanche victim.

## Claims

1. Avalanche rescue system (10) comprising
  - a) an air bag (12) configured to be collapsed in a normal state and to expand in the event of an emergency,
  - b) an inflation apparatus (16) connected to the air bag (12) to cause inflation and thereby expansion of the air bag (12),
  - c) a mobile device (26) having wireless voice and data communication functionality and having a notifying means capable of notifying information to a user of the mobile device (26),
  - d) said inflation apparatus (16) and said mobile device (26) being configured
    - a) to wirelessly transmit from the inflation apparatus (16) to the mobile device (26) at least one data signal representing an operational state of the inflation apparatus (16),
    - b) to notify information about the operational state of the inflation apparatus (16) via the notifying means of the mobile device (26) in the normal state and
    - c) to wirelessly transmit information about the operational state of the inflation apparatus (16) from the mobile device (26) to a remote contact in the event of an emergency.
2. Avalanche rescue system (10) according to claim 1, **characterised in that** the operational state is a readiness state of the inflation apparatus (16).
3. Avalanche rescue system (10) according to claim 1 or claim 2, **characterised in that** the inflation apparatus (16) comprises a gas generator (19) and a sensor (22) connected to the gas generator (19) for detecting a filling and/or readiness state of the gas generator (19) and that the at least one data signal received by the mobile device (26) represents the filling and/or readiness state of the gas generator (19).
4. Avalanche rescue system (10) according to at least one of the preceding claims, **characterised in that** the system (10), in the normal state, is configured to detect the operational state of the inflation apparatus (16) continuously or at a plurality of times in temporal sequence, and to report changes in the operational state to the user through the notifying means.
5. Avalanche rescue system (10) according to at least one of the preceding claims, **characterised in that** the mobile device (26) stores at least one contact information of a remote contact, wherein the system (10) is configured to automatically wirelessly transmit, in the event of an emergency, information about

a state of the avalanche system (10) through the mobile device (26) to the remote contact based on the contact information.

6. Avalanche rescue system (10) according to claim 5, **characterised in that** it further comprises a positioning sensor, preferably a GPS sensor, which detects a current position of the user, and wherein the information about the state of the avalanche system includes positioning information retrieved from the positioning sensor. 5
7. Avalanche rescue system (10) according to claim 6, **characterised in that** the system is configured to retrieve, in the event of an emergency, a plurality of positioning records obtained from readings of the positioning sensor in temporal sequence, and to automatically transmit the positioning records to the remote contact. 10 15
8. Avalanche rescue system (10) according to claim 7, **characterised in that** the system is configured to obtain at least three positioning records from readings of the positioning sensor at predetermined time intervals, preferably at constant time intervals. 20 25
9. Avalanche rescue system (10) according to claim 7 or claim 8, **characterised in that** the system is configured to automatically transmit each positioning record of the number of positioning records within a separate messages to the remote contact as soon as the respective positioning record is obtained from the reading of the positioning sensor. 30
10. Avalanche rescue system (10) according at least one of claims 5 to 9, **characterised in that** the mobile device (26) stores an emergency-call list containing a plurality of contact information records of a plurality of different remote contacts, wherein the system is configured to automatically transmit, in the event of an emergency, information about a state of the avalanche system (10) through the mobile device (26) to the contact information records of the emergency-call list. 35 40 45
11. Avalanche rescue system (10) according to claim 10, **characterised in that** the mobile device (26) runs an application which stores the emergency-call list and which further stores a user-editable phone-book list containing a plurality of contact information records of a plurality of different remote contacts, 50
- wherein the application has user input means allowing a user to define at least one contact information to be in the emergency-call list but not to be in the phone-book list and/or to define at least one contact information to be in the phone-book list but not to be in the emergency- 55

call list.

12. Avalanche rescue system (10) according to any of the preceding claims, **characterised in that** the notifying means comprises at least one of a display device, a speaker or a vibration alarm device.
13. Avalanche rescue system (10) according to any of the preceding claims, **characterised in that** the mobile device (26) is a smartphone.

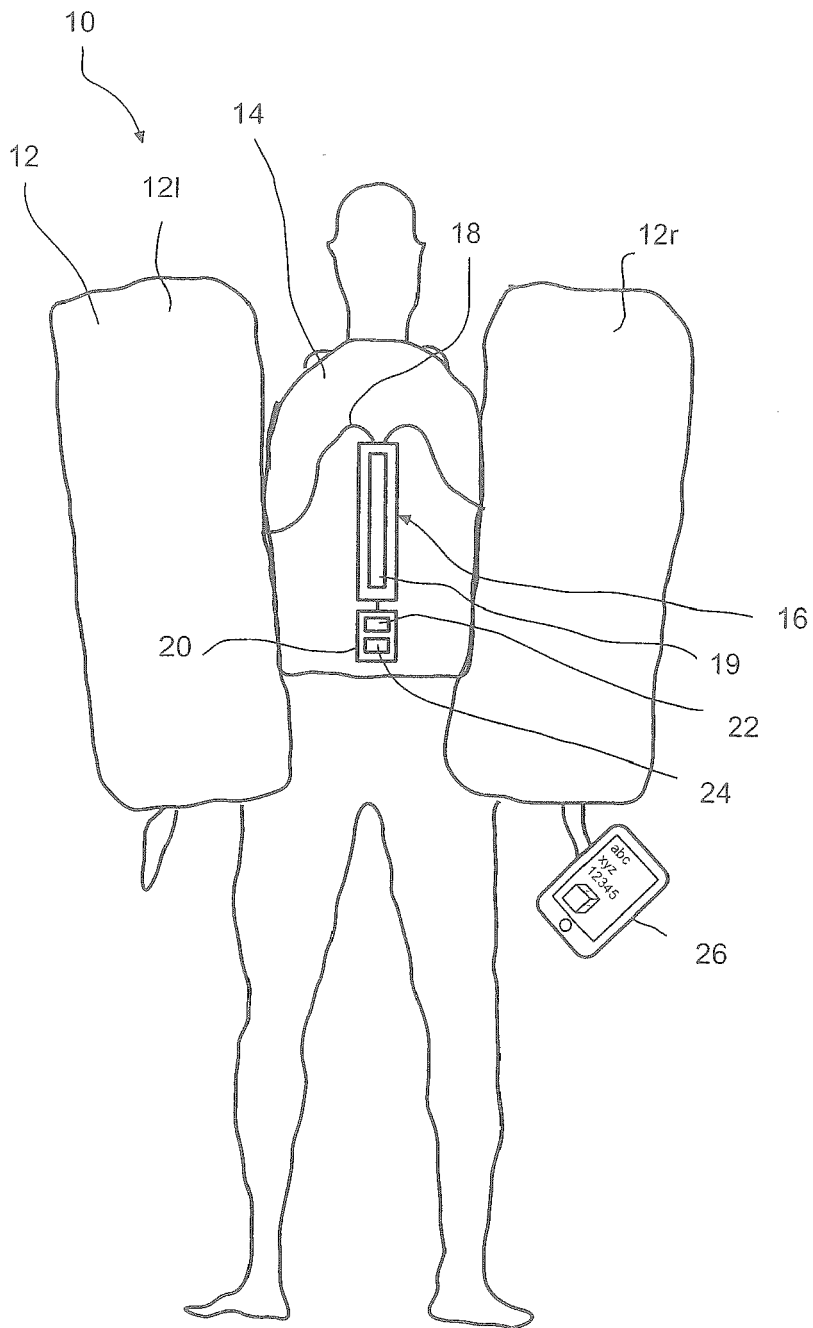


Fig. 1



EUROPEAN SEARCH REPORT

Application Number  
EP 16 15 0839

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	WO 2004/107888 A1 (HADDACKS WILLIAM N [CA]) 16 December 2004 (2004-12-16) * page 3, line 15 - page 4, line 12 * * page 6, line 1 - page 8, line 30 * * figures 1,2,4 *	1,5-8, 10-13	INV. A62B33/00 A63B29/02
A	DE 10 2012 103376 A1 (BAUER MARTIN [DE]) 25 October 2012 (2012-10-25) * paragraph [0036] - paragraph [0043] * * paragraph [0006] * * paragraphs [0128], [0140] * * figure 1 *	1,5-8, 10-13	
			TECHNICAL FIELDS SEARCHED (IPC)
			A62B A63B
The present search report has been drawn up for all claims			
Place of search <b>The Hague</b>		Date of completion of the search <b>12 May 2016</b>	Examiner <b>Nehrdich, Martin</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

EPO FORM 1503 03/02 (P04/C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 15 0839

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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12-05-2016

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