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(72) Inventors:

- **Baumann, Johann**
DK-2765 Smørum (DK)
- **Bay, Henrik**
DK-2765 Smørum (DK)
- **Bech, Martin**
DK-3670 Veksø (DK)

(71) Applicant: **Oticon A/S**

2765 Smørum (DK)

(54) **Neck loop antenna with strangulation prevention**

(57) Mechanical fuse between a lanyard element and an electronic device is provided where a releasable connection between the lanyard and a connection point at a surface element of the electronic device is established. The mechanical fuse comprises a nondestructive release

mechanism responsive to a pulling force in a first direction between lanyard and the electronic device and a destructive break apart means responsive to a pulling force in a second direction between lanyard and the electronic device. The first and the second directions do not co-inside but are angled with respect to each other.

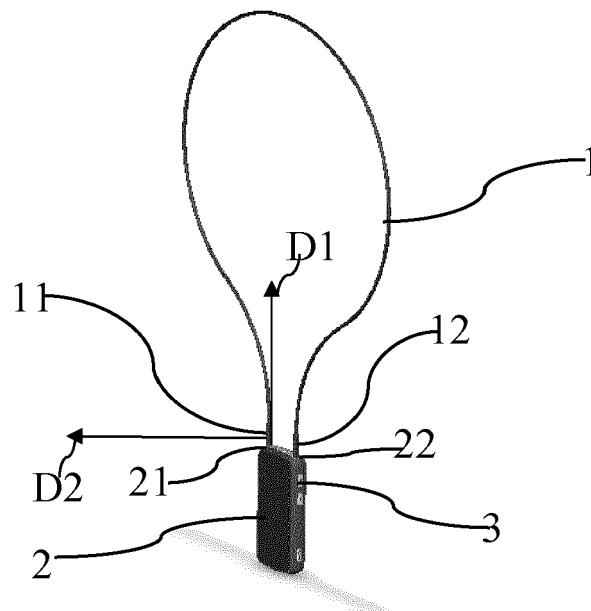


Fig. 1

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Description

AREA OF THE INVENTION

[0001] The invention regards a neck loop antenna with strangulation prevention. The strangulation prevention is particularly important when such a neck loop is to be used by a child. The antenna serves the purpose of allowing wireless communication with an ear level device such as a hearing aid or the like. The antenna loop carries a transmission device, which may receive long range wireless signals such as bluetooth and or FM signals and transmit or receive short range signals to/from a hearing aid or other ear level devices. The short range signals could be inductive signals.

BACKGROUND OF THE INVENTION

[0002] In wireless devices which are to couple inductively with a coil in a hearing aid, a neck loop or lanyard is often provided to ensure that signals travelling to and from the hearing aid may be safely relayed to a more powerful transmitter, which is connected to the neck-loop. However, such devices poses a thread for the user, as the neck loop may become entangled around foreign objects in such a way that the user is in risk of suffering strangulation. This risk is customarily dealt with in that a breakaway clasp is provided, such that a minimum pulling force on the loop allows the loop to open. Known devices comprise magnetic brake away clasps, mechanical multiple use locks and brake apart mechanical locks for one time use. The invention seeks a solution to the safety problem, which in most situations allows continued use of the device without parts being broken but which on the other hand ensures release even if the pulling force is tangential to a surface at a connection point of a transmitter.

SUMMARY OF THE INVENTION

[0003] A mechanical fuse between a lanyard element and an electronic device is provided. Further, a releasable connection is provided between the lanyard and a connection point at a surface element of an electronic device. The mechanical fuse comprises a non-destructive release mechanism responsive to a pulling force in a first direction between lanyard and the electronic device, and a destructive break apart means responsive to a pulling force in a second direction between lanyard and the electronic device. The first and the second directions do not co-inside but are angled with respect to each other. With such a system enhanced safety is provided, which on the one hand allows non-destructive detachment between the neck loop and its transmitter device when pulling forces in a first direction between the two are provided and on the other hand ensures destructive brake-apart detachment in case pulling forces are exerted in a different direction than said first direction. This gives the user

the most secure system, and also it allows the user to conduct plug in and plug out between the transmitter and the neck loop without any harm coming to the system.

[0004] It is intended that the structural features of the system described above, in the detailed description of 'mode(s) for carrying out the invention' and in the claims can be combined with the method, when appropriately substituted by a corresponding process. Embodiments of the method have the same advantages as the corresponding systems.

[0005] Further objects of the invention are achieved by the embodiments defined in the dependent claims and in the detailed description of the invention.

[0006] As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms as well (i.e. to have the meaning "at least one"), unless expressly stated otherwise. It will be further understood that the terms "includes," "comprises," "including," and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. It will be understood that when an element is referred to as being "connected" or "coupled" to another element, it can be directly connected or coupled to the other element or intervening elements maybe present, unless expressly stated otherwise. Furthermore, "connected" or "coupled" as used herein may include wirelessly connected or coupled. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items. The steps of any method disclosed herein do not have to be performed in the exact order disclosed, unless expressly stated otherwise.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

Fig. 1 and 1a discloses the lanyard and electronic device in a perspective sectional view, Fig. 2 and 2a shows a perspective sectional view of a detail of the connection between lanyard and electronic device including a section to disclose internal parts, Fig. 3 is a front and side view of the electronic device, Fig. 4 is a top view of the electronic device, Fig. 5 shows an a sideview of the pin, Fig. 6 shows an enlarged view of the v-shaped weakening.

[0008] The figures are schematic and simplified for clarity, and they just show details which are essential to the understanding of the invention, while other details are left out. Throughout, the same reference numerals are used for identical or corresponding parts.

[0009] Further scope of applicability of the present invention will become apparent from the detailed descrip-

tion given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only.

DESCRIPTION OF A PREFERRED EMBODIMENT

[0010] In Fig. 1 and Fig. 1a, the electronic device 2 with the lanyard 1 is shown. The electronic device 2 comprises one or more different communication platforms and connection means for other communication formats such as DAI, FM, Telecoil, Bluetooth and possibly further formats and a translator which will translate between any one of these formats and a further wireless signal format, which may be transmitted or received by way of an antenna embedded in the lanyard 1. The further wireless format may be one which allows short range transmission with low power consumption and high information density, such as is known from the hearing aid industry. A user wearing a hearing aid which has communication ability at this further wireless format may wear the electronic device with the lanyard around his neck, and thereby the hearing aid may gain one or two way contact with all of the communication platforms and corresponding formats provided for in the electronic device. The electronic device 2 will also comprise a rechargeable battery and control buttons 3 as is usual in wireless devices.

[0011] In fig. 3 the electronic device 2 is shown in a front and side view with the connection elements of the lanyard and lanyard ends shown. The two ends of the lanyard loop (the loop is not seen in this figure) are both connected to the electronic device. As seen, the lanyard 1 is attached to the electronic device 2 at two different locations 21, 22 and forms a loop when each of its ends 11, 12 are attached to each its location 21, 22. This loop is then dimensioned such that a user may wear it around his or her neck, suspending the electronic device 2 from the loop. A predetermined choice of loop lengths may be made available so the user may choose a loop with a suitable length. The connection which is provided between the lanyard 1 and a connection points 21, 22 on the electronic device 2 are releasable, such that a predetermined pull at the lanyard in a direction D1 away from the surface 23 will cause the dis-engagement between the lanyard 1 and the electronic device 2. The mechanical fuse comprises both of a release mechanism responsive to this pulling force in a predetermined first direction D1 between lanyard and the electronic device and a further fusing means comprising brake away means responsive to a pulling force in a second direction D2 between lanyard 1 and the electronic device 2. The first and the second directions do not co-inside but are angled with respect to each other.

[0012] The electronic device 2 is not necessarily massive, but it is notably more sturdy and in-flexible than is the lanyard 1, which has the physical property of supple yarn, rope or wire.

[0013] The two fusing mechanisms are provided in or-

der to secure a user against strangulation hazards, which are always present when a lanyard is worn around the neck. Should the lanyard get caught in an immobile object during play or other activity, it is of the outmost importance that a fusing mechanism is in place in order that the loop may open up. This opening up should take place at a predetermined minimum pulling force at the lanyard 1, this force being clearly so small that it cannot pose a real threat to the users health. It is further important that the fusing mechanism works irrespective of the pulling angle with respect to the electronic device 2, as the electronic device might get caught also and immobilized inadvertently during play or moved inadvertently with respect to the user, which could happen if the electronic device 2 is caught in machinery with moving parts. As the two fusing means are responsive to two different pulling directions a maximum security is obtained.

[0014] In Fig. 2 and 2a the electronic device is shown in an enlarged sectional view, where the section is provided down the middle of one of the connections. The outer protection sheath 35 is not shown in the section view, in order that the inner parts of the connection are better understood. The directions D2 and D1 are indicated by corresponding arrows. The brake away means are responsive to pulling force acting substantially parallel to the surface part 23 as indicated with arrow D2, whereas the dis-engagement of the connection part from the electronic device is accomplished by a pulling force perpendicular to the surface 23 as indicated by arrow D1. The surface 23 is located at the connection points 21, 22. In the disclosed embodiment, the surface part 23 is an uppermost slightly concavely shaped surface. As seen in figs. 3 and 4 the electronic device comprise an elongate flat box like structure, having two opposed large rectangular surfaces forming a front surface 13, and rear surface 14; an upper surface 23, and a bottom surface 24, and two side surfaces 5 and 6.

[0015] The lanyard 1 has an outer isolating sheath, and an inner metal core adapted to carry an electric current, and the releasable connection means of the lanyard comprise a metal pin 30 adapted to provide a galvanic contact between electric circuitry inside the electronic device 2 and the inner metal core of the lanyard 1.

[0016] The metal pin 30 has a naked end part 31 which is unisolated and a connection end part 32 which is isolated and connected to the inner metal core of the lanyard. A weakened neck 33 is provided between the naked part 31 and the connection part 32. The neck 33 is shown in further detail in Fig. 6. It is comprised of a v-shaped circumferential cut in the surface of the pin 30, which leaves a reduced section of material. This reduced section will have no bearing on the current carrying properties of the pin 30 but it will weaken the mechanical resilience of the pin in this particular area.

[0017] A hard plastic cover 34 is provided on the lanyard 1 from a region proximal the metal pin 30 and over the metal pin 30 to the weakened neck 33. This cover 34 serves to protect the solder connection between the pin

30 and the electrical lead or inner metal core in the lanyard, such that pulling forces in any direction between the lanyard 1 and the pin 9 shall not be carried exclusively by the solder connection. The hard plastic cover is preferably provided by injection molding, where the item is placed in a tool of an injection molding machine and then the molten material is injected onto the item.

[0018] An enlarged view of the weakened neck is disclosed in fig. 5. The neck may be made by usual machining such as on a lathe.

[0019] A of soft plastic cover 35 is provided covering the hard plastic cover, and this soft cover 35 covers both a part of the lanyard 1 and the weakened neck. This soft plastic cover 35 serves mainly to protect the delicate transition from the hard first cover to the soft lanyard as such transitions are known to be prone to failure due to the occurrences of small bending radiuses at the transition zone between lanyard and connection pin.

[0020] The pin 30 has a protrusion 37 at its naked tip, which is adapted to interact with a spring structure 40 inside the electronic device to ensure that the two form a stable mechanical connection when the pin is inserted in the socket. The spring structure 40 also serves the purpose of facilitating galvanic contact between the pin and the electronics of the electronic device.

Claims

1. Mechanical fuse between a lanyard element and an electronic device where a releasable connection is provided between the lanyard and a connection point at a surface element of the electronic device, and wherein the mechanical fuse comprises a non-destructive release mechanism responsive to a pulling force in a first direction between lanyard and the electronic device and a destructive break apart means responsive to a pulling force in a second direction between lanyard and the electronic device, whereby the first and the second directions do not co-inside but are angled with respect to each other.
2. Mechanical fuse as claimed in claim 1, wherein the non-destructive release mechanism is responsive to a pulling force on the lanyard acting perpendicular to the surface element of the electronic device at the connection point and wherein the brake apart means are responsive to a pulling force acting substantially parallel to the surface element at the connection point of the electronic device.
3. Mechanical fuse as claimed in claim 2, wherein the lanyard comprise an outer isolating sheath, and an inner metal core adapted to carry an electric current, wherein the mechanical fuse comprise a metal part adapted to provide a galvanic contact between electric circuitry inside the electronic device and the inner metal core of the lanyard.

4. Mechanical fuse as claimed in claim 4, comprising a metal pin which has a naked end part thereof which is unisolated and a connection part thereof which is isolated and connected to the inner metal core of the lanyard, wherein further a weakened neck is provided between the naked part and the connection part.
5. Mechanical fuse as claimed in claim 4, wherein a hard plastic cover is provided on the lanyard from a region proximal to the metal pin and over the metal pin to the weakened neck.
6. Mechanical fuse as claimed in claim 5, wherein a soft plastic cover is provided covering the hard plastic cover and covering both the end section of the lanyard and the weakened neck.
7. Method of mechanically fusing a connection between a lanyard adapted to be worn around a persons neck and a electronic device, providing one fusing mechanism for pulling forces in a first direction with respect to the electronic device, and providing another fusing mechanism for pulling forces essentially perpendicular to the first direction.
8. Method as claimed in claim 7, wherein the one fusing mechanism is provided as a destructive brake away mechanism and the other fusing mechanism is provided as a non-destructive and re-attachable release mechanism.
9. Method as claimed in claim 8, wherein one of the fusing mechanisms is provided also as an electrical galvanic contact between a metal core of the lanyard, and electronics provided inside the electronic device and facilitates working the lanyard as an antenna when coupled to the electronic device.

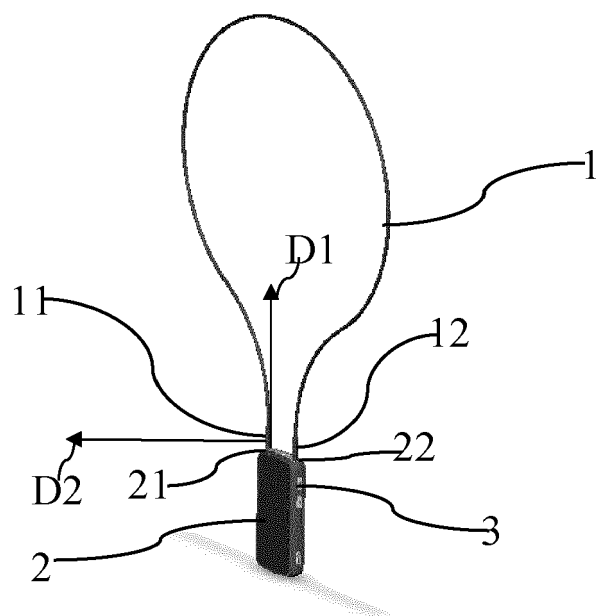


Fig. 1

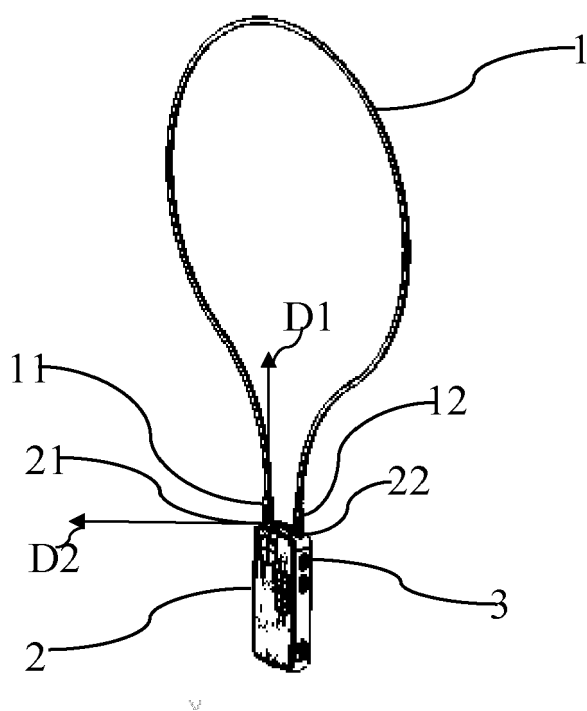


Fig. 1a

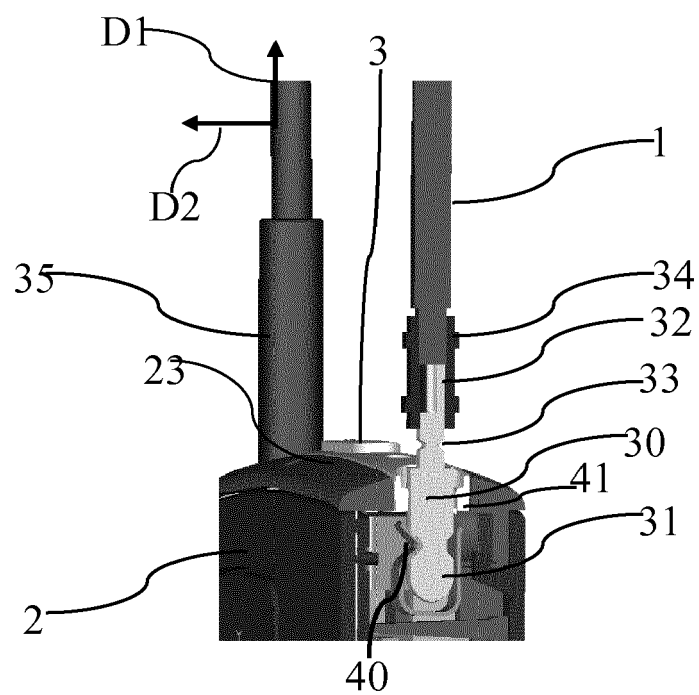


Fig. 2

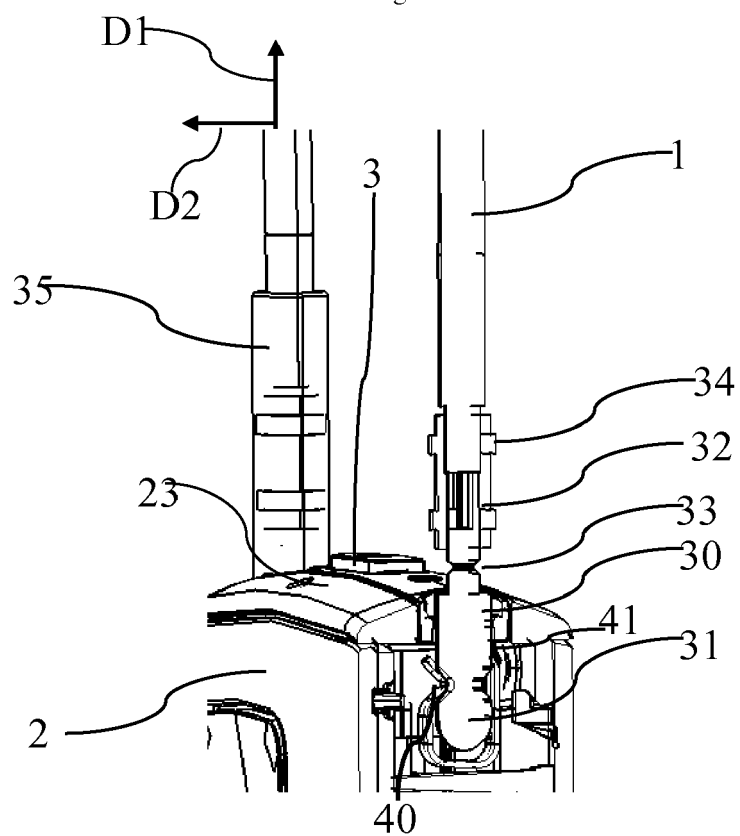


Fig. 2a

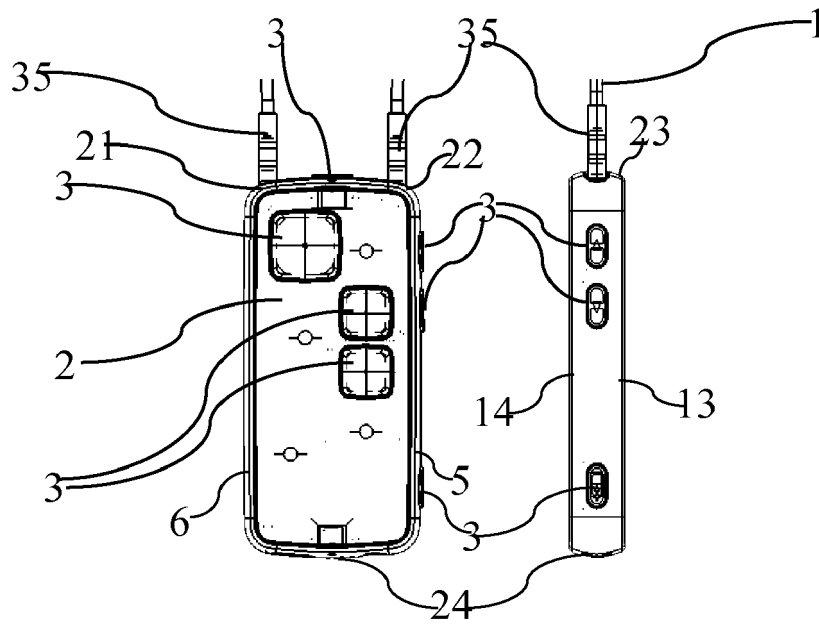


Fig. 3

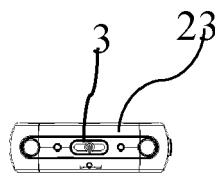


Fig. 4

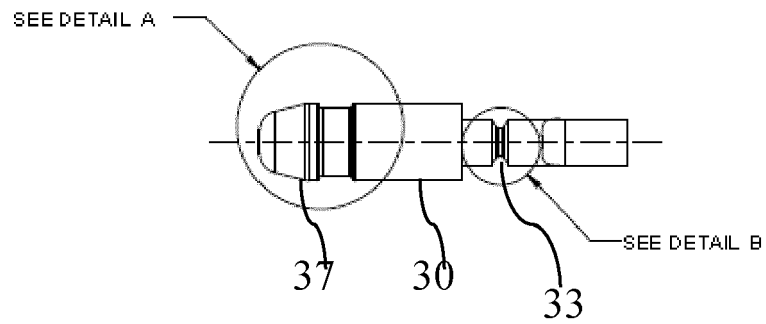


Fig. 5

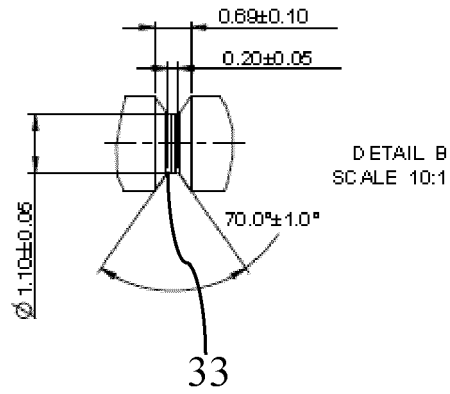


Fig. 6



EUROPEAN SEARCH REPORT

Application Number
EP 12 19 7448

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Place of search The Hague		Date of completion of the search 31 May 2013	Examiner Fredj, Aziz
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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