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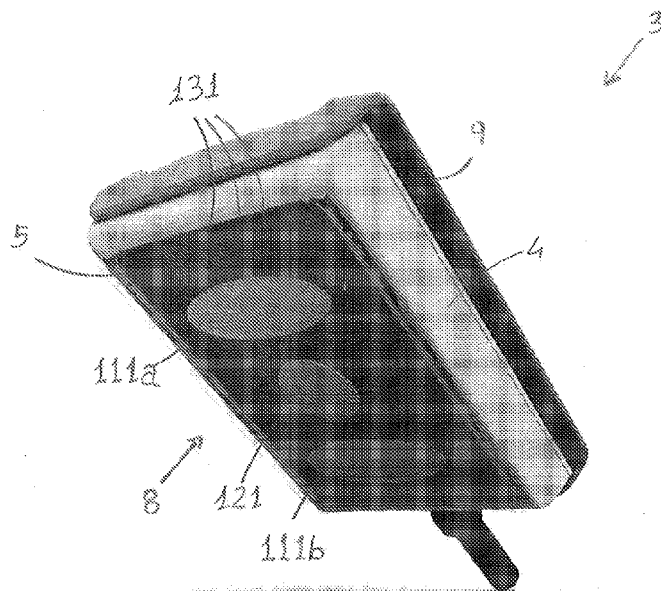


Fig. 4

(57) Abstract: The invention concerns a multifunction device (1) for the aesthetic/medical treatment of body parts, comprising a control unit (2), and at least one applicator element (3) connected to the control unit (2); the device comprising at least two emitter devices selected from: - an emitter of radio frequency waves, an emitter of ultrasonic waves, and - an emitter of laser light; the applicator element (3) housing at least two components selected from transducer and emitters, each of which belongs to the aforesaid emitter devices, and a printed circuit board (7). The applicator element (3) has a face (8) from which the waves emitted by at least two of said components (111a, 111b, 121, 131) propagate. The invention also regards said applicator element (3).



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“MULTI-FUNCTION DEVICE WITH AN APPLICATOR ELEMENT”**DESCRIPTION**

The present invention relates to a multi-function device with applicator element. In particular, it relates to a device with applicator element that emits waves of various types, device to be used to perform body treatments, both of aesthetic and of medical type. More in particular, this is a device whose applicator element is of the cover plate type and is adapted to be applied to body parts that require treatment with certain types of waves.

Therefore, the invention pertains to the field of devices that perform stimulation and toning actions by means of various types of waves, specifically ultrasonic waves, laser radiation and high frequency radio waves, on tissues of the human body, primarily, but not only, to improve the appearance and functionality and to sculpt the shape thereof.

More in particular, the device according to the present invention is adapted to be used for aesthetic and medical treatments, aimed at reducing or, according to the case, eliminating the presence of altered and undesirable conditions, such as adipose tissue, water retention, swelling, cellulite and skin blemishes, such as "orange peel skin".

Often two or more of the aforesaid altered conditions can be found simultaneously in the same person.

Therefore, in practice, this person will often undergo a number of treatments of aesthetic/medical type to deal with these altered conditions equal to the number of aesthetic/medical problems. Therefore, currently this person is treated, even during separate sessions, with dedicated devices, each of which is specific for the treatment of the distinct altered condition or for the type of wave emitted.

Therefore, the main limit of devices currently available on the market lies in the fact that the same body part, area or zone of the person must undergo two or more treatments for separate altered conditions at different times. This causes some problems,

such as longer treatment times, higher number of sessions, increased costs, etc. Moreover, an aesthetic or medical treatment center that wishes to offer its clients a complete range of these treatments requires to purchase all the relevant specific devices.

5 The object of the present invention is to provide a device that overcomes the problems of prior art devices.

Principally, the device according to the present invention allows several treatments to be performed simultaneously on the same body part of the person to be treated if this body area or zone requires treatment with different waves of the type mentioned hereinafter.

10 The device of the present invention thus produces the advantage that the person to be treated greatly reduces the time needed to dedicate to the treatment of a single body part with at least one of the aforesaid altered conditions that benefits from treatment with wave types mentioned hereinafter, as said altered condition is simultaneously treated with two or three different methods in order to improve, or eliminate, this altered condition.

15 Another advantage offered by the present invention is the fact that treating at least one altered condition simultaneously with two or more different methods can lead to the desired positive aesthetic/medical effects being achieved more rapidly, and can even obtain better results than those achieved with treatments at different times. This may be due to increased adhesion to the treatment plan by the person in treatment and even, in some
20 cases, more timely treatment of the altered condition.

Moreover, with reference to aesthetic and/or medical treatment centers, the device according to the present invention offers the advantage of increasing operating efficiency, in particular use of the structures of the center, such as the workstations (e.g. beds, chairs, etc.), dedicated to these treatments. This also offers the advantage of being able to treat a
25 larger number of people with the same number of opening hours of the center and the same number of workstations.

Another advantage offered by the present invention is that it requires fewer operations to comply with hygiene standards to clean and disinfect the part of the device that comes into contact with the body of the person to be treated each time this part of the device is positioned on the body of this person. Clearly, the less this part of the device is moved from one person to another, or also from one body part to another body part of the same person, the fewer cleaning and disinfecting operations are required.

A further advantage of the present invention is of proposing an economical and space-saving multi-function device.

The predetermined objects and the advantages obtained are achieved with a multi-function device provided with a series of applicator elements that emit radiofrequency waves, ultrasonic waves and laser waves. These waves hit the body part involved, exerting their effect on different structures of this part.

Therefore, the present invention relates to a multi-function device comprising:

- a control unit, and
- an applicator element connected to the control unit.

The device also comprises at least two wave emitter devices selected from an emitter of radiofrequency waves, an emitter of ultrasonic waves, and an emitter of laser light.

The applicator element houses at least the following components:

- at least two components selected from an emitter of laser light, at least two cover plates of an emitter of radiofrequency waves and an ultrasonic transducer; and
- a printed circuit board.

The applicator element has a face from which the waves emitted by at least two of said components selected from emitters and transducers propagate.

The face of the applicator element from which the waves emitted by the aforesaid

components propagate is the face that comes into contact with the surface of the body part of the patient to be treated and hereinafter this face is called contact face.

In particular, the applicator element is a body, at least partially hollow, for example, in the shape of a polyhedron or the like. The faces of the polyhedron can be flat or curved.

5 The aforesaid components are housed inside this body.

More precisely, the emitter of laser light is functionally connected and, optionally, fixed to the printed circuit board.

Also, the transducer and the ultrasonic emitters, separately from one another, are functionally connected, and optionally fixed, to the printed circuit board.

10 Preferably, the light emitter has the side from which the laser light is emitted opposite the side facing the printed circuit board.

On the printed circuit board, two or more emitters are, typically, arranged side by side or concentric with respect to one another.

In the device of the present invention the emitter device of radiofrequency waves, if
15 present, preferably comprises at least two or more entities, such as plates, heads or the like, that act as poles, at least one of which is positive. These entities are inserted into the body of the applicator element, but each has a part that is outside the applicator element and is flush with the contact face.

In the device of the present invention the ultrasonic wave transducer, if present, is
20 inserted into the body of the applicator element, but has a part that is outside the applicator element and is flush with the contact face.

If present, the emitter of laser light, preferably in a number larger than one, is inserted into the applicator element, but recessed with respect to the contact face.

This contact face of the applicator element, preferably, consists at least partially of
25 a cover plate. This cover plate is, typically, flat or, optionally, has a slightly concave outer part. Moreover, the cover plate has at least one through hole or opening at the ultrasonic

emitter or two through holes or openings, at each of said plates.

As described above, said entities and said transducer, if present, have a part flush with the contact face, i.e., with said cover plate. In fact, once the applicator element is in use, said entities and transducer are in direct contact with the surface of the body part of the patient to be treated.

According to a first preferred embodiment, if the emitter of laser light is present, said cover plate is made of a transparent material or a material that allows the passage of the laser light emitted. Therefore, in this embodiment the emitter of laser light is positioned between the aforesaid printed circuit board and the aforesaid cover plate.

In an alternative embodiment, the cover plate is opaque and has a through hole or opening present at the emitter of laser light, so as to allow the light waves to propagate outside the contact face.

According to an embodiment, the number of through holes present on the cover plate is the same as the number of the aforesaid emitters of laser light present inside the applicator element. Each hole has a suitable span and, therefore, is positioned at each emitter from which the laser light is emitted.

However, and according to a different embodiment, the through holes of the cover plate can also be fewer in number with respect to the total number of emitters of laser light. In fact, the emission side of two or more emitters can face a single hole, for example if the emitters are side by side or arranged concentrically with respect to one another.

In the applicator element, the printed circuit board is positioned parallel or substantially parallel to the cover plate. According to a preferred variant, the device of the present invention comprises all three the aforesaid emitter devices, i.e., the emitters of radiofrequency waves, of ultrasonic waves and of laser light.

More precisely, in the applicator element according to the present invention, the emitters are two or more, at least one for each type of wave emitted.

According to a particular example of the invention, the device comprises an ultrasonic wave transducer. It is typically a transducer of piezoelectric type.

According to this variant, the device comprises an emitter of radiofrequency energy with two poles, typically spaced apart, according to the prior art. The energy is generated
5 by a dedicated printed circuit board.

If, in the device according to the present invention, the emitter device of laser light is present, the applicator element houses at least one emitter of laser light, preferably at least ten, more preferably more than thirty emitters of laser light.

Hereinafter, the device emitter of laser light is also called laser LED.

10 Naturally, the number of each type of emitter or transducer is variable at will, according to needs.

Positioning both of the emitters and of the transducer with respect to the printed circuit board, in particular to its side facing the contact face, is not binding. This positioning depends mainly on the number and on the size both of the emitters and of the
15 transducer.

According to a variant of the invention, the body consists of a frame with lateral walls, said cover plate and a wall opposite said cover plate.

The applicator element according to the present invention can be of static or mobile type.

20 The applicator element of static type also comprises retaining means. These means are adapted to retain the applicator on the body part to be treated.

For this purpose, these means are designed so as to surround the body part involved. In this case, these means are, for example, in the form of a belt, band, strip or the like and made of suitable material, which can be natural, synthetic or artificial, such as
25 cotton or plastic fabric.

The upper part of the applicator element is preferably in the form of, or provided

with, gripping means or at least one through slot or slit. These parts allow, besides gripping of the object, if required, the retaining means to be constrained to the body of the applicator element.

According to another variant, the body is elongated in a main direction of extension
5 and has a size and a shape suitable to be grasped and held with one hand to perform the treatment on the body of the person.

The device according to the present invention can also comprise more than one applicator element. The number of these applicator elements is not binding; normally there are at least two or more, for example from two to ten.

10 The applicator element and the control unit are connected to each other, preferably via a cable.

The control unit consists of a body with a shape that is not binding. This body is of suitable shape and volume to house the various components. Typically, the body is a polyhedron shape with walls that are flat or curved, or both.

15 In particular, the control unit houses, with reference to the aforesaid devices, electronic components capable of transforming, modulating or driving the mains current to supply the components of the applicator element.

Moreover, the outside of the control unit has at least one site for positioning the applicator element when not in use. Depending on the design of the control unit, these sites
20 can have a different form, for example a support that extends from the body of the control unit or a niche on the body of the control unit. The number of these sites is generally a function of the number of applicator elements supplied with the device according to the present invention.

Moreover, the device according to the present invention is preferably provided with
25 a display screen, which can be of tactile type. Preferably, this screen is positioned in the control unit, typically on the upper part of the body. However, according to another

embodiment, each applicator element can be provided with a display screen.

The device according to the present invention, in particular the control unit, is also provided with software, in particular application software. The main task of the application software is setting operation of the devices of the device. In fact, the application software comprises preset programs or programs in which all or only some of the conditions can be freely selected by the user or operator of the device or, preferably, both types of programs.

In particular, the user or operator can choose to set, in said free program, for example at least one of the following conditions: how many and which devices to be operated (i.e., exclude the operation of at least one device), their operating sequence (simultaneous or in succession), the duration of their operation, which waves to emit, the power of the waves emitted, etc.

Although the device according to the present invention is provided with at least two of the aforesaid emitter devices, it is clear that this device can also be set to operate only one or two of the devices present, thus choosing freely to exclude the operation of any other device present. For this reason, the device according to the present invention is adapted to be used also to perform the different treatments one at a time or in groups of two, according to needs, rather than unavoidably all together.

According to possible variants, the applicator element can comprise at least (a) the devices capable of transforming, modulating or driving the mains current or also (b) a central processing unit (CPU) and optionally (c) the display device.

From the above, it is clear that the device according to the present invention is powered by electricity, which allows the aforesaid emitter devices, the software and the optional display screen, as well as any other electrical or electronic components present, to operate. More in particular, the electricity, which is typically provided by the mains current, supplies both the control unit and, directly or indirectly, also the applicator element.

The emitter devices that can be used in the device of the present invention are substantially the same as those used in prior art technical devices for the same use, i.e., aesthetic/medical. Therefore, as these devices are well known to those skilled in the art they will not be described in detail.

5 The aforesaid devices are capable of transforming or modulating the electricity that supplies the device according to the present invention into sound waves, radiofrequency waves and light waves with wavelengths and powers typically used in the aforesaid treatments.

The present invention also relates to an applicator element as previously described.

10 As specified above, the device according to the present invention can be equipped with devices selected from:

- laser LEDs capable of emitting laser light, generally with a wavelength from 760 to 1200 nm for aesthetic use and from 600 to 1200 nm for medical use and maximum power up to 10 mW/cm², for aesthetic use, or up to 500 mW/cm², for
15 medical use;
- ultrasonic emitters capable of emitting ultrasonic waves both for medical use and for aesthetic use. For medical use the resonance frequency can be low (up to 40 kHz), medium (greater than 100 and up to 800 kHz) and high (greater than 800 kHz and up to 5 MHz) and maximum power for each channel typically up
20 to 10 W/cm². For aesthetic use the resonance frequency is typically comprised between 800 kHz and 3.5 MHz and the maximum power for each channel is typically up to 1.5 W/cm² for frequencies up to 1.2 MHz, and up to 3 W/cm² for frequencies comprised between 1.2 MHz and 3.5 MHz.
- radiofrequency emitters capable of emitting radiofrequency waves with base
25 frequency generally comprised between 400 KHz and 1500 kHz and maximum power up to 25 W/cm², with resistive emitters, and up to 50 W/cm² with

capacitive emitters, for aesthetic use; instead, for medical use the power is typically up to 500 W/cm².

The maximum application time of the waves emitted by the device according to the present invention depends on the type of treatment and on the synergic combination of the powers used, typically from a minimum of 20 to a maximum of 60 minutes. In any case, this time corresponds to the time currently recommended for treatments with these types of waves, also considering the limits established by law for aesthetic treatments.

Further features and details of the invention will be better understood from the description below, provided by way of non-limiting example, and from the accompanying drawings, wherein:

- Fig. 1 is a representation of a perspective top view of a device according to an embodiment of the present invention;
- Fig. 2 is a representation of a perspective top view only of the applicator element of the device of Fig. 1;
- Fig. 3 is a representation of a perspective detail and exploded view of the applicator element illustrated in Fig. 2;
- Fig. 4 is a representation of a perspective bottom view of the applicator element illustrated in Fig. 2;
- Fig. 5 is a representation of a bottom side view of the applicator element illustrated in Fig. 2;
- Fig. 6 is a representation of a perspective top side view of the applicator element illustrated in Fig. 2, provided with a fixing element;
- Figs. 7a and 7b are representations of perspective top views of an applicator element according to other two embodiments of the present invention;
- Figs. 8a and 8b are respectively a perspective top representation and a bottom plan view of an applicator element according to another embodiment of the present

invention.

With reference to Fig. 1, the numeral 1 indicates a multi-function device according to a preferred embodiment of the present invention, the numeral 2 represents a control unit and the numeral 3 represents an applicator element.

5 The device 1 comprises the control unit 2 and eight applicator elements 3.

As illustrated in Fig. 3, each applicator element 3 comprises a hollow body consisting of a frame 4, a cover plate 5, which forms a wall of the body, and a wall 6 located on the opposite side to the cover plate 5. Therefore, the frame 4 supports, on one side, the wall 6 and, on the opposite side, the cover plate 5.

10 The body of the applicator element houses at least a printed circuit board 7 and the laser LEDs 131, the transducer 121 and the plates 111a, 111b acting as poles of the emitter device of radiofrequency waves.

In detail, the printed circuit board 7 is positioned parallel to the cover plate 5. The emitters and the transducers are connected and also fixed to the printed circuit board 7,
15 more precisely to its side facing the cover plate 5.

More in particular, the further components of the applicator element are the following: a single ultrasonic transducer 121, two plates 111a, 111b of the emitter device of radiofrequency waves, and forty-eight laser LEDs 131.

The ultrasonic transducer 121 is positioned at the center of the printed circuit board
20 7.

The two plates 111a, 111b are spaced from each other and arranged at the two sides of the transducer 121.

The plates 111a, 111b and the transducer have their outer part flush with the cover plate 5.

25 Forty-four laser LEDs 131 are positioned along the whole of the perimeter of the printed circuit board 7. Four further laser LEDs 131 are positioned close to the ultrasonic

transducer, each at the height of each end of the plates 111a, 111b.

The cover plate 5 is made of opaque material and therefore has the same number of holes as the ultrasonic wave transducer 121, the plates 111a, 111b and the laser LEDs.

According to a variant, not illustrated, the cover plate 5 is made of a transparent or
5 at least partially transparent material.

Preferably, the cover plate 5 has the same shape as the printed circuit board 7. In the examples of Figs. 3 and 8, the cover plate is, respectively, substantially rectangular and circular in shape.

The various parts of the device are fixed and connected to one another according to
10 known methods and means, such as interlocking insertion, screws, etc.

According to an embodiment illustrated in Figs. 6 and 7a, 7b, the applicator element 3 also has a slot 9 at each long side of the wall 6, on the outer side thereof. The two slots allow the passage of a strip of fabric 11 to fix the applicator element to the body part to be treated.

15 As illustrated in Fig. 1, the control unit 2 consists of a polyhedron shaped body with volume suitable to house the electronic components adapted to supply the emitters and/or the transducer and, in particular, to transform and/or modulate the mains current in order to generate, with the aforesaid devices, waves having the characteristics necessary to treat the body of the person. Typically, the control unit 2 comprises a CPU that controls all the
20 operations requested by a dedicated application software. Moreover, the control unit 2 includes a display screen 21 and a connection to the mains current, and also frequency and power generators that supply the devices in the applicator element.

Eight supports (not visible in the figures) extend from the body, to house the applicator elements therein.

25 Figs. 7a and 7b illustrate a further two embodiments of the form of the body of the applicator element.

In these embodiments, the applicator element can be fixed to the body part of the person, for example by means of a belt 11 or the like, but can, if necessary, also be grasped and held on or moved over the body parts of the person.

5 Figs. 8a and 8b represent an applicator element 3 according to another possible embodiment.

According to this embodiment, the applicator element is of mobile type, i.e. adapted to be grasped by the operator or user and held or moved on the body of the person to be treated. The applicator element comprises an elongated body with a shape and size such as to be grasped with one hand. A head 12, in which the emitters and/or the transducer are
10 housed, is fixed to one end of the body. Optionally, the head 12 also houses the printed circuit board 7.

In the example of the figures, the applicator element comprises at least two plates 111a, 111b, an ultrasonic transducer 121, and from 10 to 30 laser LEDs 131.

The head 12 preferably has a circular shape. The plates 111a, 111b and the
15 ultrasonic transducer 121 are preferably arranged concentrically to one another. As illustrated in Figs. 8a, 8b, one (outer plate) of the two plates 111a, 111b is arranged at the perimeter of the head 12, while the other (inner plate) is close to the ultrasonic transducer 121.

The laser LEDs are arranged along a circular line between the outer and inner plates
20 in the head 12. The contact face 8 of the head is preferably provided with the cover plate (not illustrated in the figure) that covers the LEDs 131. Preferably, the cover plate also has at least one central hole to allow propagation of the waves from the radiofrequency and ultrasonic devices.

The invention has been described purely for illustrative and non-limiting purposes,
25 according to some preferred embodiments. Therefore, a person skilled in the art can make modifications or variations, all of which are considered as falling within the scope of

protection of the present invention.

CLAIMS

1. An applicator element (3) for a multi-function device (1) for the aesthetic/medical treatment of body parts, comprising at least the following components:

- at least two components selected from an ultrasonic transducer (121), at least
5 two plates (111a, 111b) of an emitter of radiofrequency waves and an emitter of laser light (131);
- a printed circuit board (7);

the applicator element (3) having a contact face (8) from which the waves emitted by at least two of said components (111a, 111b, 121, 131) propagate.

10 2. The applicator element (3) according to claim 1, wherein the face (8) comprises a cover plate (5) with at least one through hole.

3. The applicator element (3) according to claim 2 wherein the cover plate has at least two of the following characteristics:

- a through hole or opening at the ultrasonic transducer (121),
- 15 - two through holes or openings, each at said plates (111a, 111b),
- a through hole or opening or cover plate made of material transparent to laser light at the emitter of laser light (131).

4. The applicator element (3) according to any one of claims 1 to 3, comprising the ultrasonic transducer (111a), two or more plates (111b, 131) of emitters of radiofrequency
20 waves and the emitters of laser light (131).

5. The applicator element (3) according to any one of claims 1 to 4, wherein the emitter of laser light is connected and also fixed to the printed circuit board (7).

6. The applicator element (3) according to any one of claims 1 to 5, comprising an ultrasonic transducer (121), two plates (111a, 111b) of a radio frequency emitter and from
25 ten to sixty laser LEDs (131).

7. The applicator element (3) according to any one of claims 1 to 6, wherein the body of

the applicator element comprises holding means or at least one through slot or slit (9) located on the upper part of this applicator element (3).

8. A multi-function device (1) for the aesthetic/medical treatment of body parts comprising:

- 5 - a control unit (2), and
 - at least one applicator element (3) connected to the control unit (2);

the device comprising at least two emitter devices selected from:

- an emitter of radio frequency waves,
 - an emitter of ultrasonic waves, and
10 - an emitter of laser light;

the applicator element (3) being according to any one of claims 1 to 7.

9. The device (1) according to the preceding claim, wherein the control unit (2) comprises an application software comprising preset operating programs and, optionally, a display screen (21).

15 **10.** The device (1) according to claim 8 or 9, comprising all three emitter devices.

11. The device (1) according to any one of claims 8 to 10, comprising at least one site for positioning the applicator element when not in use.

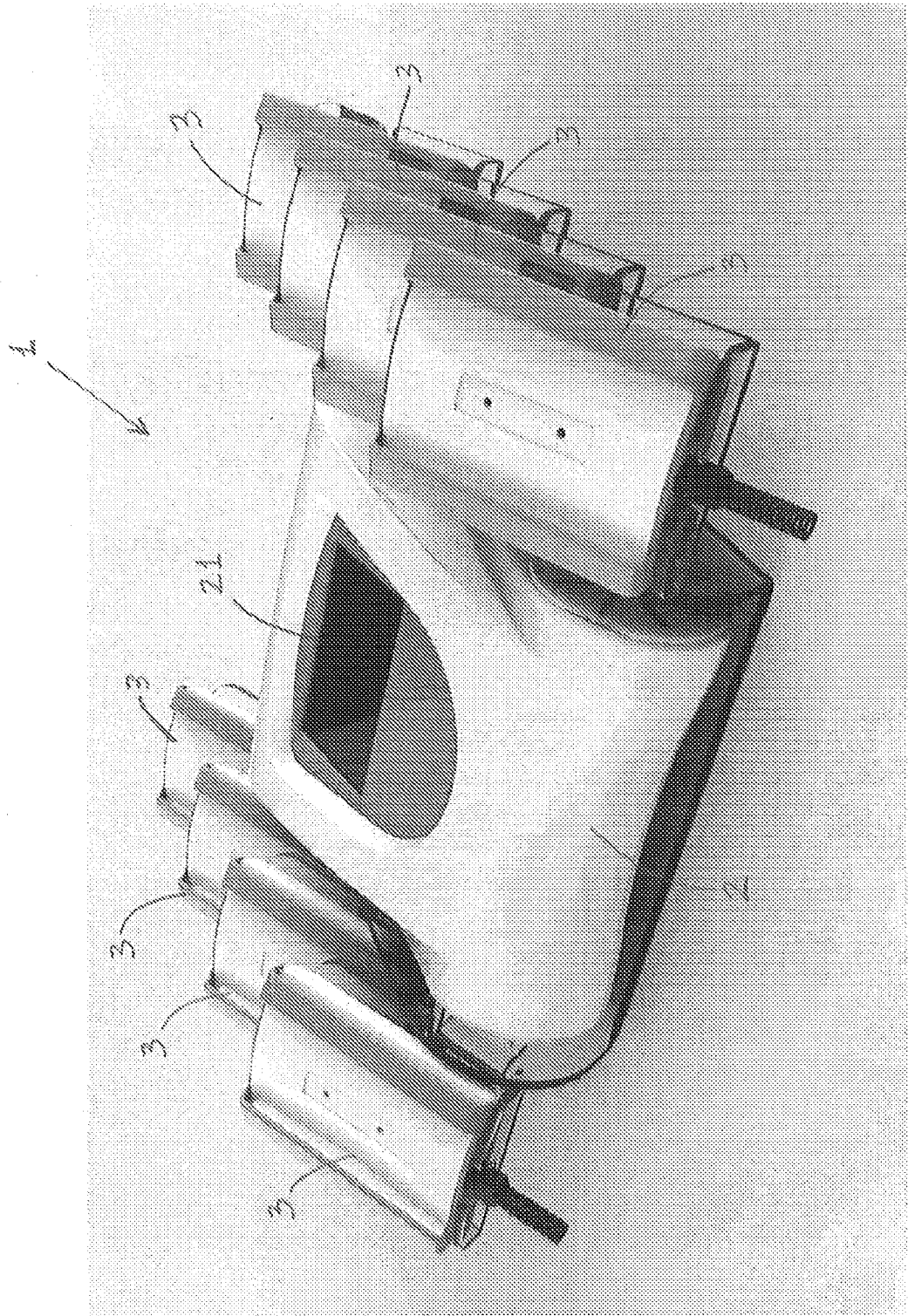


Fig.1

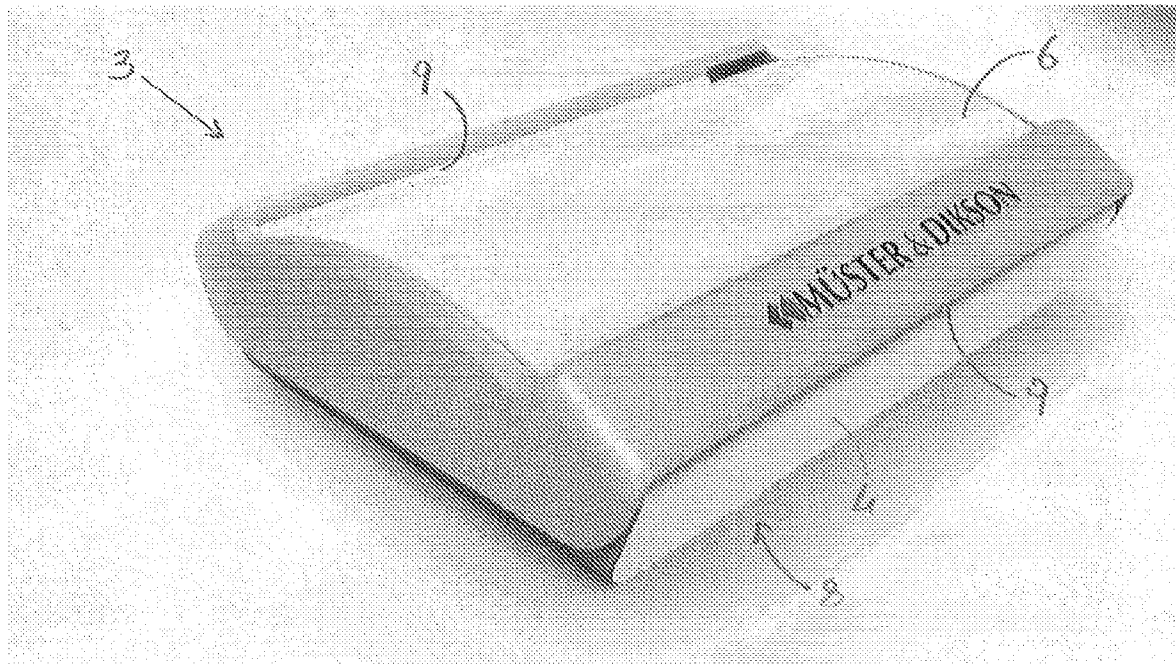


Fig. 2

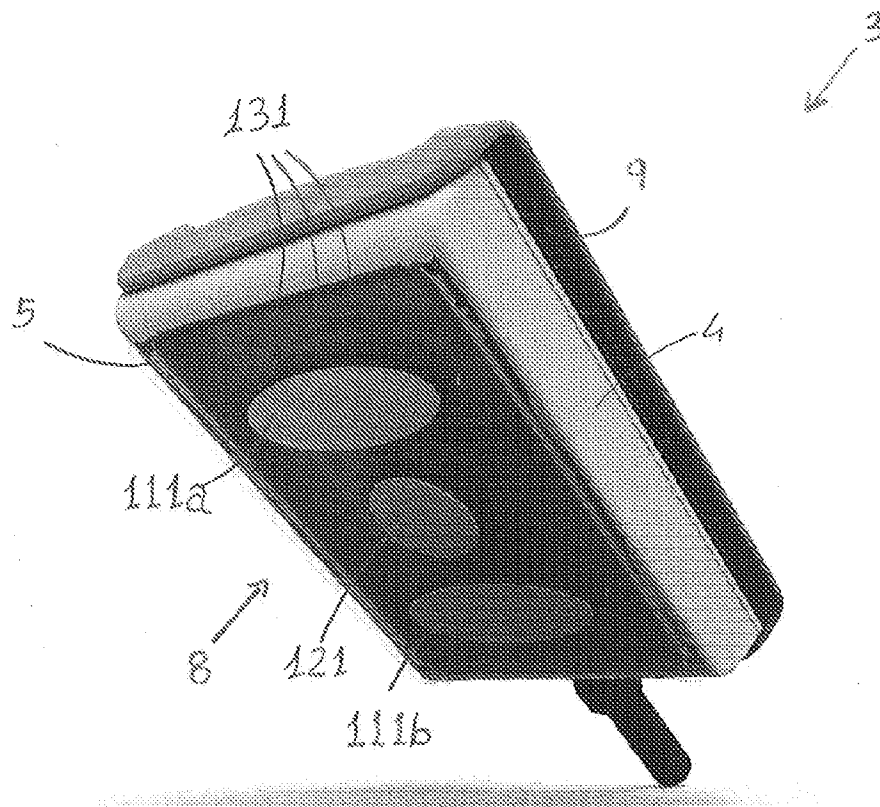


Fig. 4

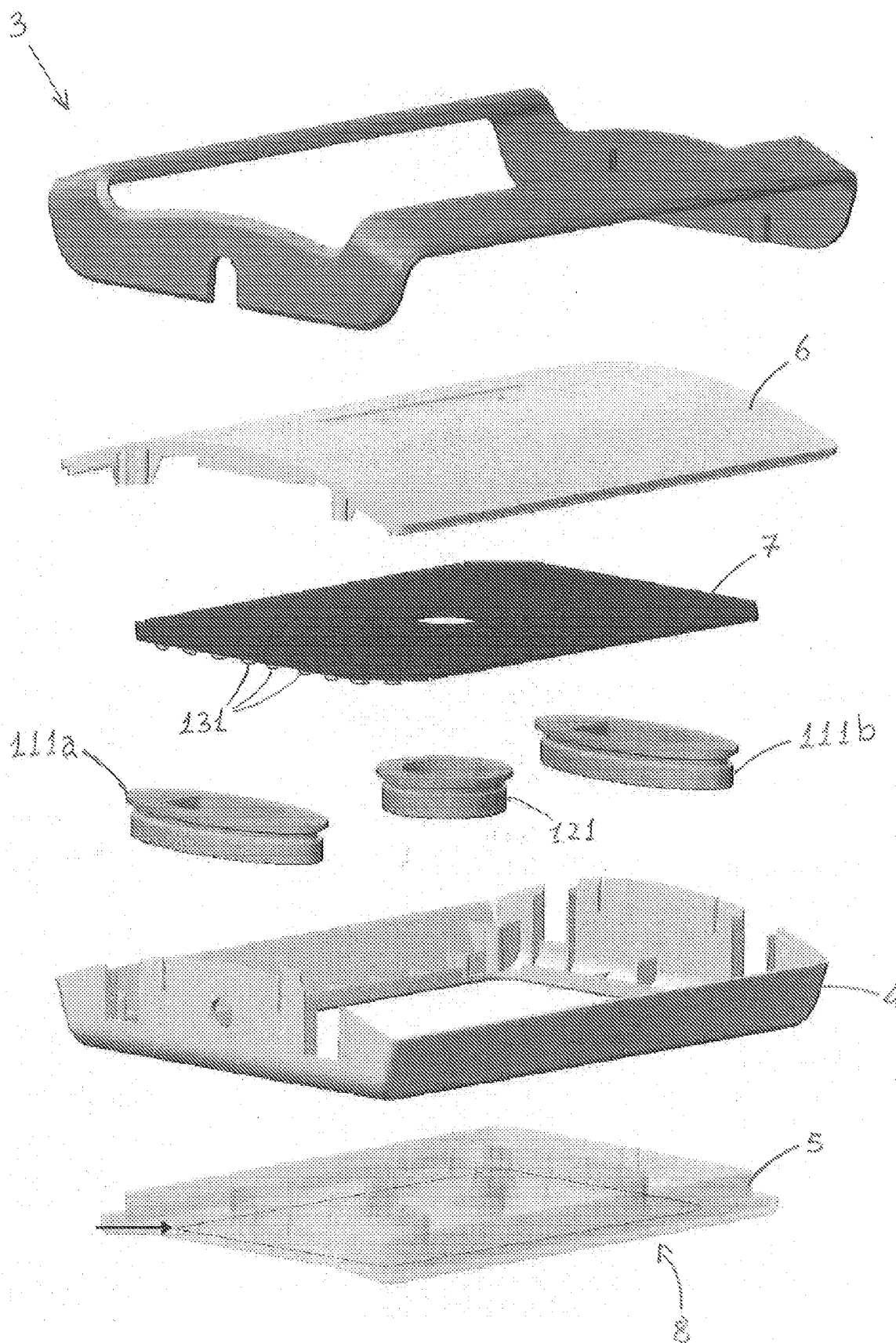


Fig.3

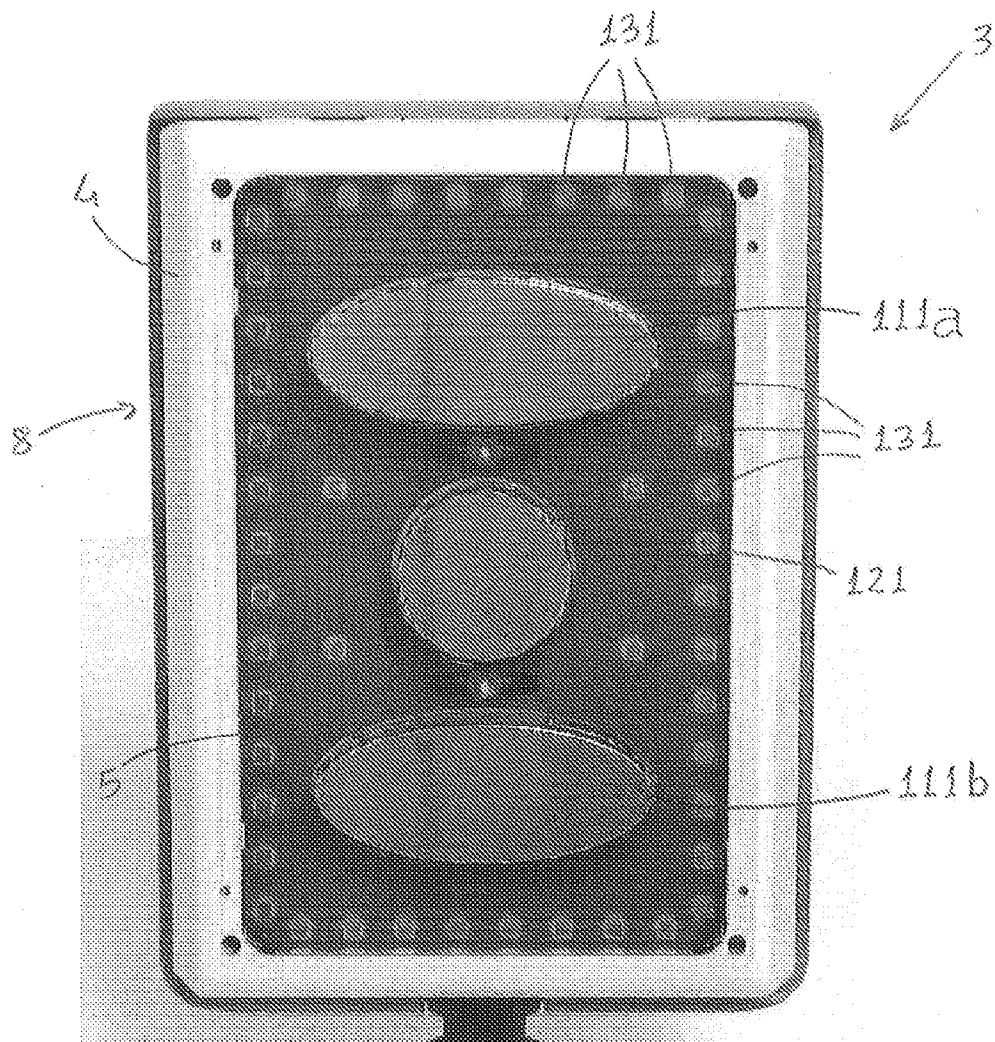


Fig.5

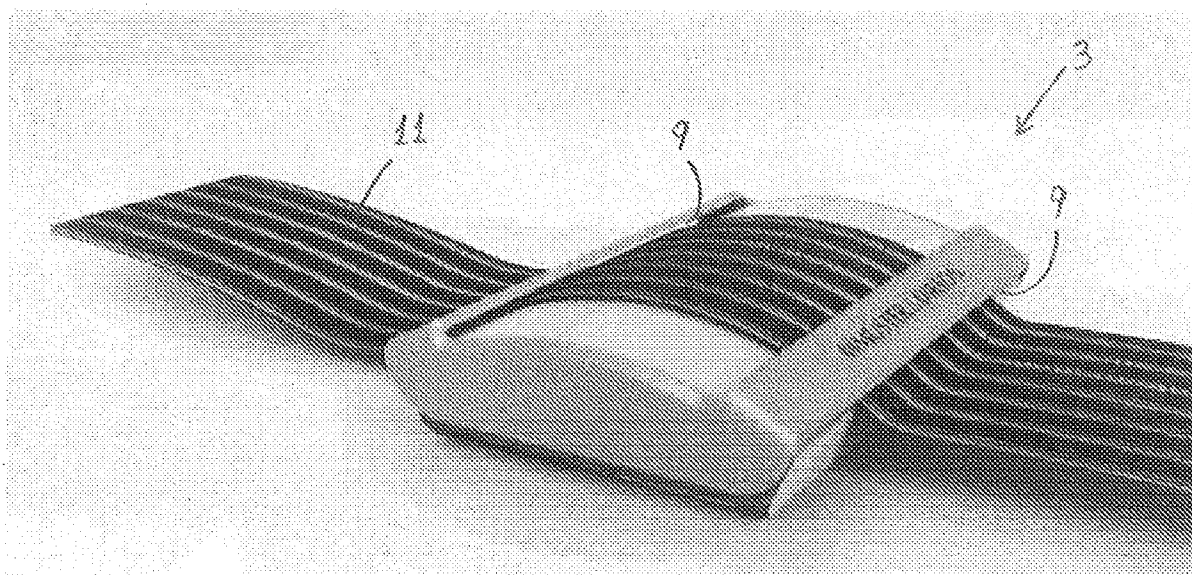


Fig.6

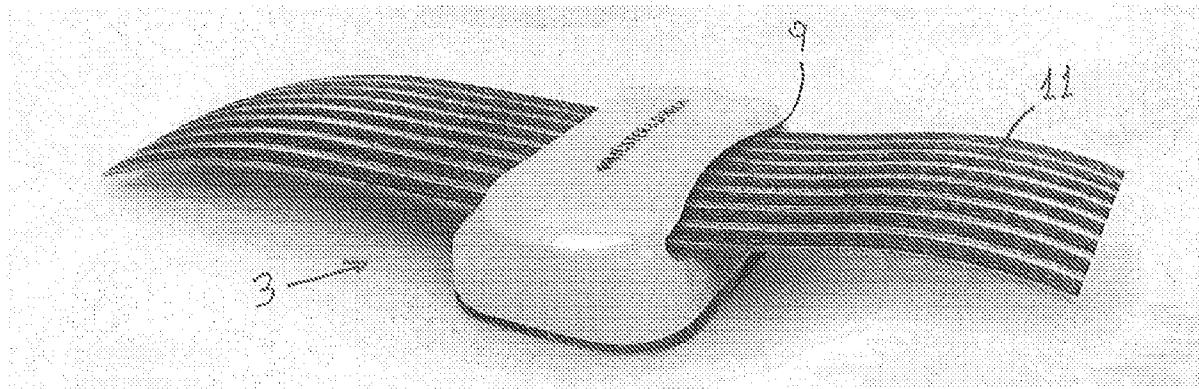


Fig. 7a

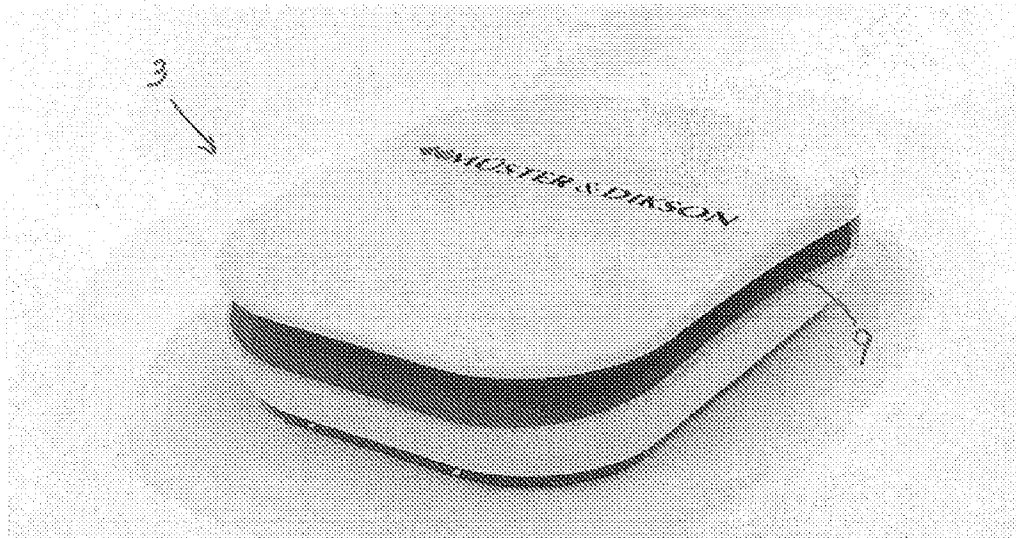


Fig. 7b

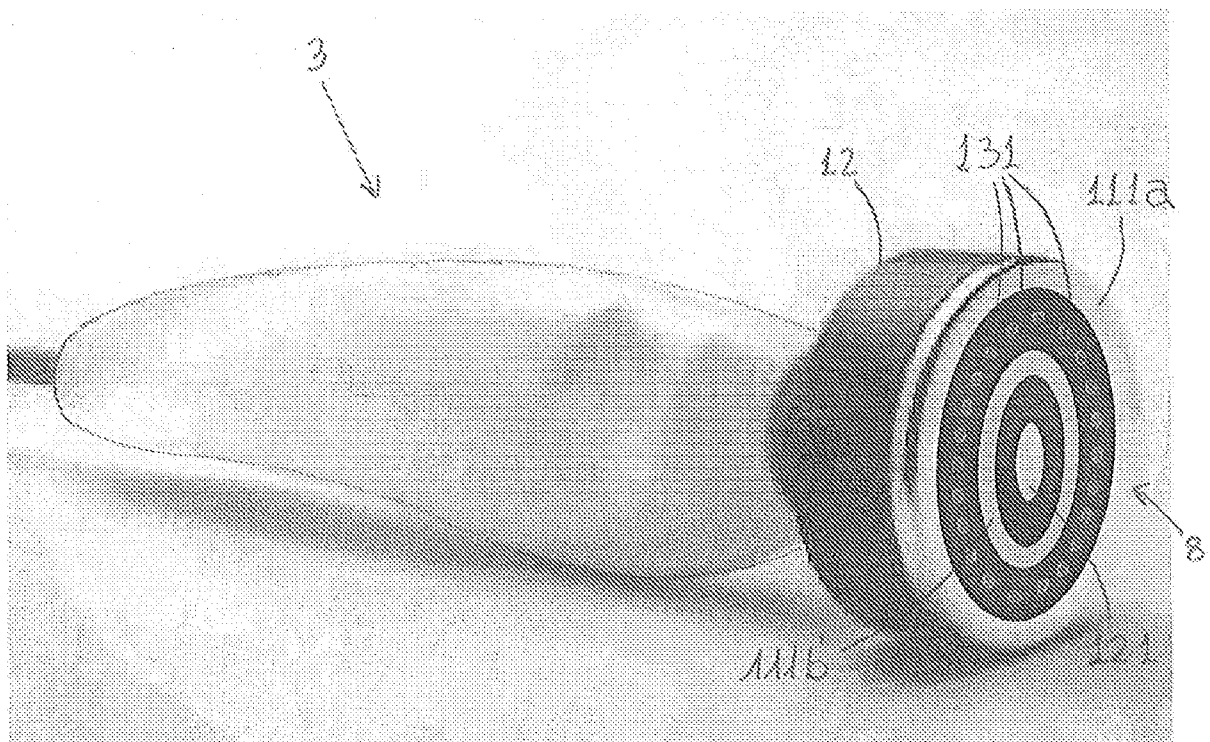


Fig.8a

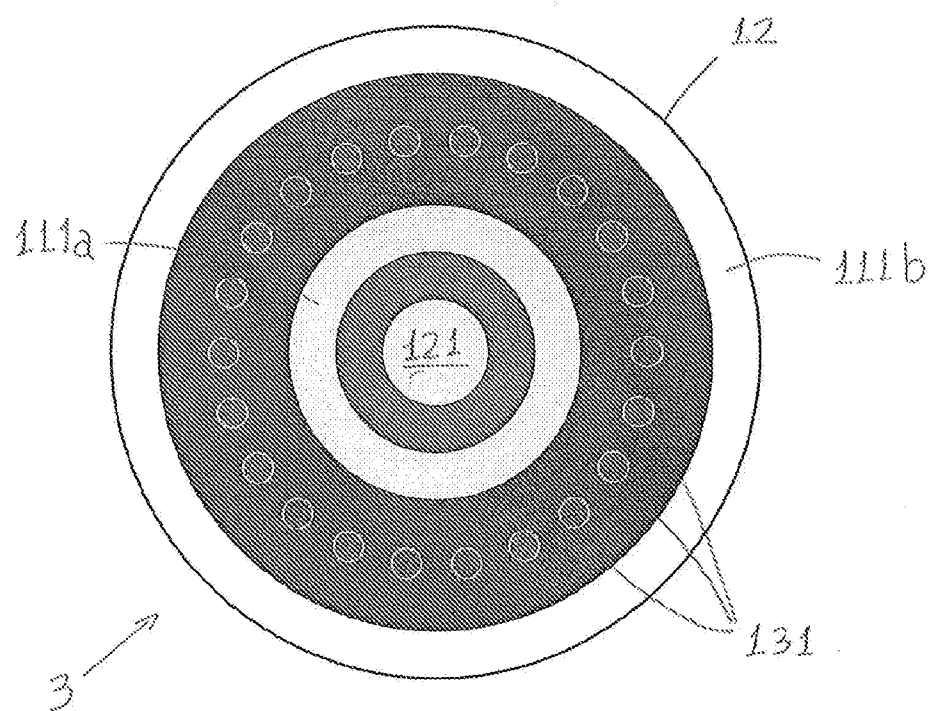


Fig.8b

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER INV. A61N7/00 A61B18/14 A61B18/20 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) A61N A61B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 2013 0005126 A (AMOREPACIFIC CORP [KR]) 15 January 2013 (2013-01-15) paragraph [0008] paragraphs [0026] - [0027]; figures 1-6 paragraphs [0034] - [0038]; figures 7-8 -----	1-11
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X	WO 2016/040150 A1 (CANDELA CORP [US]) 17 March 2016 (2016-03-17) paragraph [0002] paragraphs [0024] - [0038]; figures 1-3B ----- -/--	1-11
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
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Date of the actual completion of the international search 26 September 2018		Date of mailing of the international search report 16/10/2018
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Schnurbusch, Daniel

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International application No
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