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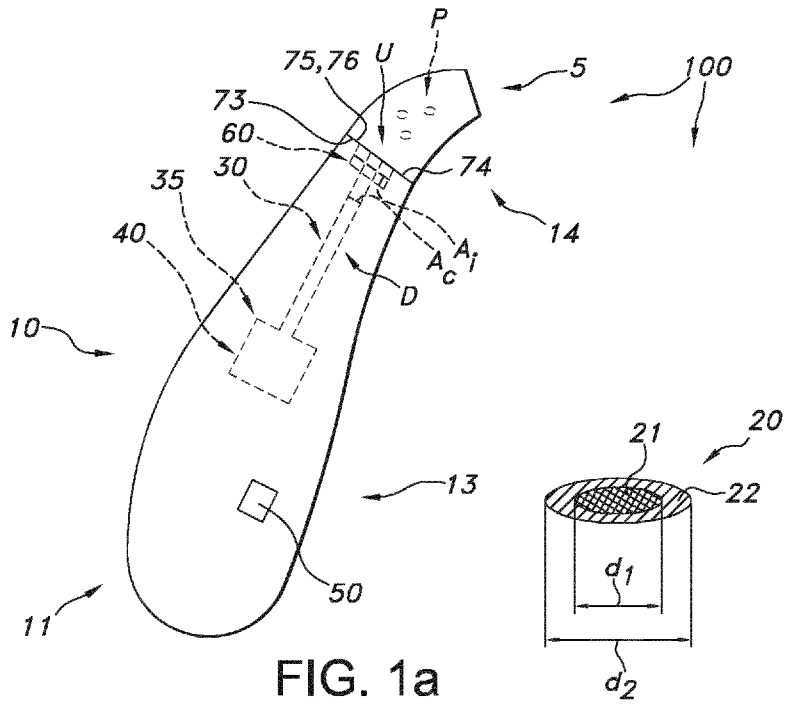

FIG. 1a

(57) Abstract: The invention provides a personal care device (10) and a filter element (20), wherein the personal care device (10) comprises a fluid flow system (35) comprising a fluid flow channel (30) and a fluid flow generator (40) configured to generate a flow of the fluid in at least part of the fluid flow channel (30), wherein the fluid flow channel (30) comprises a channel section (60) configured to host the filter element (20), wherein the fluid flow channel (30) comprises a fluid flow channel cross-section area (Ac) wherein the filter element (20) comprises an integrated filter (21) and seal (22), with the seal (22) perimetrically surrounding the filter (21).

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Filter element in personal care device

FIELD OF THE INVENTION

The invention relates to a personal care device, such as a micro dermo abrasion device or an electronic dental floss device, and to a filter element for such personal care device. The invention further relates to the use of such personal care device.

BACKGROUND OF THE INVENTION

Devices for personal care are known in the art. US2012209294 (Riiviva), for instance, describes an integrated hand-held device for micro dermo abrasion (microdermabrasion) which includes a device housing configured to be handheld. An abrasive suction tip attached to the device housing allows air to flow into the device housing through a tip opening and a secondary inlet separate from the tip opening. The abrasive suction tip includes an abrasive surface. A vacuum motor enclosed within the device housing provides air flow suction through the abrasive suction tip. An electrical storage component enclosed within the device housing provides electrical power to the vacuum motor. A switch electrically coupled to the vacuum motor and the electrical storage component can power on the vacuum motor.

Further, WO0141651 (Altair) describes a treatment tool and tissue collection system, for removal of outer layers of skin to provide a revitalized, fresh skin surface, and a method of using same, comprising an abrasive tipped tool mounted on the end or within the end of a hollow tube, said tube being connected to a source of vacuum. The vacuum aids in maintaining intimate contact between the abrasive tip and the skin during the treatment process and transports the removed tissue to a collection container. The abrasive surface within the tube is a motor driven abrasive pad. Contact between the pad and the abrasive disk is brought about or increased by application of a vacuum through the tube to the skin surface.

WO2009048281 describes an air injection portable inter-dental toothbrush can be devised consisting of: driving section, including air injection pan, filter for removing foreign aerial substance from outside, pan motor for bringing in air and supplying it to air injection pan, battery as a power for driving the pan and a battery still attached bedding; cleaning section, including cleansing fluid inlets and hose which is composed of a container

for keeping cleansing fluid, where the cleansing fluid container is connected to the hose while the other end of the latter being attached to the center of the gravity so that the fluid inlets and hose can infuse cleansing fluid no matter how the container's position changes, a valve which can control cleansing fluid flow, a stopper by which cleansing fluid being refilled or replaced; injecting section, including injecting nozzle where air brought in by driving section and cleansing fluid supplied by cleaning section blending and being injected; next to which inter-dental toothbrush section, including an outlet for discharging air and cleansing fluid, holes in plural numbers for injecting air and cleansing fluid perpendicularly and aslant, injection nozzle with toothbrush bristle stuck for injecting.

US2008249537 describes a skin resurfacing device for peeling the outermost layer of the skin for renewing the skin surface and repairing skin damage including a housing, a skin sensor, and a skin treater. The skin treater consists of an abrasive tip, a first end, a transparent portion, a first filter, and a second end, all of which are detachable and replaceable. The skin treater is connected to a vacuum source by a tubular hose. The vacuum provides both closeness of contact between the abrasive tip and the user's skin and the suctioning of skin debris peeled off. The skin treater, especially the abrasive tip is made with common material and mass production process so that they are disposable and economic.

SUMMARY OF THE INVENTION

The “micro dermo abrasion” (MDA) technique is being used to help the upper skin layer (the so called stratum corneum) to renew in a faster way than it would normally do. Traditionally, crystal microdermabrasion system contains a pump, a connecting tube, a hand piece, and a vacuum source. While the pump creates a high-pressure stream of inert crystals, like aluminum oxide, to abrade the skin, the vacuum removes the crystals and exfoliated skin cells. Instead of abrasion with particles in a gas stream, also a roughened surface, such as a diamond surface, of the tip of the device can be used. This is for instance known as (diamond) microdermabrasion. Unlike the crystal microdermabrasion system, the (diamond) microdermabrasion does not produce particles from crystals that may be inhaled into patients’ nose or blow into the eyes. One of the MDA working principles, the abrasion part, is causing debris (mainly being loosened dead skin cells). Because the device uses vacuum, part of this debris will be transported with the air into the device. The debris going into the device has an organic nature. This means that living organisms can use the debris as a breeding ground for starting and maintaining a living culture. On the other hand, the debris can clog the device in the end.

One of the options to this problem is collecting the debris on a filter. A disadvantage is however that now on the filter debris is collected. This only translates the problem to another part of the device. Optionally, a removable filter could be used. Hence, a further option would be to collect the debris in a more controlled way, e.g. on a disposable filter carrier. By exchanging this filter after use, the debris is being disposed of before it can do any harm. However, also such option is not without problems. Should the user forget to place the filter (sometimes also indicated as pre-filter), debris will nevertheless find its way into the device and may start causing harm.

Hence, it is an aspect of the invention to provide an alternative personal care device, such as a micro dermo abrasion (MDA) device, which preferably further at least partly obviates one or more of above-described drawbacks. It is further an aspect of the invention to provide an alternative filter element, that can be used as removable (such as disposable) filter element in such personal care device, which preferably further at least partly obviates one or more of above-described drawbacks. It is yet a further aspect of the invention to provide an alternative use of the personal care device, which preferably further at least partly obviates one or more of above-described drawbacks (of the use of state of the art uses of state of the art personal care devices).

Herein, the invention proposes a new solution by combining the filter with a seal. Hereby, the user, especially a consumer, will get instant feedback (the device will not be able to create (a good) vacuum on the skin, which the consumer feels instantly) and thus be triggered to place the filter in case the user would have forgotten to place the filter. Hence, in an embodiment, especially the MDA embodiment, the filter element and the personal care device are especially configured to be able to create a sufficient vacuum on the skin when the filter element is arranged in its position, while when the filter element is absent, an insufficient vacuum on the skin is created.

Hence, in a first aspect the invention provides a kit of parts comprising (at least) (i) a personal care device ("device") and (ii) a filter element, wherein the personal care device comprises a fluid flow system comprising a fluid flow channel (herein also indicated as "flow channel", or "channel") and a fluid flow generator (herein also indicated as "flow generator" or "generator") configured to generate a flow of the fluid in at least part of the fluid flow channel, wherein the fluid flow channel comprises a channel section, (the channel section being) configured to host the filter element, wherein the filter element comprises an integrated filter and seal, with the seal perimetrically surrounding the filter.

With such device, the user will get instant feedback when the filter element is not placed at the channel section, such as in case the user would have forgotten to place the filter element, and thus be triggered to place the filter element. When the filter element is not arranged in its position at the channel section, this may lead to an undesired pressure (too high or too low, depending upon the type of personal care device such as a too low (small) underpressure in e.g. the case of an MDA) and thereby a malfunction of the device. Thereby, the user will know that the filter element has not (yet) been placed. For instance in case of a MDA, the vacuum will not be enough to allow a useful micro dermo abrasion method (with the device), whereas when the filter unit is placed, the vacuum will allow a useful micro dermo abrasion method (with the device).In a specific embodiment, the fluid flow channel comprises a fluid flow channel cross-section area (A_c), wherein the channel section comprises a channel section cross-section area (A_i), with $A_i/A_c > 1$ (see also below). Especially, the filter element is configured to reduce an amount of particulate material downstream of the filter element. Assuming a suction flow, such particulate material should in general not enter the flow channel and optionally even the flow generator. Assuming a flow outwards from the device, it may be desired that items (including e.g. the skin or another body part or device part) downstream of the filter element should not be subjected to such particulate material. One may for instance desire to reduce scale formation downstream of such filter element. Hence, the filter element may especially be configured to filter the fluid that flows through the channel (at the position of the filter element, i.e. the channel section), or the fluid that enters the channel (at the position of the filter element, i.e. the channel section) or the fluid that leaves the channel (at the position of the filter element, i.e. the channel section).

In a further aspect, the invention provides the personal care device *per se*, i.e. a personal care device comprising a fluid flow system comprising a fluid flow channel and a fluid flow generator configured to generate a flow of the fluid in at least part of the fluid flow channel, wherein the fluid flow channel comprises a channel section, (the channel section being) configured to host the filter element, wherein the filter element comprises an integrated filter and seal, with the seal perimetrically surrounding the filter. In a further embodiment, the invention also provides such personal care device (already) comprising such (replaceable/disposable) filter element arranged in the channel section. In yet a further embodiment, (during use of the personal care device (in a personal care (device) method with such personal care device) at least once the filter element is replaced by a new filter element. This may be done by the user, such as the consumer. Hence, in further embodiments, the

invention also provides a kit of parts including a plurality of filter elements and/or a set including a plurality of filter elements. The user, such as the consumer, may for instance acquire during the lifetime of the personal care device new (disposable) filter elements, such as a set of filter elements. Especially, the fluid flow channel comprises a fluid flow channel cross-section area (A_c), wherein the channel section comprises a channel section cross-section area (A_i), with $A_i/A_c > 1$ (see also below).

An advantage of the filter element for the personal care device is that the user may immediately know when the filter element is not arranged in its position at the channel section. A further advantage of the filter element of the invention is that biological material, or other material, may be gathered on an element that may in principle be disposable. Hence, the present invention further allows a more hygienic personal care method, with a regular replacement of the filter element when necessary. This would also be possible with a normal disposable filter, i.e. a non integrated filter (without the seal). However with the present filter element including the seal, a further advantage is that the filter element is more easily handled than a normal filter. In many applications, the filter may have a diameter of less then about 1 cm, and the filter is relatively thin, which is a piece that is relatively difficult to handle. With the perimetrically surrounding seal, the filter can more easily be handled by the user.

In yet a further aspect, the invention also provides the filter element *per se*, i.e. a filter element comprising an integrated filter and seal, with the seal perimetrically surrounding the filter. The filter may especially comprise microfibers. Further, the filter may be configured to capture scale particles (from a liquid flow). Alternatively or additionally, the filter may be configured to capture one or more of abrasion particles (like inert crystals, like aluminum oxide) and exfoliated skin cells. Further, the seal may especially comprise e.g. a foam, a silicon rubber, a rubber, an elastomer, a thermoplast, a thermoplastic elastomer, or other polymer. Further, the filter element may e.g. be obtainable by injection molding a sealing material at the perimeter of a filter.

Especially, the filter element is configured to be functionally usable in the personal care device as described herein. The term "functionally usable" especially indicates that the filter elements fulfills the required filter function in the (personal care) device when arranged (correctly) in the channel section of the fluid flow channel of the fluid flow system of the (personal care) device.

Hence, in a further aspect the invention also provides the use of a removable filter element, such as described herein, for an fluid flow system (especially of the (personal

care) device as described herein) comprising a fluid flow channel and a fluid flow generator configured to generate a flow of the fluid in at least part of the fluid flow channel, which filter element, when arranged in the operating position, seals off a channel section of the air fluid flow system and wherein a channel section cross-section area (A_i) of the channel section in the absence of the filter element is too big to provide a meaningful suction stream while a cross-section area (A_c) of the channel section with the filter element in its operating position is such that a meaningful suction stream is generated, wherein the filter element comprises an integrated filter and seal, with the seal perimetrically surrounding the filter.

Herein the term "kit of parts" is especially used to indicate the combination of a personal care device and filter element, which are separate elements, but which may especially belong together, as the personal care device may function optimal when the filter element is placed at the right position in the personal care device. However, the personal care device may also be available as such (see also above), and the invention also includes embodiments where a user receives or orders one or more (additional) filter elements, such as when buying the personal care device or later, e.g. via web shop or a internet service site of the provider of the personal care device.

The term "personal care device" especially relates to an electronic device that is used to treat one or more of a skin, a pelt, a fur, a tooth, gum, and a body cavity. The term personal care device especially relates to an electronic device that is used to treat one or more of a skin, a tooth, gum and a body cavity. Examples thereof are for instance a micro dermo abrasion device or an electronic dental floss device (such as an Airfloss ®, see also below).

A micro dermo abrasion or microdermabrasion (MDA) device allows a popular and effective, non-surgical way to help reduce acne, scars, fine wrinkles, hyperpigmentation and stretch marks. Microdermabrasion is a skin care treatment designed to exfoliate the skin by gently pelting it with small particles carried by a stream of air. These treatments are administered for a variety of skin conditions, using abrasive particles and different types of microdermabrasion machines. However, also devices without using abrasive particles may be applied, such as with or without a moving abrasive piece (like a rotating ring with diamond pieces). In both cases however, whether or not using abrasive particles, a vacuum is used to remove debris from the skin and to massage the skin. Such device may include a filter element in order to protect the vacuum system, especially a pump, against debris, such as particles from the skin (skin flakes) and/or abrasive particles (if applicable).

Another example of the personal care device is an electronic dental floss device, such as the "Airfloss" of Philips. The Airfloss is a device using micro-droplet technology delivering a rapid burst of air and water droplets that gently removes plaque between the teeth and helps to improve gum health. The guidance tip on the device makes it easy to find the spaces between teeth and to place the tip at the appropriate angle for optimal cleaning of the whole mouth. Amongst others, such Airfloss is described in WO2009053892. Such device may also include a filter element in order to prevent scale transfer beyond the filter element.

Other examples of personal care devices may be a shaver, a beard styler, a body groomer, and a tooth brush.

The term "filter element" refers to in integrated item including a filter and seal. At least part of the seal is perimetrically arranged around the filter. In other words, the filter, which is especially an item having a thickness that is smaller than its length & width or smaller than its diameter, has at its (entire) perimeter a seal. The seal is used to promote maintenance of the desired pressure or pressure drop, and is especially configured to prevent flow of fluid, such as a gas or a liquid, around the filter. Hence, the seal is especially designed to promote flow of the liquid only through the filter, and not via a bypass beyond the filter. The phrase "perimetrically arranged around" does include filters that are round, square, rectangular, oval, etc. etc. The filter and filter element may independently have any shape, like round, square, rectangular, oval, etc. The function of the filter element is especially to remove material (being generated while executing a personal care method with the personal care device through the fluid flow channel), such as the above indicated skin flakes and/or other debris. Alternatively, the filter element may also be arranged to prevent scale migration beyond the filter element (see also above). Hence, the filter element may be arranged for filtering the fluid (flow) through (at least part of) the fluid flow channel. The term "filter element" may also refer to a plurality of filter elements, for instance arranged adjacent to each other (to increase the filter function), and/or arranged at different positions within the personal care device. For instance, there may be a pre-filter (filter element) at the channel section and further filter element between the channel section and the fluid flow generator, or a filter element beyond the flow generator, when seen from the channel section.

Especially, the filter generally comprises microfibers, arranged in a woven or random order, but especially with fluid paths that are smaller than the intended particle size of the debris. Especially, the seal comprises a material that can be (easily) compressed and that prevents fluid to flow through it. The filter element may for instance comprise two sheets

of supporting material (the outer layers, giving the filter the necessary strength) with a layer of randomly arranged fibers as filter. The phrase "integrated filter and seal" indicates that the filter element is a single unit, which can e.g. be arranged in the channel section.

As indicated above, the personal care device comprises a fluid flow system comprising a fluid flow channel and a fluid flow generator configured to generate a flow of the fluid in at least part of the fluid flow channel. Of course this does not exclude the presence of all kind of other items in the personal care device, but at least the personal care device comprises such fluid flow system. The term "fluid" may refer to a gas, such as air (such as in case of the MDA), to a liquid, such as water, or to a mixture of a gas and a liquid, such as air and water, like in the Airfloss. The "fluid flow generator" may in principle be any item that is able to generate a flow, e.g. by imposing a pressure difference, but may especially refer to an electric pump. The flow may be a suction flow, such as in the case of a micro dermo abrasion device, i.e. a device inwards directed flow, but the flow may also be a flow directed outwards from the device, such as in the case of an electronic dental floss device, such as the Airfloss. In the case of a suction flow, the flow system may especially be arranged to remove material (being generated while executing a personal care method with the personal care device) through the fluid flow channel.

The fluid flow channel comprises a channel section, at which the filter element is arranged. Especially, the filter element is removable arrangeable to the channel section. The filter element may be arranged to partly close the channel section with the seal, and to leave a part open by the fluid permeable filter. The channel section is especially configured to host the filter element. Hence, in an embodiment, there may be an arrangement, like a recession, wherein the filter element can be (removably) arranged. The channel section may e.g. be a channel end, such as a channel inlet or channel outlet (these terms relate to the configured flow during use of the device). Especially, the filter may thus be configured (and arranged) to filter the fluid in the channel or entering the channel or leaving the channel.

Both the flow channel and the channel section have a cross-sectional area. These areas especially relate to the respective cross-sectional areas with a channel axis perpendicular to such cross-section. Hence, this cross-section is especially a cross-section perpendicular to a channel axis (or main flow direction vector during use of the device). Especially, the cross-section of the channel is smaller than the cross-section than the filter channel section. In other words, the filter element will in general be too large to enter the channel, as its cross-section is larger. This larger cross-section is especially indicated by the equation $A_i/A_c > 0.1$, especially > 0.5, even more especially > 1, wherein A_i is the cross-

sectional area of the channel section, such as a channel inlet, and A_c is the cross-sectional area of the channel. Especially this condition may lead to the advantageous effect that absence of the filter element will immediately be detected by the user due to malfunction of the device.

As indicated above, the channel section may be a channel end. This indicates that the channel section in such embodiment is not a possible channel section at the flow generator, but remote thereof. It is a channel section that is upstream from the flow generator in case of a suction flow, and is downstream of the generator in case of a flow that is directed outwards (to the user). In the former case, it may be an inlet; in the latter case the channel section may be an outlet. The term "channel section" does not exclude the presence of another channel adjacent to the filter element. Especially, the channel section remote from the flow generator is a channel section from a channel that is in fluid contact with the fluid flow generator and which channel section is the end of such channel closest to the user when the personal care device is used (for a personal care method with such device).

Especially, the personal care device comprises a first part (such as a device housing) and a second part (such as a functional unit) detachable connected to said first part, wherein especially the personal care device is configured to provide a user access to the channel section to replace the filter element when the first part and the second part are in a detached state. For instance, referring to the MDA device, the second part may be a head that - during use - is in contact with the skin, and which head may be detachable be connected to the first part, for instance with a magnetic connection. In case of the electronic dental floss device, the second part may be the part that provides the burst of air and water droplets to the gum/teeth, and the first part may (again) be the device housing including the flow system (and water reservoir). And advantage of such two-part system (or multiple part system) may be it may provide a user access to the channel section, such as to replace the filter element, or to inspect the filter element, when the first part and the second part are in a detached state. Such second part may also comprise a channel, which may be in fluid contact with the fluid flow channel. For instance such channel in the second part may be directly adjacent to the filter element, when the second part is functionally coupled to the first part. However, such channel in the second part may be considered as another channel in a physical different part than the first part (while nevertheless forming (in use) a single unit, i.e. the personal care device). Between the first and the second part, there may be a (small) opening, as these are separate parts that are connected to each other to provide a functional device. For instance, due to such slit, (under)pressure may leak away. Assuming a suction flow, without the seal

sealing of such slit, the fluid flow generator, here a suction flow generator, may suck to much air, by which the personal care device cannot offer a useful vacuum to the user. When bringing together the first part and the second part, they may form a connection (a detachable connection); for instance an upper face of the first part and a lower face of the second part may form a connection. Especially, the filter element is configured to seal the connection between the first part and said second part (when the first element and second element are connected (attached) to each other). In this way, fluid may not leak away through said connection (in the case of an outward flow) or gas may enter the channel through said connection (in the case of an inward flow; vacuum). The first part and the second part may be connected (attached) to each other with means known in the art, like one or more of magnetic means, physical (reversibly attachable) attachment means, like via a screw connection, a sliding connection, or other types of reversible fasteners that may mechanically joins or affixes two or more objects together in a reversible way.

Especially, the personal care device may also include a user warning functionality, especially configured to give a warning signal (to the user) related to a status of the functionality of the filter element in the personal care device. Such functionality may include one or more of (i) measuring the pressure drop over the filter, (ii) measuring the number of particles upstream or downstream or both upstream and downstream of the filter, (iii) optically measuring the filter, etc. etc. The warning signal may include a(n indicator) light that is switched on when the filter is fine, or which turns red when the filter is (too) polluted, or which indicates a (performance) range, such as e.g. often used for vacuum cleaners, etc. etc. Alternatively or additionally, the warning signal may include a sound signal or a vibration signal, etc. etc. Alternatively or additionally, the warning signal may also include a switching off or a prevention of switching on of the device, or of the flow generator. However, also visual inspection of the filter element by the user may be applied.

The personal care device as described herein, may be used for personal care, wherein (during use) at least once the filter element is replaced by a new filter element. Especially, such personal care device may be used for cosmetic personal care. The term "cosmetic personal care" especially relates to the use in a cosmetic treatment. Hence, the invention also provides the use of the personal care device in a cosmetic treatment, wherein in a specific embodiment (during use) at least once the filter element is replaced by a new filter element.

The terms “upstream” and “downstream” relate to an arrangement of items or features relative to the propagation of the fluid, with in general upstream being at a higher pressure and downstream being at a lower pressure.

The term “substantially” herein, such as in “substantially consists”, will be understood by the person skilled in the art. The term “substantially” may also include embodiments with “entirely”, “completely”, “all”, etc. Hence, in embodiments the adjective substantially may also be removed. Where applicable, the term “substantially” may also relate to 90% or higher, such as 95% or higher, especially 99% or higher, even more especially 99.5% or higher, including 100%. The term “comprise” includes also embodiments wherein the term “comprises” means “consists of”. The term “and/or” especially relates to one or more of the items mentioned before and after “and/or”. For instance, a phrase “item 1 and/or item 2” and similar phrases may relate to one or more of item 1 and item 2. The term "comprising" may in an embodiment refer to "consisting of" but may in another embodiment also refer to "containing at least the defined species and optionally one or more other species".

Furthermore, the terms first, second, third and the like in the description and in the claims, are used for distinguishing between similar elements and not necessarily for describing a sequential or chronological order. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other sequences than described or illustrated herein.

The devices herein are amongst others described during operation. As will be clear to the person skilled in the art, the invention is not limited to methods of operation or devices in operation. Further, the invention may also be applied in devices in general, i.e. not only personal care devices, though the invention may especially be of interest for the personal care device applications.

It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. Use of the verb "to comprise" and its conjugations does not exclude the presence of elements or steps other than those stated in a claim. The article "a" or "an" preceding an element does not exclude the presence of a plurality of such elements. The invention may be implemented by means of hardware comprising several distinct elements, and by means of a suitably

programmed computer. In the device claim enumerating several means, several of these means may be embodied by one and the same item of hardware. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

The invention further applies to a device comprising one or more of the characterizing features described in the description and/or shown in the attached drawings. The invention further pertains to a method or process comprising one or more of the characterising features described in the description and/or shown in the attached drawings.

The various aspects discussed in this patent can be combined in order to provide additional advantages. Furthermore, some of the features can form the basis for one or more divisional applications.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying schematic drawings in which corresponding reference symbols indicate corresponding parts, and in which:

Figs.1a-1f schematically depict a number of embodiments and aspects of the invention.

The drawings are not necessarily on scale.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Fig. 1a schematically depicts a kit of parts 100 comprising a personal care device 10 and a filter element 20. Here, by way of example the personal care device 10 is an MDA device, indicated with reference 11. The personal care device 10 comprises a fluid flow system 35 comprising a fluid flow channel 30 and a fluid flow generator 40 configured to generate a flow of the fluid in at least part of the fluid flow channel 30. As this is internal in the device, the fluid flow system 35 is indicated with dashed lines. The fluid flow channel 30 comprises a channel section 60 configured to host the filter element 20. Here, channel section 60 is a channel end (of channel 30). This filter element 20 is shown in the right part of the drawing, and such filter element can be arranged in the channel section 60. Assuming a suction flow generator, i.e. the flow is directed in a direction from the functional piece indicated with reference 5 to the flow generator 40, the channel section 60 may be a channel inlet. The channel section 60 here can e.g. a recess in a body of the device 10 (see also fig. 1b), which recess includes a channel end.

Reference 50 indicates an optional user warning functionality. For instance, this may be an indicated light configured to give a warning signal (light signal) related to a status of the functionality of the filter element 20 in the personal care device 10, for instance green indicating that the filter is properly working and red indicating that the filter is polluted and the filter element 20 should be replaced with a fresh one. A different and more simple feedback system could be, when the filter material would be chosen in a contrasting color with respect to the debris material, thus giving instant (color based) feedback to the user. This may allow (simple) visual inspection.

The fluid flow channel 30 comprises a fluid flow channel cross-section area A_c and the channel section 60 comprises a channel section cross-section area A_i, which is indicated in fig. 1b. These cross-sections are especially cross-sections perpendicular to a channel axis (or main flow direction vector during use of the device)(not depicted). Especially $A_i/A_c > 1$. As also shown in fig. 1a, the filter element 20 comprises an integrated filter 21 and seal 22, with the seal 22 perimetrically surrounding the filter 21. By way of example the filter 21 is round, and also the seal 22 is round. The former has a diameter d1; the latter a diameter of d2, with d2>d1. Such filter element 20 may be arranged in the channel section 60, as shown by the recession in fig. 1b.

Fig. 1b schematically depicts an embodiment of a top part of a first part 13, such as a housing, of the electronic personal care device 10. On top of such first part 13, a second part 14, especially a functional part may be arranged, such as schematically depicted in figs. 1c-1e. Reference 70 indicates an optional recess, with one or more openings 71. Air may enter flow channel 30 (see figs 1a-1b) through the opening(s) 71 (in the recess) in the second part 14, and through the filter 21 of filter element 20 (see fig. 1a and 1d). Fig. 1d schematically depicts the same embodiment as schematically depicted in fig. 1c, but now with the filter element 20 downstream (in this MDA embodiment) of the opening(s) 71 (see fig. 1c). The filter element 20 will reside in channel inlet 60 (see figs. 1a-1b). Reference 75 indicates an opening between the first part 13 and the second part 14, as these are separate parts that are connected to each other to provide a functional device. For instance, due to such slit, (under)pressure may leak away. Hence, when the seal does not seal off this slit, a non-functional underpressure may be obtained, which makes – in this embodiment – an MDA not work properly. Reference 73 refers to an upper face of the first part 13 and reference 74 refers to a lower face of second part 14. Note that the terms upper and lower are only used to indicate these faces, but are not limiting on the use of the device. When bringing together the

first part 13 and the second part 14, for instance the upper face 73 and the lower face 74 may form a connection.

This connection between the two parts is indicated with reference 76 (see also fig. 1f). Hence, especially the filter element 20 is configured to seal the connection 76 between the first part and said second part. The connection may have a continuous perimeter. In an embodiment, said connection is in a plane. More in particular, the connection may be substantially circular or substantially oval.

Reference U indicates the upstream side of the filter element and reference D indicates the downstream side of the filter element in this embodiment. The filter element 20, when arranged in the personal care device 10 may prevent particulate material, such as schematically depicted to be present in the second part 14, to penetrate into the flow channel 30.

Fig. 1f schematically depicts a further embodiment of the personal care device 10, here for instance a dental floss device 12, such as the Airfloss. In such system, the flow generator 40 may especially be arranged to provide a water stream through the flow channel 50, and finally out of the functional piece 5. Again, the device may comprise at least two parts, a first part 13 and a second part 14, which may be disconnected to arrange the filter element in the channel section 60, here a channel outlet. As in fig. 1f, schematically a dental floss device is shown, here downstream D and upstream U are arranged opposite relative to fig. 1a, which schematically shows a device which uses a suction flow. Here, it may be desirable to prevent entrance of particulate matter P in the second part 14 of the device.

Referring to figs. 1a and 1f, the second part 14 in fig. 1a is arranged upstream of the first part 13, as a MDA is schematically depicted, whereas in fig. 1f, the second part 14 is arranged downstream of the first part 13, as an Airfloss is schematically depicted.

In both figures 1a and 1b, the filter element 20 may alternatively (or additionally) also be arranged in the second part of the personal care device. Such second part may also include a fluid flow channel with channel section.

With the devices schematically depicted above, and with other personal care devices, the filter element, when arranged in the operating position, may seal off a channel section of the air fluid flow system, wherein a channel section cross-section area (A_i) of the channel section in the absence of the filter element is too big to provide a meaningful suction stream (or outward flow) while a suction channel section (or channel section for an outward flow) (A_c) of the channel section with the filter element in its operating position is such that a

meaningful suction stream (or outward flow) is generated, wherein the filter element comprises an integrated filter and seal, with the seal perimetrically surrounding the filter.

CLAIMS:

1. A kit of parts (100) comprising a personal care device (10) and a filter element (20), wherein the personal care device (10) comprises a fluid flow system (35) comprising a fluid flow channel (30) and a fluid flow generator (40) configured to generate a flow of a fluid in at least part of the fluid flow channel (30), wherein the fluid flow channel (30) comprises a channel section (60) configured to host the filter element (20), wherein the filter element (20) comprises an integrated filter (21) and seal (22), with the seal (22) perimetrically surrounding the filter (21).

2. The kit of parts (100) according to claim 1, comprising a micro dermo abrasion device (11) or an electronic dental floss device (12).

3. The kit of parts (100) according to any one of the preceding claims, wherein the seal comprises a foam, a silicon rubber, a rubber, an elastomer, a thermoplast, a thermoplastic elastomer, or another polymer, and wherein the filter element is obtainable by injection molding a sealing material at the perimeter of a filter.

4. The kit of parts (100) according to any one of the preceding claims, wherein the personal care device (10) comprises a first part (13) and a second part (14) detachable connected to said first part (13), wherein the personal care device (10) is configured to provide a user access to the channel section (60) to replace the filter element (20) when the first part (13) and the second part (14) are in a detached state, and wherein the filter element (20) is configured to seal a connection (76) between the first part (13) and the second part (14).

5. The kit of parts (100) according to any one of the preceding claims, wherein the fluid flow channel (30) comprises a fluid flow channel cross-section area (A_c) and wherein the channel section (60) comprises a channel section cross-section area (A_i), with $A_i/Ac > 1$.

6. The kit of parts (100) according to any one of the preceding claims, wherein the personal care device (10) includes a user warning functionality (50) configured to give a warning signal related to a status of the functionality of the filter element (20) in the personal care device (10).

7. A personal care device (10) comprising a fluid flow system (35) comprising a fluid flow channel (30) and a fluid flow generator (40) configured to generate a flow of a fluid in at least part of the fluid flow channel (30), wherein the fluid flow channel (30) comprises a channel section (60) configured to host a filter element (20), and wherein the filter element (20) comprises an integrated filter (21) and seal (22), with the seal (22) perimetrically surrounding the filter (21), and wherein the filter element (20) is configured to reduce an amount of particulate material downstream of the filter element (20).

8. The personal care device (10) according to claim 7, comprising such filter element (20) arranged in the channel section (60).

9. The personal care device (10) according to any one of claims 7-8, comprising a micro dermo abrasion device (11) or an electronic dental floss device (12), wherein the personal care device (10) comprises a first part (13) and a second part (14) detachable connected to said first part (13), wherein the personal care device (10) is configured to provide a user access to the channel section (60) to replace the filter element (20) when the first part (13) and the second part (14) are in a detached state, and wherein the filter element (20) is configured to seal a connection (76) between the first part (13) and the second part (14).

10. The personal care device (10) according to any one of claims 7-9, wherein the fluid flow channel (30) comprises a fluid flow channel cross-section area (A_c) and wherein the channel section (60) comprises a channel section cross-section area (A_i), with $A_i/Ac > 1$.

11. The personal care device (10) according to any one of claims 7-10, wherein the personal care device (10) includes a user warning functionality (50) configured to give a warning signal related to a status of the functionality of the filter element (20) in the personal care device (10).

12. A filter element (20) comprising an integrated filter (21) and seal (22), configured to be functionally usable in the personal care device (10) as defined in any one of claims 7-11.

13. The filter element according to claim 12, wherein the seal comprises a foam, a silicon rubber, a rubber, an elastomer, a thermoplast, a thermoplastic elastomer, or another polymer, and wherein the filter element is obtainable by injection molding a sealing material at the perimeter of a filter.

14. Use of the personal care device (10) as defined in any one of claims 7-11 for personal care, wherein at least once the filter element (20) is replaced by a new filter element (20)

15. Use of a removable filter element (20) for an air fluid flow system (35) comprising a fluid flow channel (30) and a fluid flow generator (40) configured to generate a flow of the fluid in at least part of the fluid flow channel (30), which filter element (20), when arranged in the operating position, seals off a channel section (60) of the air fluid flow system (35) and wherein a channel section cross-section area (A_i) of the channel section (60) in the absence of the filter element (20) is too big to provide a meaningful suction stream while a cross-section area (A_c) of the channel section (60) with the filter element (20) in its operating position is such that a meaningful suction stream is generated, wherein the filter element (20) comprises an integrated filter (21) and seal (22), with the seal (22) perimetrically surrounding the filter (21).

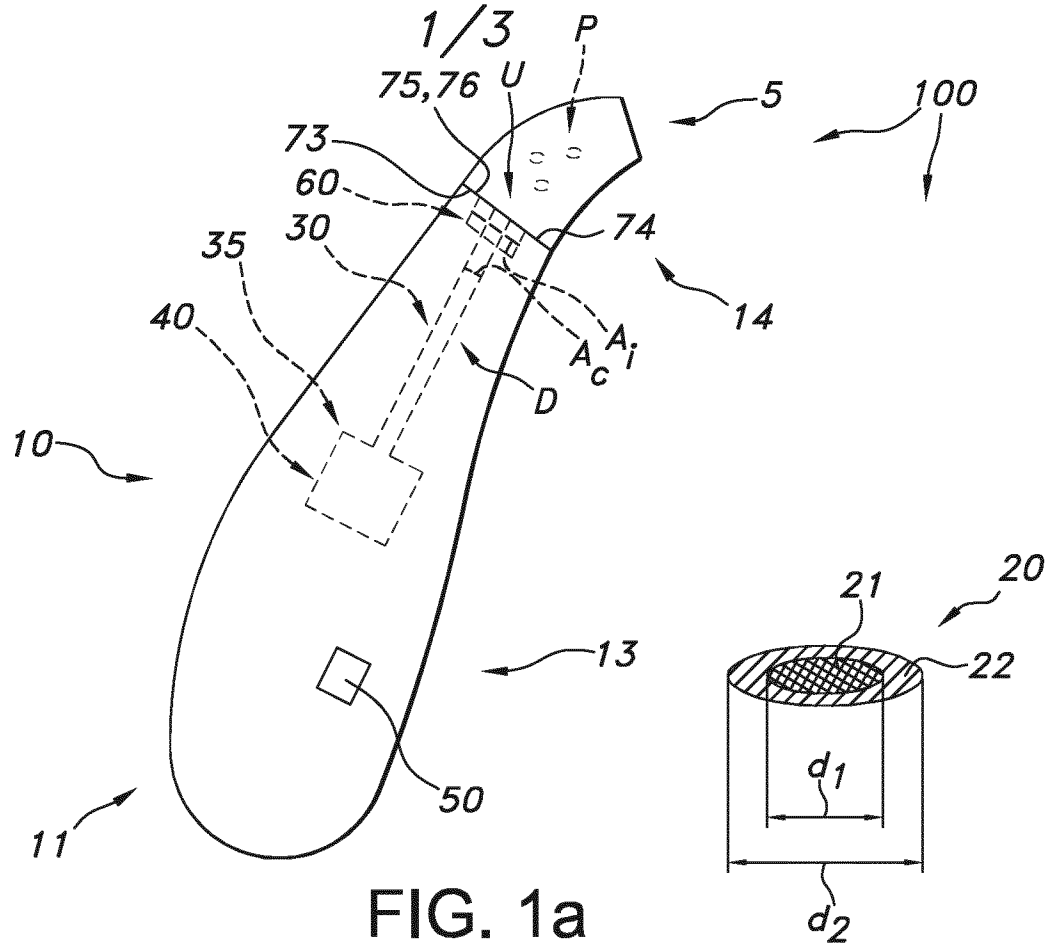
1/3
P
75,76
U
5
100
73
60
74
30
35
14
40
A_i
A_c
D
10
21
20
22
13
d_1
50
11
d_2

FIG. 1a

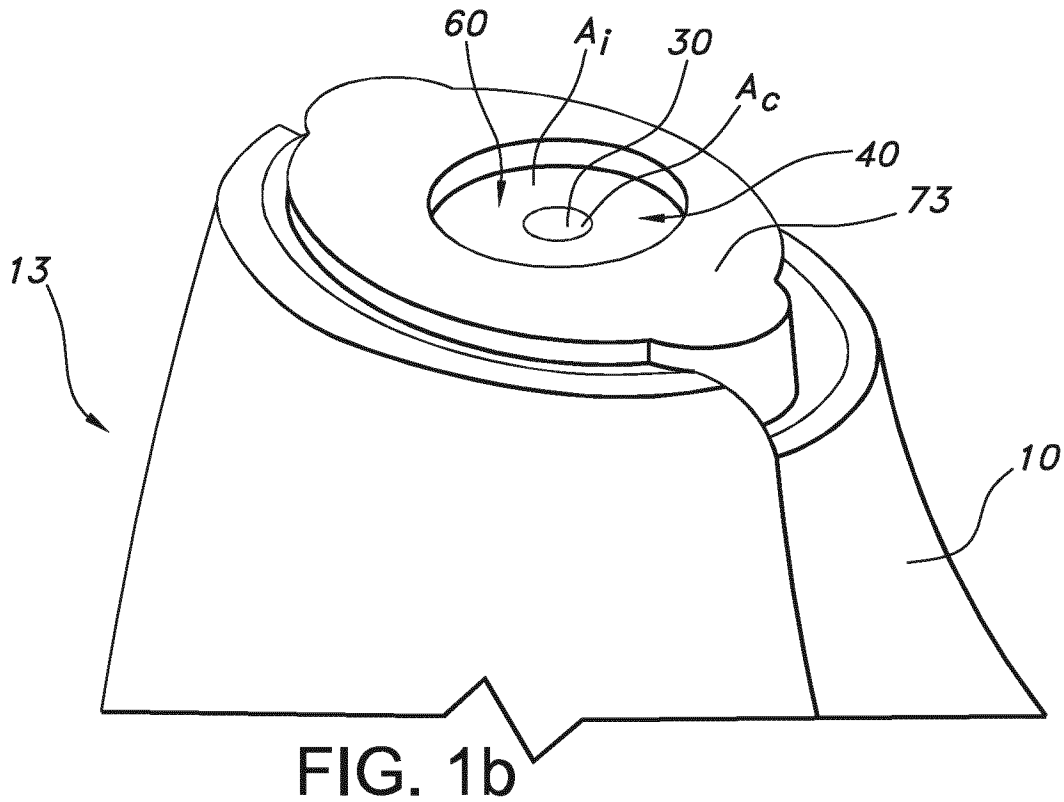
60
A_i
30
A_c
40
73
13
10

FIG. 1b

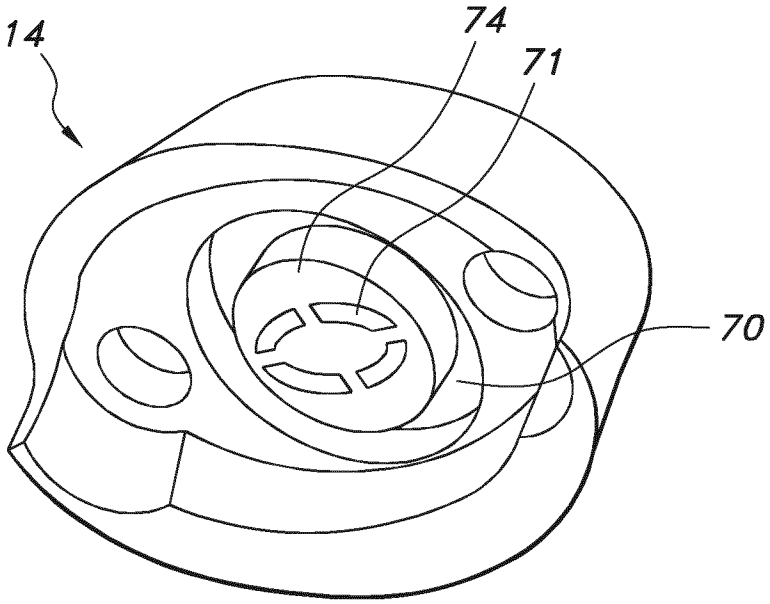

FIG. 1c

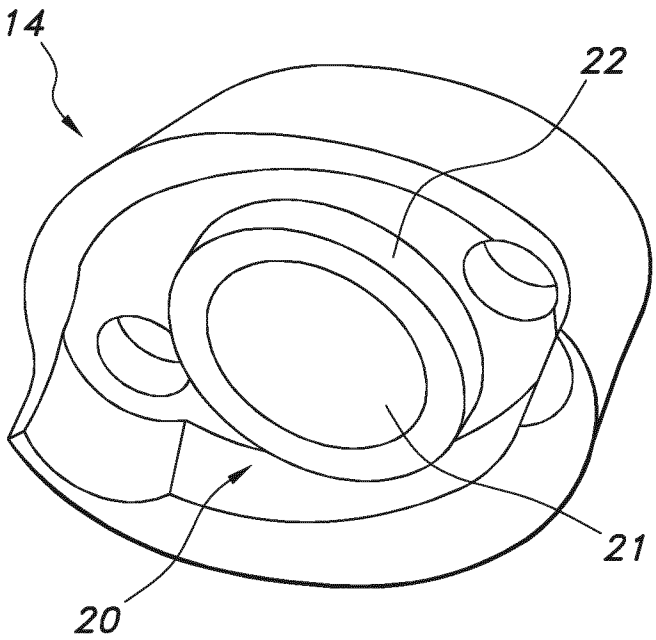

FIG. 1d

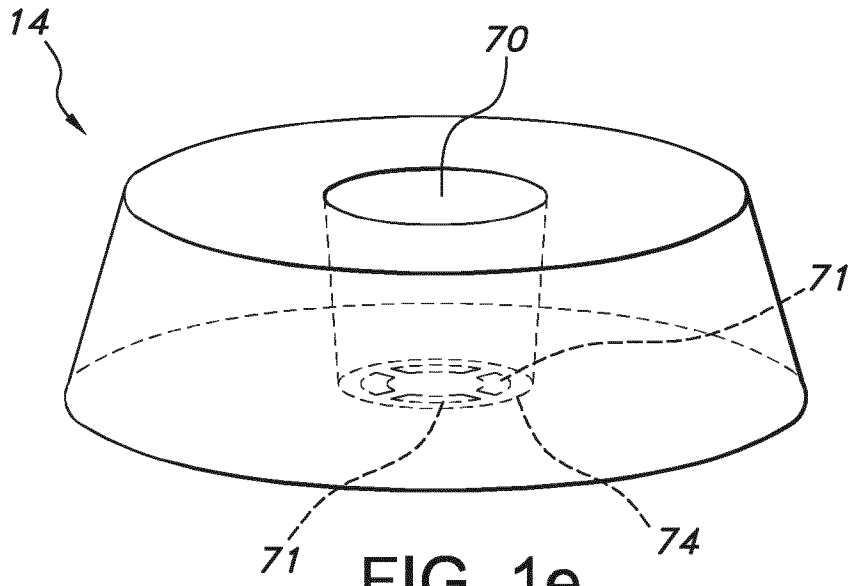

FIG. 1e

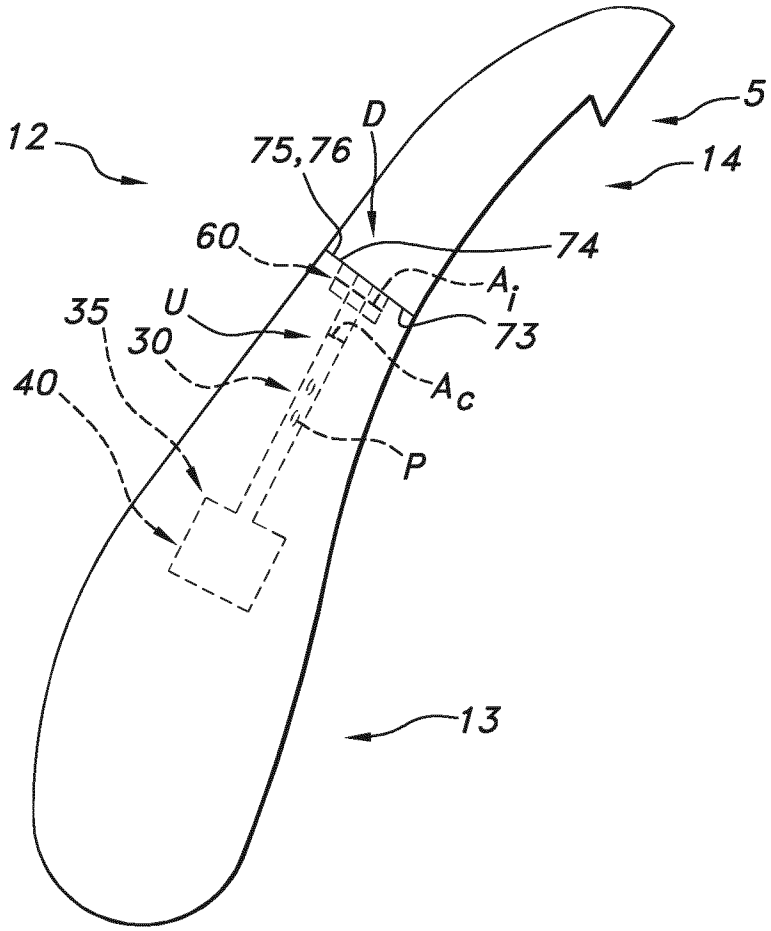

FIG. 1f

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/057100

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61C15/04 A61C17/02 A61B17/54
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)
A61B A61C

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	WO 2009/048281 A2 (KANG SO-DAE [KR]) 16 April 2009 (2009-04-16)	1,2,4-12
A	paragraphs [0001], [0064], [0079]; figures 3, 4, 8	3,13,15

X	US 2008/249537 A1 (CHUNG TAE JUN [KR]) 9 October 2008 (2008-10-09)	7-11
A	paragraphs [0001], [0007], [0025], [0031]; figures 1-3, 6	1-6,12, 13,15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 July 2014	07/08/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Wirth, Christian

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2014/057100

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		KR 20070055441 A	30-05-2007
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		WO 2009048281 A2	16-04-2009
US 2008249537 A1	09-10-2008	NONE	