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(54) **Title**: SKIN GRAFT DEVICES AND METHODS

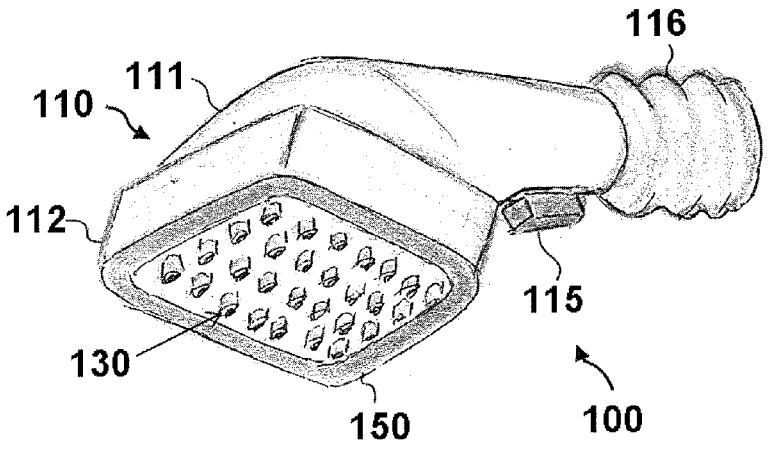

FIG. 2

(57) **Abstract**: Devices and methods for obtaining a plurality of skin tissue particles for use in skin grafting.

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

DESCRIPTION

SKIN GRAFT DEVICES AND METHODS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Application Serial No. 61/477,485, filed April 20, 2011, the entire contents of which are incorporated herein by reference.

BACKGROUND

1. Field of the Invention

[0002] The present invention relates generally to skin grafting and related devices and methods. The present invention provides a systematic approach to the process of skin grafting, i.e., harvesting, post-excision processing and application of donor skin and treatment of the graft recipient site.

2. Background Information

[0003] Advances in medical technology have provided many patients with benefits inconceivable a century ago. In particular, skin grafting has enabled doctors to heal wounds with the patient's own skin from a harvest site on the patient. The skin grafting techniques have many wonderful benefits, but are still replete with a number of problems.

[0004] The process of split-thickness skin grafting can be envisaged as a series of steps; (1) harvesting the split-thickness-skin graft ("STSG") at a donor site; (2) processing of excised STSG; (3) application of the processed skin to the wound site; and (4) pre- and/or post-graft treatment to accelerate healing of the wound site. Each of these steps interposes various challenges and obstacles, e.g., technical, therapeutic and financial, in executing a successful graft.

[0005] In regard to the first step, harvesting a STSG at a donor site has traditionally been accomplished using powered, hand-held dermatomes. These devices are expensive and the operation is known to be highly dependent on user skill and training, and requires involved procedures to accurately obtain a successful harvest. These devices must be operated at a precise constant angle relative to the skin, with the exact amount of pressure to insure a uniform harvest. Slight variations in operative use of these dermatomes result in excised skin of variable-thickness, which sometimes must be discarded altogether. As a

result, these devices are primarily wielded only by experienced plastic surgeons. Use of these dermatomes are generally confided to the operating room setting, increasing the cost of the procedure, especially given the average fee for operating room use.

[0006] There is a current need for harvesting procedures that require a lower degree of operator skill and are capable of being performed outside of an operating room, thus decreasing the costs of the procedure.

[0007] In regard to the second step of processing excised skin, it is highly desirable to maximize the coverage of the donor skin at the wound site for any given area of a potential donor site. Apart from minimizing trauma incurred at the donor site, a major factor limiting survival following extensive injury is insufficient availability of donor sites to provide enough skin for the required grafting procedures. One procedure is to mesh the skin graft i.e., creating slits in the excised donor skin to allow for the skin to be stretched. A graft-meshing machine is commonly used in hospital-based surgical practices, and generally allow for an expansion ratio of 3:1 to 9:1. The excised harvested skin is placed on a specific template, depending on the expansion ratio desired, and the template and graft are pressed through the mesher. While greater ratios than 9:1 may be possible using meshing techniques, there is a concomitant significant delay in epithelialization with using such ratios. When healed, a meshed grafted site characteristically has a permanent "crocodile skin" or "weaved" appearance.

[0008] Micro grafting techniques, in which the donor tissue is actually minced in order to achieve a greater than 10:1 expansion ratio, are known in the art. Such techniques allow for a greater coverage area from a small donor site than meshing techniques. Traditional micrograft techniques, dating back to 1963, utilized minced skin that is between 1/8th inch (approximately 3 mm, or 3000 μm) and 1/16th inch (approximately 1.5 mm, or 1500 μm) in size. However, disadvantages of using pieces larger than 1500 μm have been noted. For example, in skin pieces of this size cells remote from a cut edge have a limited availability to migrate and proliferate and thereby contribute to forming new skin. In addition, the techniques employed have required each piece to be oriented epidermis upwards, making the procedure tedious and impractical. Further, the appearance of the new skin that is produced using particles of this size is poor, often having a cobblestone appearance.

[0009] There is currently a need for a procedure capable of producing micrograft particles in a size less than 1500 μm in a rapid and efficient manner, with a minimum of handling procedures, while resulting in skin pieces that are viable and capable of "taking"

when applied to a wound site. Such technique would significantly aid in the ease and speed of operations utilizing micrografts.

[00010] The third step of the graft procedure, application of processed excised skin to the wound site, it is particularly relevant to the application of micrograft particles to a wound site. Current methods of distributing micrografts, such as mechanical spreading results in clumps or aggregates of skin particles, frustrating an even distribution. In addition, in larger aggregates, some micrograft particles will not be in direct contact with the wound bed. Such particles cannot readily integrate with the wound bed and also will have a reduced potential for nourishment from the wound fluid exudates and consequently have an decreased potential to remain viable. Thus, the aggregation of micrografts reduces the efficiency of epithelialization and may significantly increase the time required to close a wound.

[00011] There is a current need for devices and methods to effect an even distribution of micrcograft particles on a wound surface, thereby promoting the efficiency of epithelialization.

[00012] The fourth step of the graft procedure relates to pre- and/or post-graft treatment to accelerate healing of the wound site. As is known in the art, closure of surface wounds involves the inward migration of epithelial, dermal and subcutaneous tissue adjacent to the wound. This migration is ordinarily assisted through the inflammatory process, whereby blood flow is increased and various functional cell types are activated. Through the inflammatory process, blood flow through damaged or broken vessels is stopped by capillary level occlusion; thereafter, cleanup and rebuilding operations may begin.

SUMMARY

[00013] Certain embodiments of the present disclosure comprise devices and methods relating generally to skin grafting. Particular embodiments provide a systematic approach to the process of skin grafting, i.e., harvesting, post-excision processing and application of donor skin and treatment of the graft recipient site.

[00014] Certain embodiments of the present disclosure comprise a device for obtaining a plurality of skin tissue particles for use in skin grafting. In particular embodiments, the device includes a dressing comprising a first surface configured to retain a plurality of skin tissue particles; a housing configured to receive the dressing, wherein the housing comprises a first aperture configured to be coupled to a vacuum source; and a plurality of hollow needles proximal to the first surface of the dressing. In certain embodiments, the first surface

comprises a gel. In specific embodiments, the gel is a polyurethane film, an extra-cellular matrix (e.g. collagen), or a silicone based polymer.

[00015] In particular embodiments, the plurality of hollow needles are tapered. In specific embodiments, the plurality of hollow needles are tapered such that each of the plurality of needles comprises a larger end proximal to the first surface of the dressing. In certain embodiments, the housing comprises a seal configured to extend around the plurality of hollow needles. In particular embodiments, during use, the plurality of hollow needles are placed proximal to a donor site contained within the seal.

[00016] In specific embodiments, the dressing is located between the plurality of hollow needles and the first aperture. In particular embodiments, the dressing is removable from the housing, and in certain embodiments, the housing comprises a first aperture configured to be coupled to a bellows.

[00017] Exemplary embodiments also comprise a method of obtaining a plurality of skin tissue particles for use in skin grafting, the method comprising: placing a first device according to claim 1 onto a first donor site; applying negative pressure to the first device; removing a first plurality of skin tissue particles from the first donor site; removing a first dressing from the housing of the first device, wherein the first plurality of skin tissue particles are retained on the first surface of the dressing; and placing the first dressing on a graft site, where the first plurality of skin tissue particles are proximal to the graft site.

[00018] Particular embodiments may also comprise covering the dressing and the graft site with a drape; and applying negative pressure to a region under the drape. Certain embodiments may further comprise: placing a second device onto the donor site and applying negative pressure to the second device; removing a second plurality of skin tissue particles from the donor site; removing the second dressing from the housing of the second device, wherein the second plurality of skin tissue particles are retained on the first surface of the second dressing; and placing the second dressing on the graft site, wherein the second plurality of skin tissue particles are proximal to the graft site.

[00019] Certain embodiments may also comprise a device for obtaining a plurality of skin tissue particles for use in skin grafting, the device comprising: a processor configured to process skin tissue into a plurality of skin tissue particles; and a container configured to retain the plurality of skin tissue particles, wherein the processor comprises a first cutting surface configured to penetrate skin tissue at a donor site and a second cutting surface that rotates.

[00020] In particular embodiments, the first surface comprises a punch configured to penetrate skin tissue and the second cutting surface is configured to sever skin tissue from the

donor site. In certain embodiments, the second cutting surface rotates in a plane generally parallel to the skin tissue of the donor site. In specific embodiments, the second cutting surface rotates in a plane generally perpendicular to the skin tissue. In particular embodiments, the processor is manually operated. In certain embodiments, the processor is electrically powered. In specific embodiments, the device is configured such that the device can be separated from the processor.

[00021] The following drawings illustrate by way of example and not limitation. For the sake of brevity and clarity, every feature of a given structure is not always labeled in every figure in which that structure appears. Identical reference numbers do not necessarily indicate an identical structure. Rather, the same reference number may be used to indicate a similar feature or a feature with similar functionality, as may non-identical reference numbers.

BRIEF DESCRIPTION OF THE DRAWINGS

[00022] **FIGS. 1-5** illustrate perspective and section views of a first exemplary embodiment.

[00023] **FIGS. 6-14** illustrate section views of the embodiment of FIGS. 1-5 during use.

[00024] **FIGS. 15-18** illustrate perspective and orthographic views of a second exemplary embodiment.

[00025] **FIGS. 19-20** illustrate perspective and orthographic views of a third exemplary embodiment.

[00026] **FIGS. 21-22** illustrate perspective and orthographic views of a fourth exemplary embodiment.

DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[00027] The term "coupled" is defined as connected, although not necessarily directly, and not necessarily mechanically; two items that are "coupled" may be integral with each other. The terms "a" and "an" are defined as one or more unless this disclosure explicitly requires otherwise. The terms "substantially," "approximately," and "about" are defined as largely but not necessarily wholly what is specified, as understood by a person of ordinary skill in the art.

[00028] The terms "comprise" (and any form of comprise, such as "comprises" and "comprising"), "have" (and any form of have, such as "has" and "having"), "include" (and

any form of include, such as "includes" and "including") and "contain" (and any form of contain, such as "contains" and "containing") are open-ended linking verbs. As a result, a wound-treatment method that "comprises," "has," "includes" or "contains" one or more steps possesses those one or more steps, but is not limited to possessing only those one or more steps. Likewise, a wound dressing that "comprises," "has," "includes" or "contains" one or more elements possesses those one or more elements, but is not limited to possessing only those elements.

[00029] Further, a device or structure that is configured in a certain way is configured in at least that way, but it can also be configured in other ways than those specifically described.

[00030] Referring now to FIGS. 1-5, a device 100 for obtaining skin tissue particles for use in skin grafting is shown. Device 100 comprises a housing 110 that is configured to receive a dressing 120. In certain embodiments, housing 110 may comprise a first portion 111 and a second portion 112 that may be coupled together or separated to allow the contents within housing 110 to be removed. In the embodiment shown, device 100 also comprises a plurality of hollow needles 130, which are configured to penetrate tissue during use and remove skin particles from a harvest site. In the illustrated embodiment, device 100 further comprises a seal 150 configured to seal an area around the plurality of needles 130.

[00024] An overview of the operation of device 100 will be provided initially, followed by a more detailed description. During operation, device 100 can be placed on a skin harvest site such that hollow needles 130 are in contact with the harvest site and seal 150 has sealed the area within the harvest site. A low pressure source 116 (*e.g.* a bellows device, a vacuum pump or other suitable device) can be coupled to aperture 140 and operated to provide a low pressure region within housing 110. In the embodiment shown, a switch 115 can control operation of low pressure source 116.

[00025] The operation of low pressure source 116 can cause air to flow in the direction of arrow 145 (*see* FIG. 3) and draw the harvest site toward needles 130. Skin tissue from the harvest site can be drawn into needles 130 and removed from the harvest site. In certain embodiments, device 100 may be vibrated or laterally translated to assist in the removal skin tissue from the harvest site. In particular embodiments, hollow needles 130 may be tapered as shown in the cross-section view of FIG. 5 such that an end 131 proximal to dressing 120 is larger than an end 132 distal from dressing 120.

[00026] When the skin tissue is removed from the harvest site, the tissue particles contact dressing 120, which includes a surface 121 that is configured to retain the particles

when dressing 120 is removed from housing 110. A perspective view of dressing 120 removed from housing 110 is shown in FIG. 4. Dressing 120 can then be placed on a graft site oriented such that surface 121 and the tissue particles are in contact with the graft site. In certain embodiments, a negative pressure wound therapy can then be applied to the graft site to assist in the grafting of the tissue particles to the graft site.

[00027] Referring now to FIGS. 6-13, a description of individual steps in an exemplary method of use will be provided. As shown in FIG. 6, device 100 has been placed on a donor site 200 such that needles 130 are in contact with the skin tissue at donor site 200 and seal 150 has sealed the area of donor site around needles 130. Referring now to FIG. 7, a negative pressure source (in fluid communication with device 100 via aperture 140) has been operated to provide a negative pressure to device 100. With negative pressure applied, tissue from donor site 200 is drawn into needles 130 to a controlled depth so that the tissue extends through needles 130 and to surface 121 of dressing 120. Device 100 can then be manipulated (*e.g.* vibrated, laterally translated, or other suitable action) to remove skin tissue particles 131 from donor site 200. When device 100 is removed from donor site 200, skin tissue particles 131 are retained by surface 121 of dressing 120. In particular embodiments, surface 121 may comprise a gel configured to retain the skin tissue particles by adhering the particles to the layer.

[00028] As shown in FIG. 8, device 100 has been removed from donor site 200 and surface 121 has retained skin tissue particles 131 after removal from donor site 200. Referring now to FIG. 9, first portion 111 of device 100 has been separated from second portion 112. This can allow dressing 120 to be removed from housing 110 of device 100. As shown in this embodiment, surface 121 continues to retain skin tissue particles 131 with dressing 120 removed from housing 110.

[00029] Referring now to FIG. 10, dressing 120 is positioned proximal to a graft site 300 so that skin tissue particles 131 are oriented proximal to graft site 300. As shown in FIG. 11, in certain embodiments, multiple dressings 120 may be placed adjacent to each other in cases where graft site 300 is larger than dressing 120. In specific embodiments, dressing 120 may be configured so that multiple dressings can be placed adjacent to each other to substantially cover graft site 300. For example, in certain embodiments, dressing 120 and surface 121 may be triangular, square, rectangular, hexagonal or other suitable configurations (when viewed from above looking down toward dressing 120 and graft site 300).

[00030] As shown in FIG. 12, dressing 120 is placed on graft site 300 so that skin particles 131 are in contact with graft site 300. As illustrated in FIGS. 8-12, skin tissue

particles 131 are retained by surface 121 from the time the particles are harvested from donor site 200 until they are placed on graft site 300. The ability to retain skin tissue particles 131 during the harvesting and grafting process provides many benefits, including the ability to provide a consistent and repeatable delivery of the particles to the graft site. This can increase the likelihood of obtaining a successful graft and improve the uniformity of the graft appearance.

[00031] In certain embodiments, negative pressure wound therapy can also be applied to graft site 300. As shown in FIG. 13, a drape 160 has been applied over dressing 120 and graft site 300. In the embodiment shown a coupling member 161 couples a conduit 162 to drape 160 and allows a negative pressure to be applied to the region under drape 160 (including *e.g.*, dressing 120 and graft site 300). As shown in FIG. 14, a larger drape 160 may be used in cases where multiple dressings 120 are needed to cover graft site 300.

[00032] Referring now to FIG. 15-18, an exemplary embodiment comprises a unitary dermatome and mincer single use multi-bladed micro punch 400 configured to incise the epidermis to the required depth and dimension. The punch can be activated using the snap switch situated on the side of the device. In this embodiment, a disposable tip also incorporates a specimen tray or container, where the processed skin particles are collected. Harvested material is released from the device by pressing the knob on the rear of the device. This embodiment provides a manual operation multi-specimen micro punch device with disposable tip and specimen tray/container. This device is able to harvest the skin particles (or islets) and process them to a ready to use state using simple operations. Additional details regarding the features and operation of the embodiment of FIG. 15-18 can be found in the figures and accompanying description in FIGS. 15-18.

[00033] Referring now to FIGS. 19-20, a unitary, battery powered, re-useable dermatome and mincer is shown. In this embodiment, the battery-powered device is placed on the donor site with moderate pressure and activated using the on/off trigger. During operation of this embodiment, the skin tissue can be excised and transferred by vacuum to a removable/disposable collection canister or container. In this exemplary embodiment, the cutting head may also be a disposable component. The canister / container of this device provide easy access to fully processed skin particles. Additional details regarding the features and operation of the embodiment of FIG. 19-20 can be found in the figures and accompanying description in FIGS. 19-20.

[00034] Referring now to FIGS. 21-22, a disposable, single-use skin mincer is illustrated. In this embodiment, the donor skin can be harvested using a dermatome or Weck

knife and then placed into the device. Exemplary embodiments of this device comprise two contra-rotating blades which are operated by rotating the handle, which grind the donor skin tissue into small particles. The finished skin particles can be ejected from the device once the required dimensions have been achieved. This embodiment provides a unique method of processing the donor skin by using a twisting action to prepare the donor skin ready for grafting. Additional details regarding the features and operation of the embodiment of FIG. 21-22 can be found in the figures and accompanying description in FIGS. 21-22.

[00035] The claims are not intended to include, and should not be interpreted to include, means-plus- or step-plus-function limitations, unless such a limitation is explicitly recited in a given claim using the phrase(s) "means for" or "step for," respectively.

CLAIMS

We claim:

1. A device for obtaining a plurality of skin tissue particles for use in skin grafting, the device comprising:
   a dressing comprising a first surface configured to retain a plurality of skin tissue particles;
   a housing configured to receive the dressing, wherein the housing comprises a first aperture configured to be coupled to a vacuum source; and
   a plurality of hollow needles proximal to the first surface of the dressing.

2. The device of claim 1 wherein the first surface comprises a gel.

3. The device of claim 2 wherein the gel is a polyurethane film, an extra-cellular matrix, or a silicone based polymer.

4. The device of claim 1 wherein the plurality of hollow needles are tapered.

5. The device of claim 4 wherein the plurality of hollow needles are tapered such that each of the plurality of needles comprises a larger end proximal to the first surface of the dressing.

6. The device of claim 1 wherein the housing comprises a seal configured to extend around the plurality of hollow needles.

7. The device of claim 6 wherein during use, the plurality of hollow needles are placed proximal to a donor site contained within the seal.

8. The device of claim 1 wherein the dressing is located between the plurality of hollow needles and the first aperture.

9. The device of claim 1 wherein the dressing is removable from the housing.

10. The device of claim 1 wherein the housing comprises a first aperture configured to be coupled to a bellows.

11. A method of obtaining a plurality of skin tissue particles for use in skin grafting, the method comprising:

placing a first device according to claim 1 onto a first donor site;

applying negative pressure to the first device;

removing a first plurality of skin tissue particles from the first donor site;

removing a first dressing from the housing of the first device, wherein the first plurality of skin tissue particles are retained on the first surface of the dressing; and

placing the first dressing on a graft site, wherein the first plurality of skin tissue particles are proximal to the graft site.

12. The method of claim 11 further comprising:

covering the dressing and the graft site with a drape; and

applying negative pressure to a region under the drape.

13. The method of claim 11 further comprising:

placing a second device according to claim 1 onto the donor site;

applying negative pressure to the second device;

removing a second plurality of skin tissue particles from the donor site;

removing the second dressing from the housing of the second device, wherein the second plurality of skin tissue particles are retained on the first surface of the second dressing;

placing the second dressing on the graft site, wherein the second plurality of skin tissue particles are proximal to the graft site.

14. A device for obtaining a plurality of skin tissue particles for use in skin grafting, the device comprising:

a processor configured to process skin tissue into a plurality of skin tissue particles,; and

a container configured to retain the plurality of skin tissue particles, wherein the processor comprises a first cutting surface configured to penetrate skin tissue at

a donor site and a second cutting surface that rotates.

15. The device of claim 14 wherein the first surface comprises a punch configured to penetrate skin tissue and the second cutting surface is configured to sever skin tissue from the donor site.

16. The device of claim 14 wherein the second cutting surface rotates in a plane generally parallel to the skin tissue of the donor site.

17. The device of claim 14 wherein the second cutting surface rotates in a plane generally perpendicular to the skin tissue.

18. The device of claim 14 wherein the processor is manually operated.

19. The device of claim 14 wherein the processor is electrically powered.

20. The device of claim 14 wherein the device is configured such that the device can be separated from the processor.

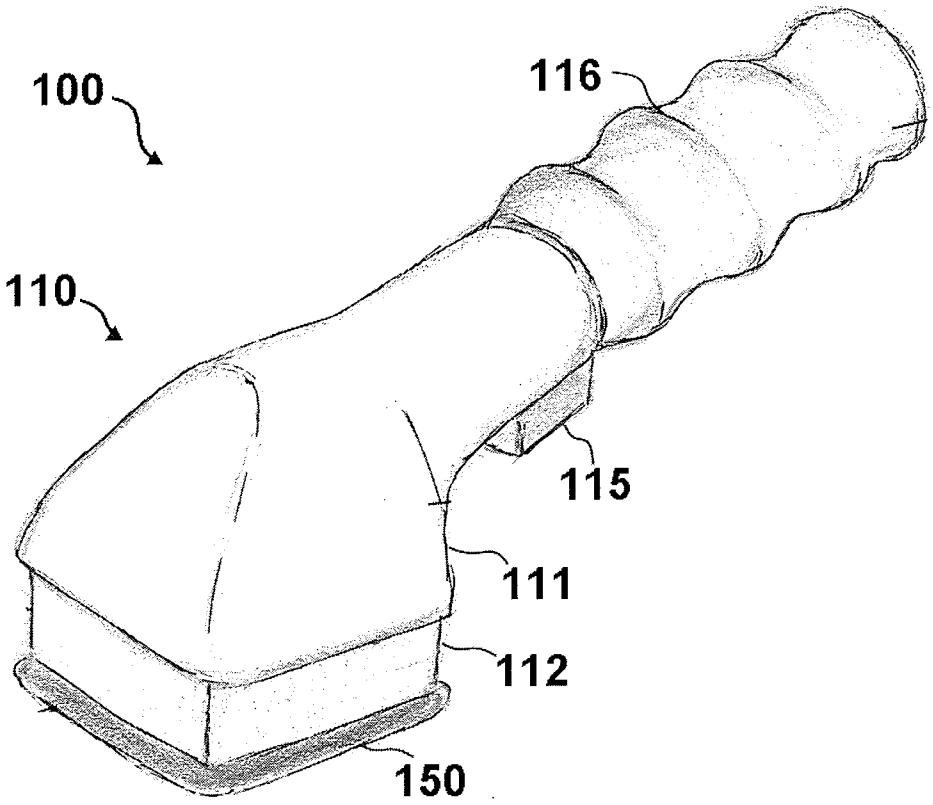

FIG. 1

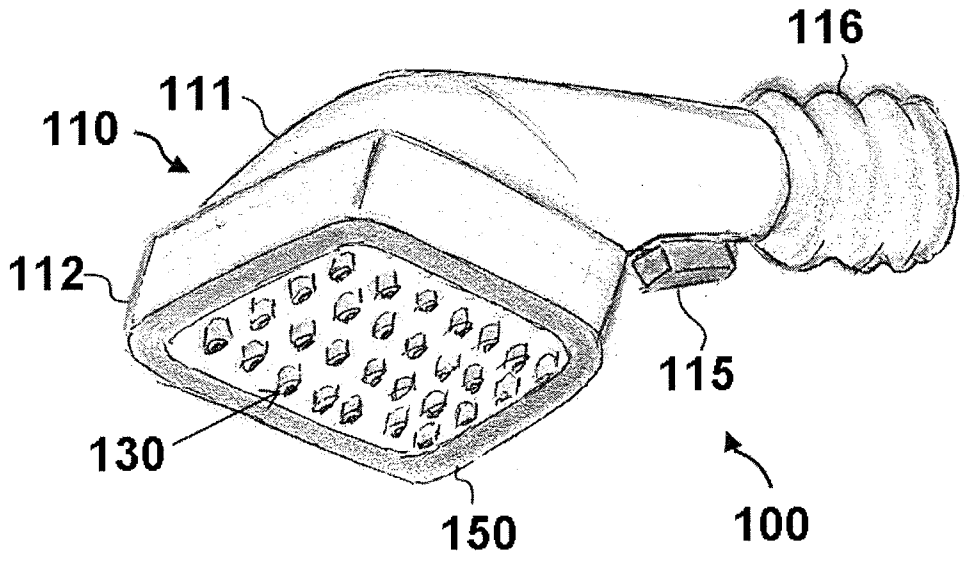

FIG. 2

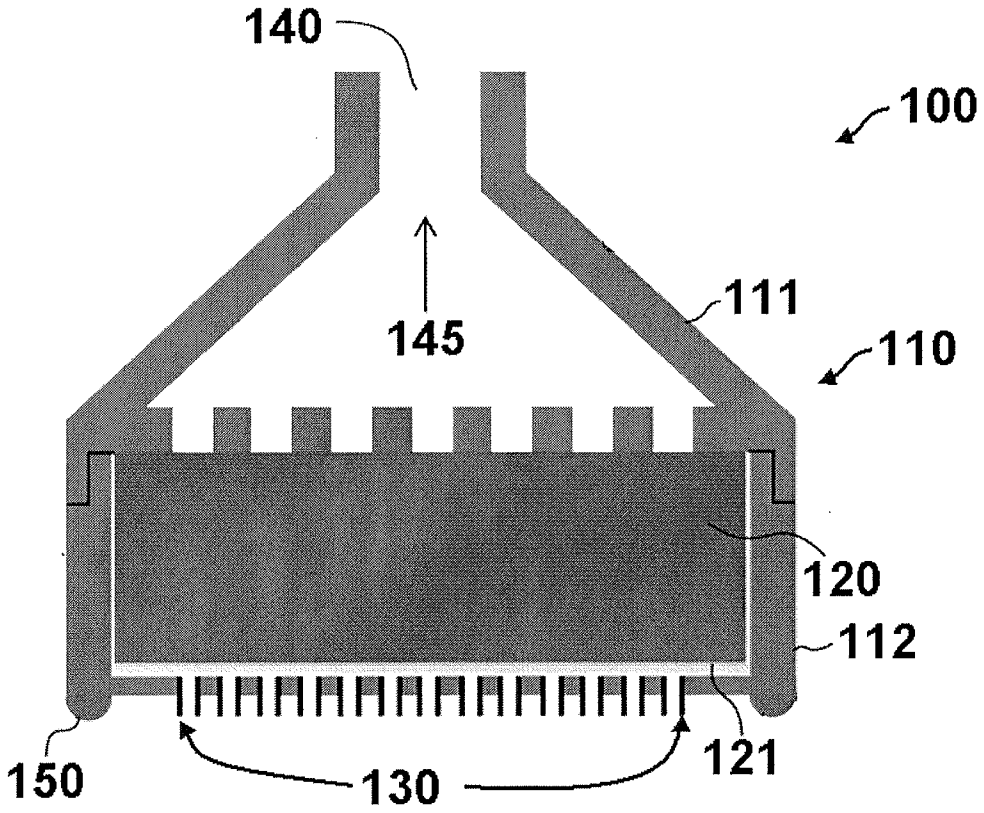

FIG. 3

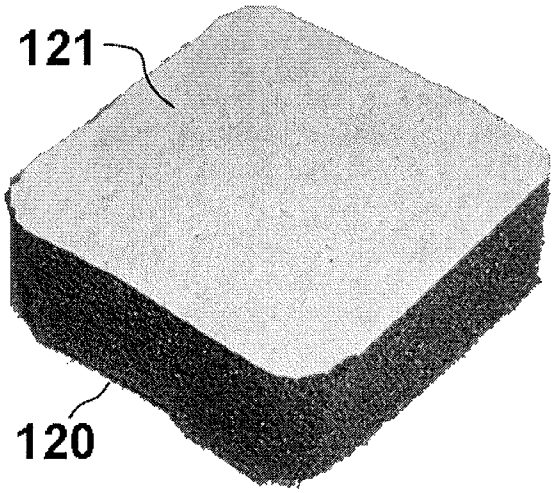

FIG. 4

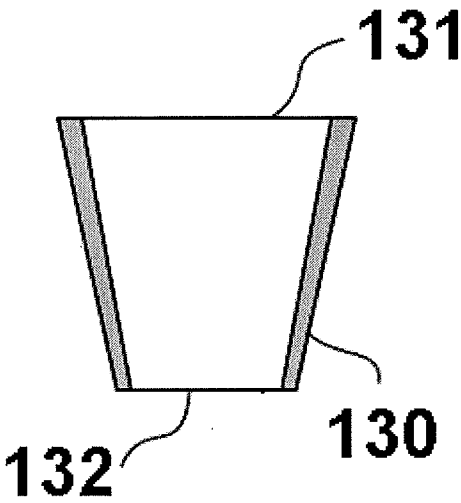

FIG. 5

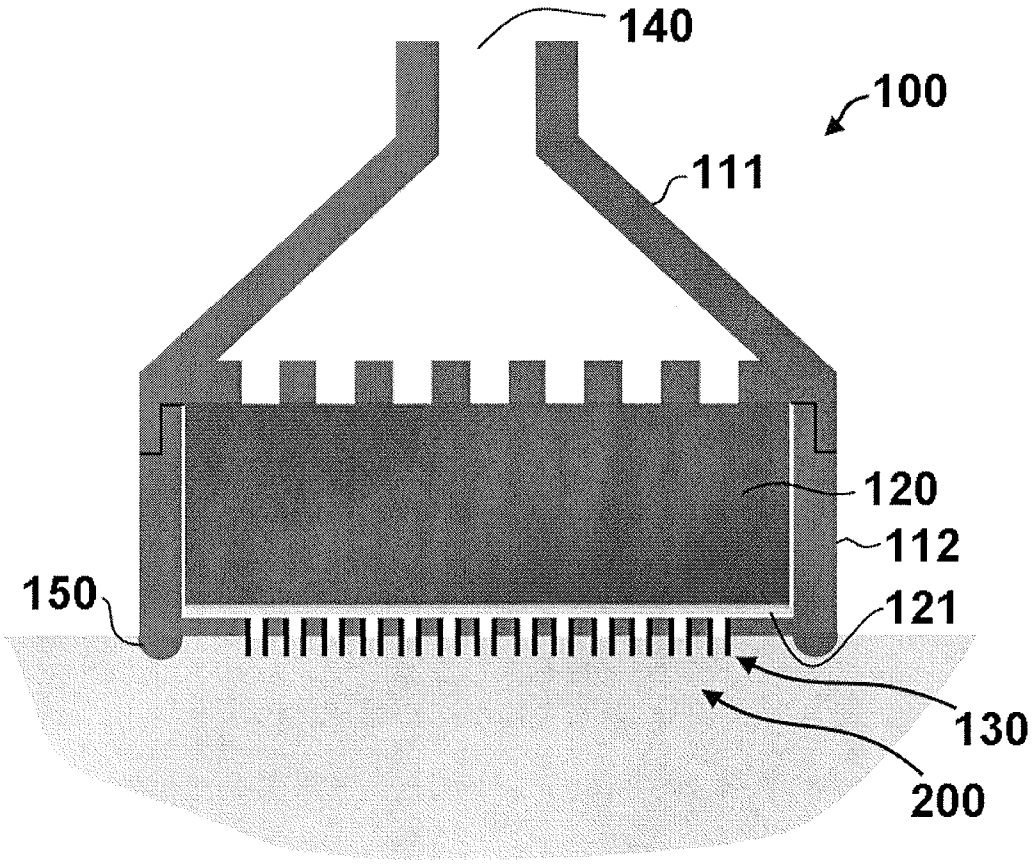

FIG. 6

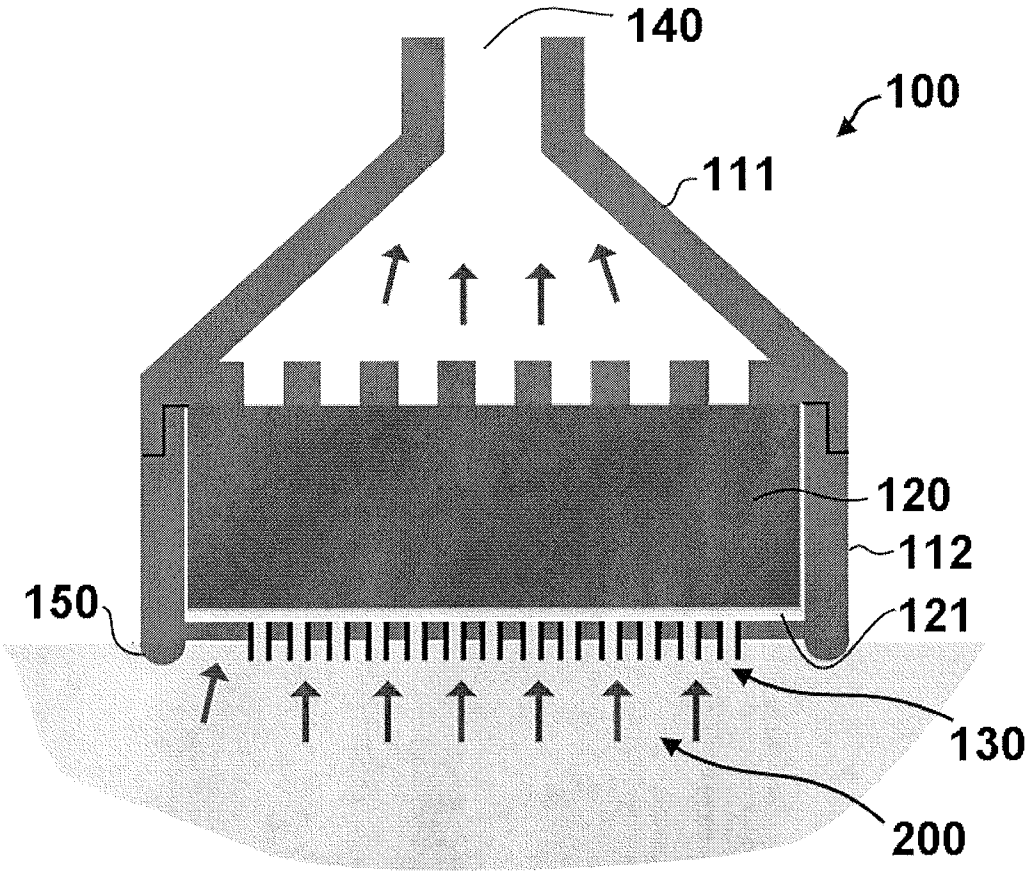

FIG. 7

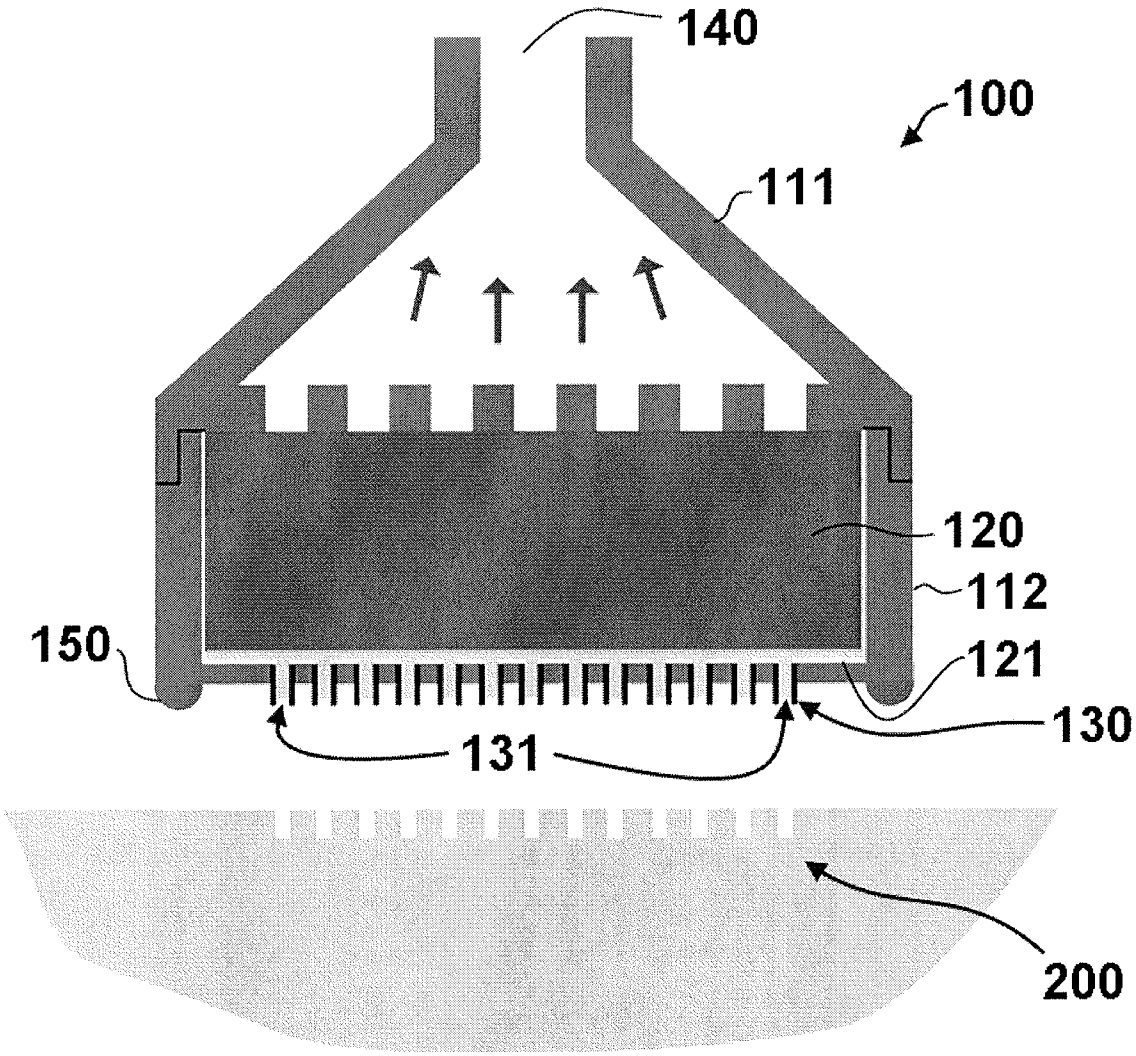

FIG. 8

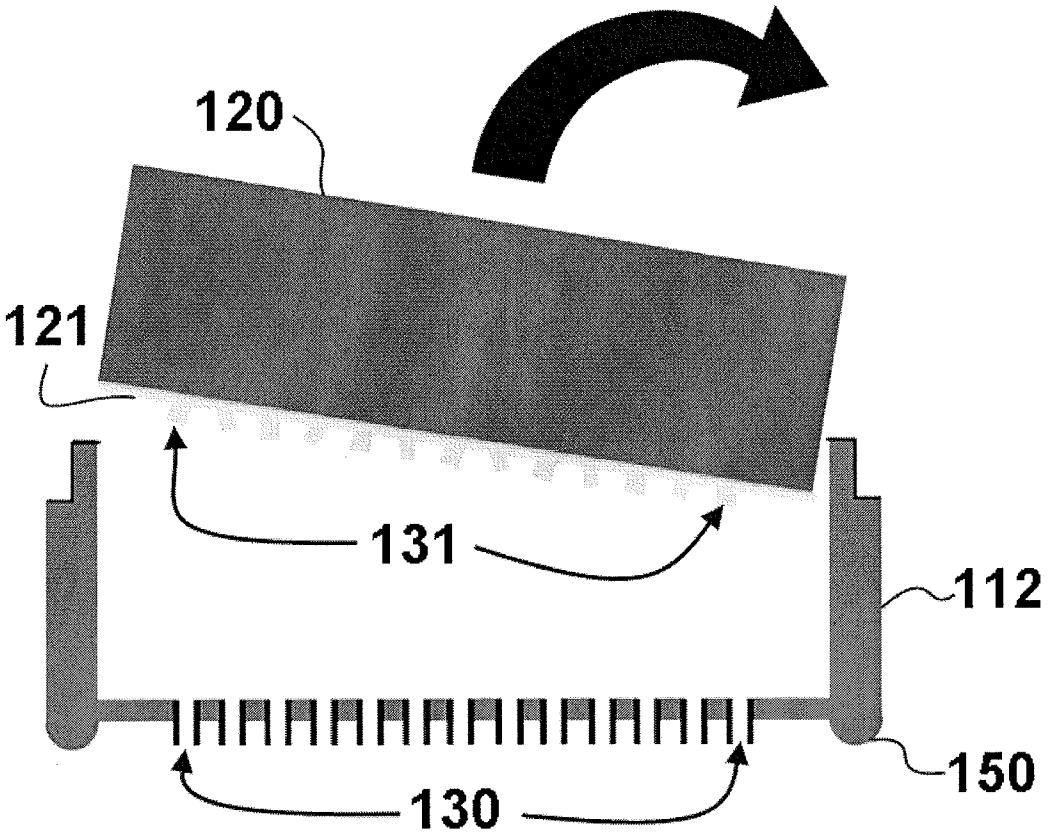

FIG. 9

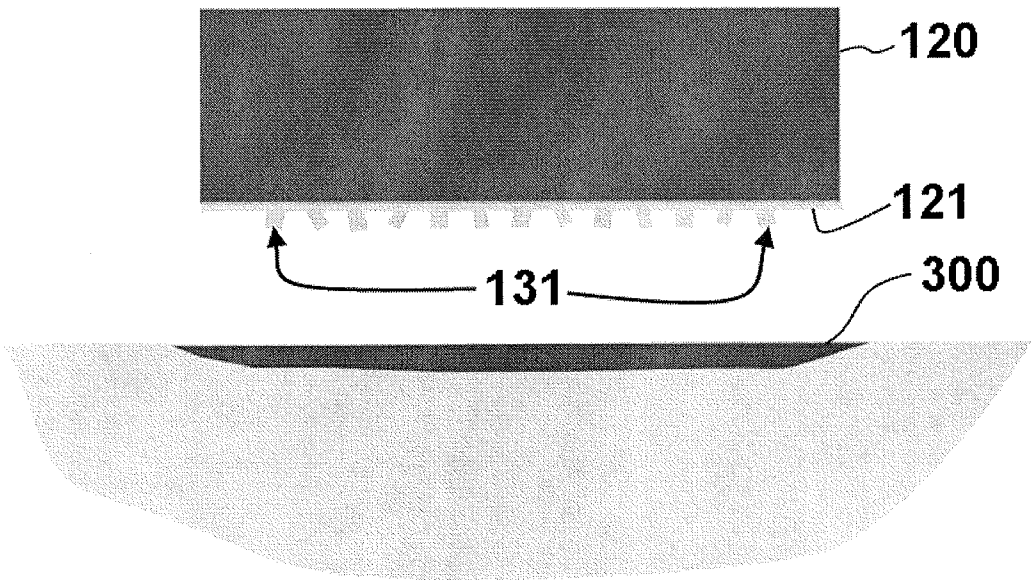

FIG. 10

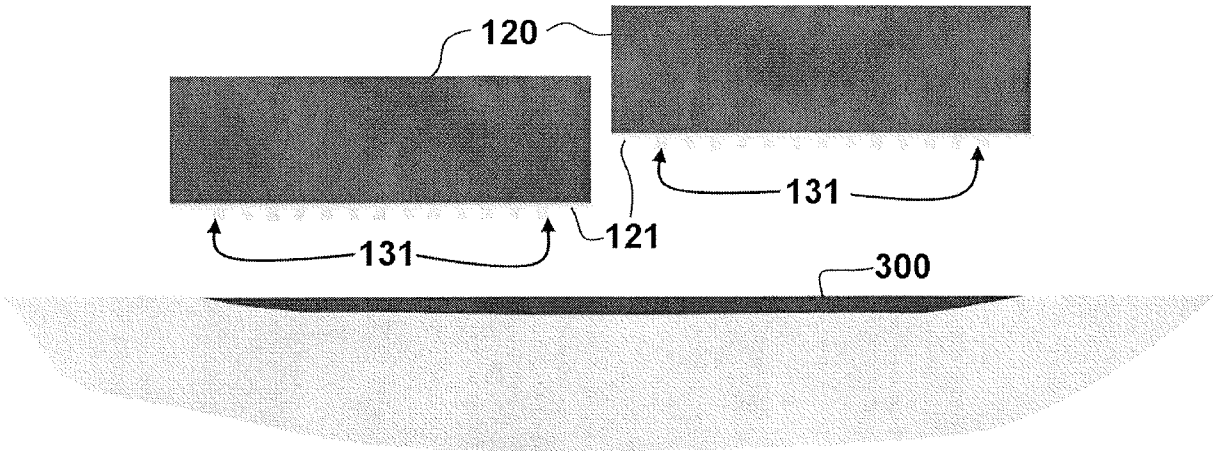

FIG. 11

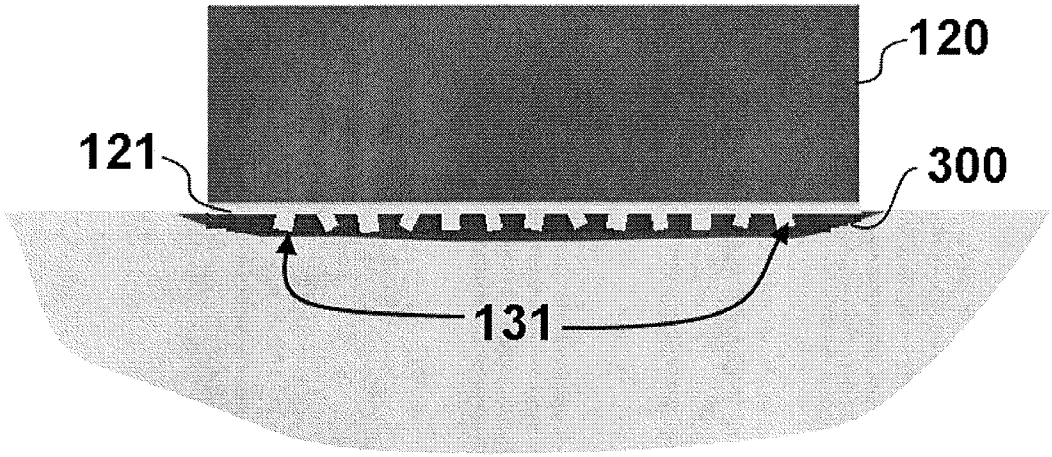

FIG. 12

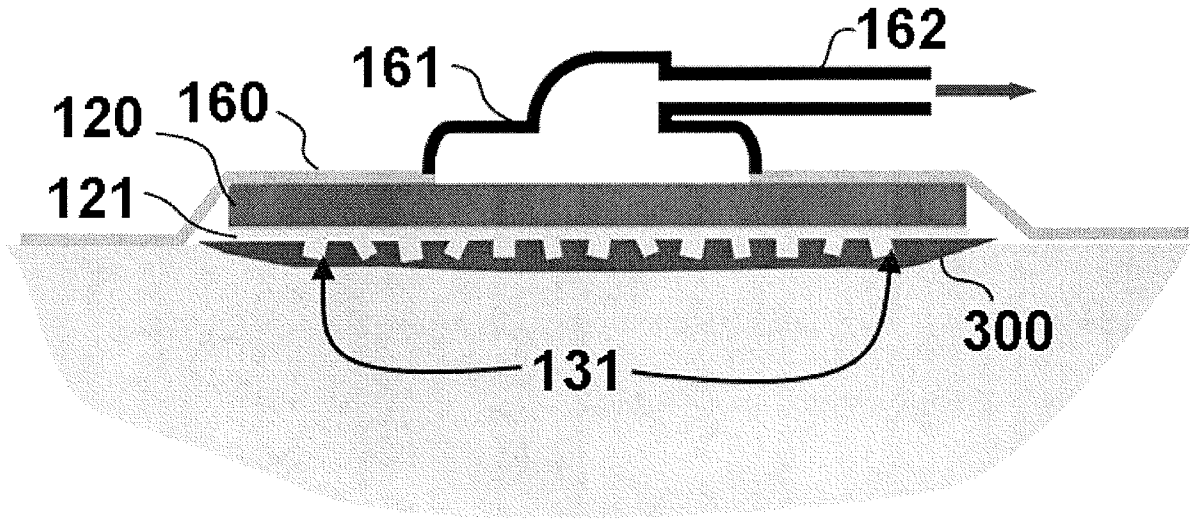

FIG. 13

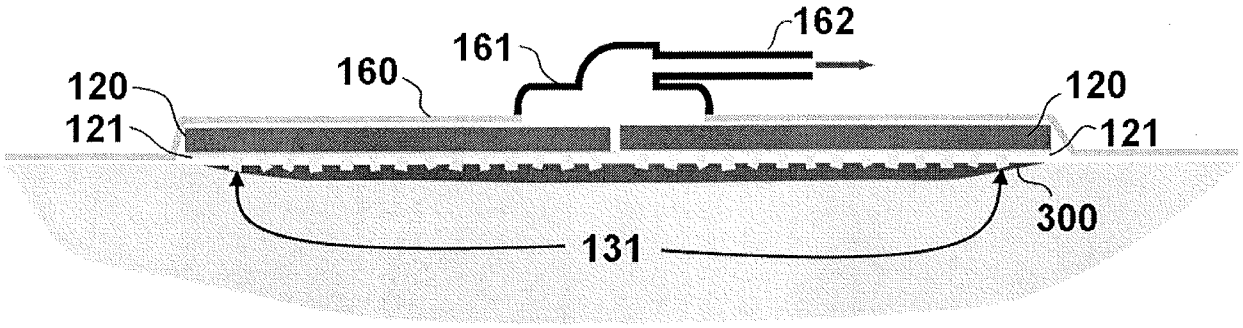
162
161
160
120
121
120
121
300
131

FIG. 14

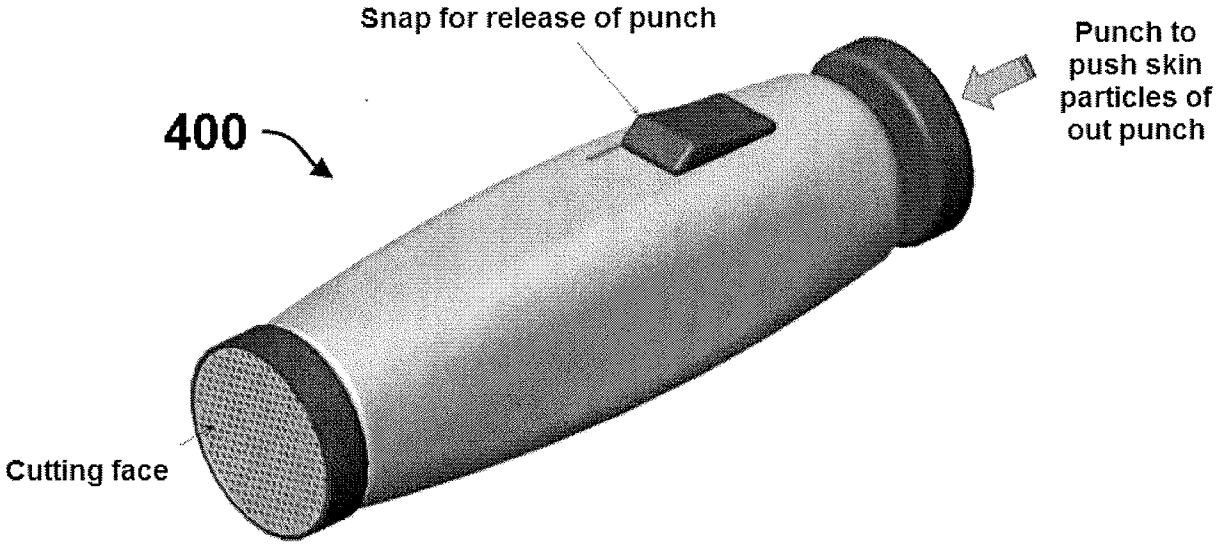
Snap for release of punch
Punch to push skin particles of out punch
400
Cutting face

FIG. 15

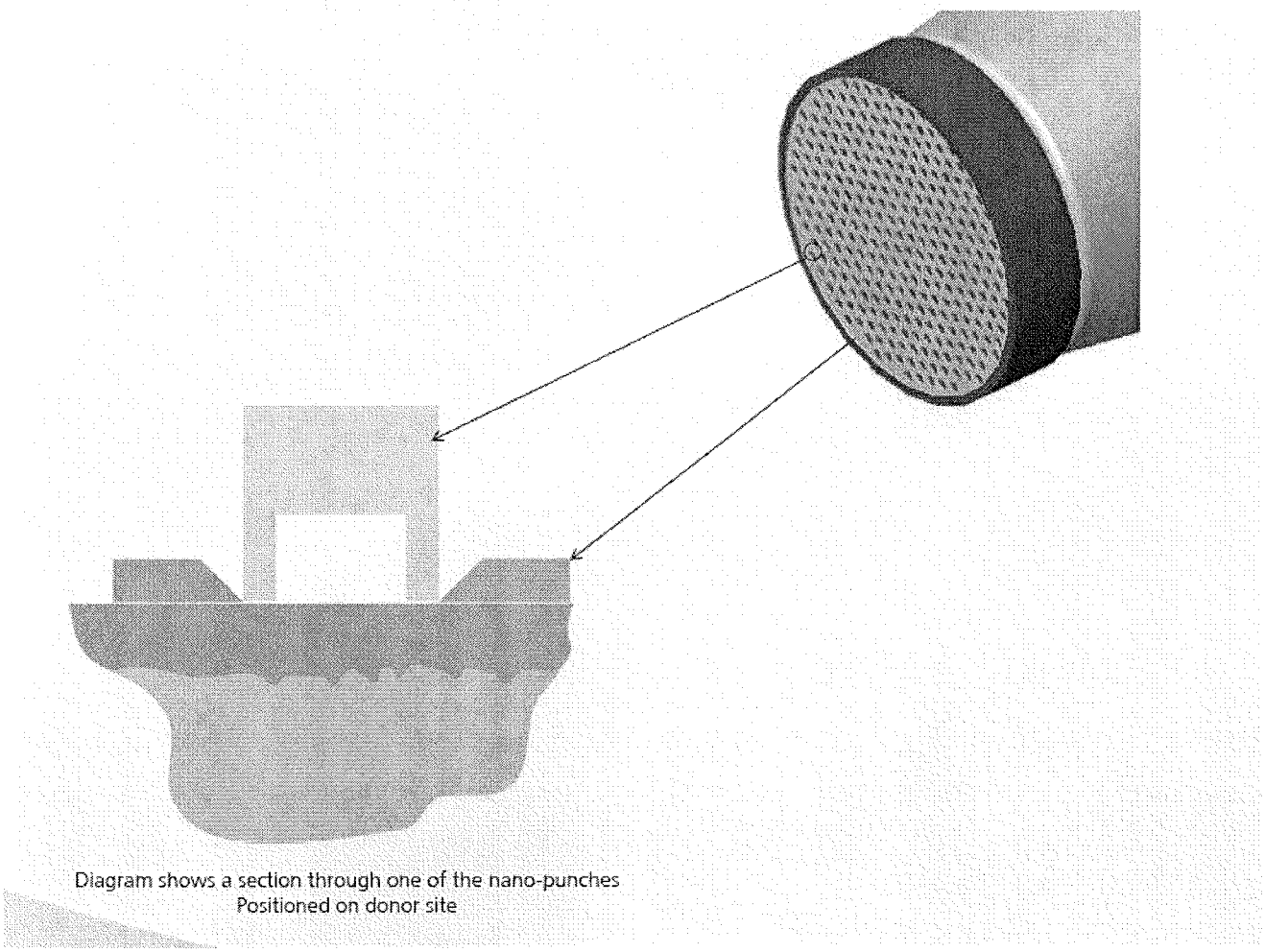
Diagram shows a section through one of the nano-punches
Positioned on donor site

FIG. 16

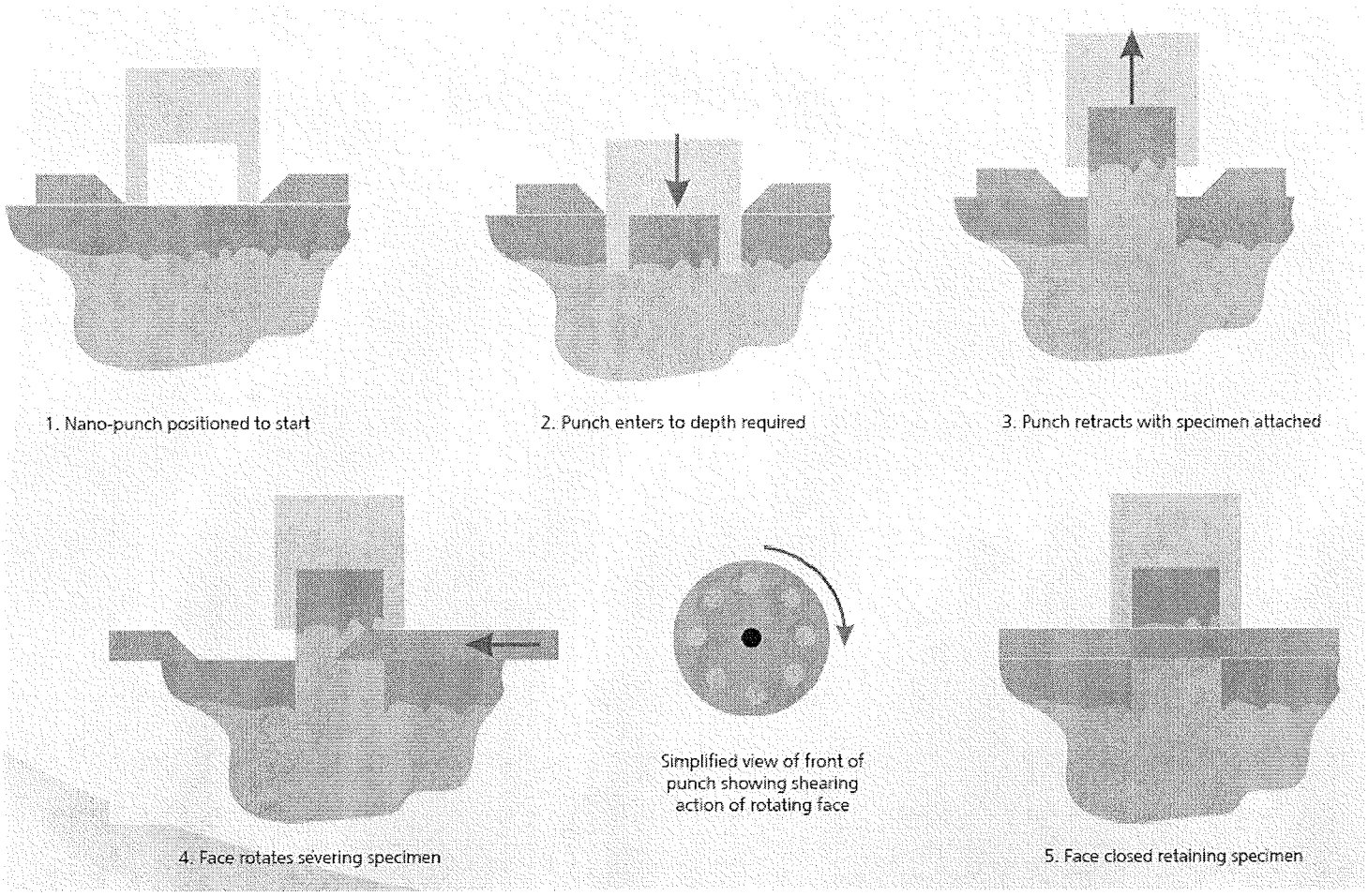
1. Nano-punch positioned to start
2. Punch enters to depth required
3. Punch retracts with specimen attached
4. Face rotates severing specimen
Simplified view of front of punch showing shearing action of rotating face
5. Face closed retaining specimen

FIG. 17

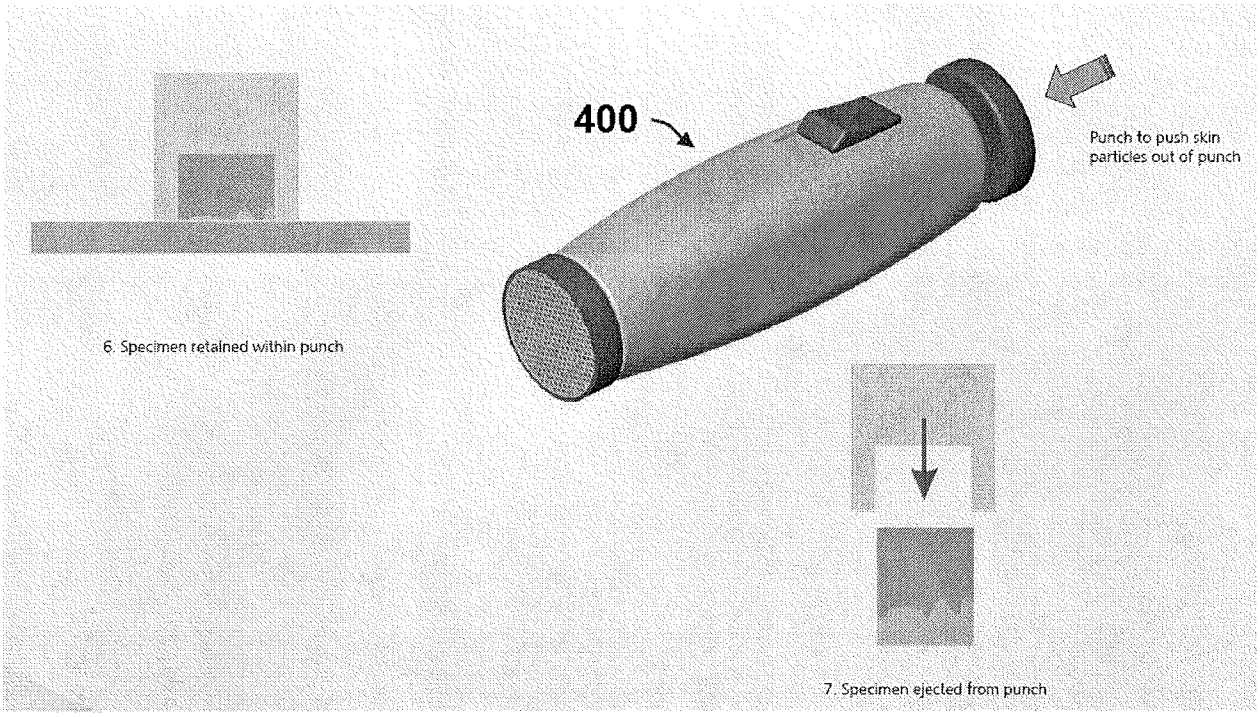
400
Punch to push skin particles out of punch
6. Specimen retained within punch
7. Specimen ejected from punch

FIG. 18

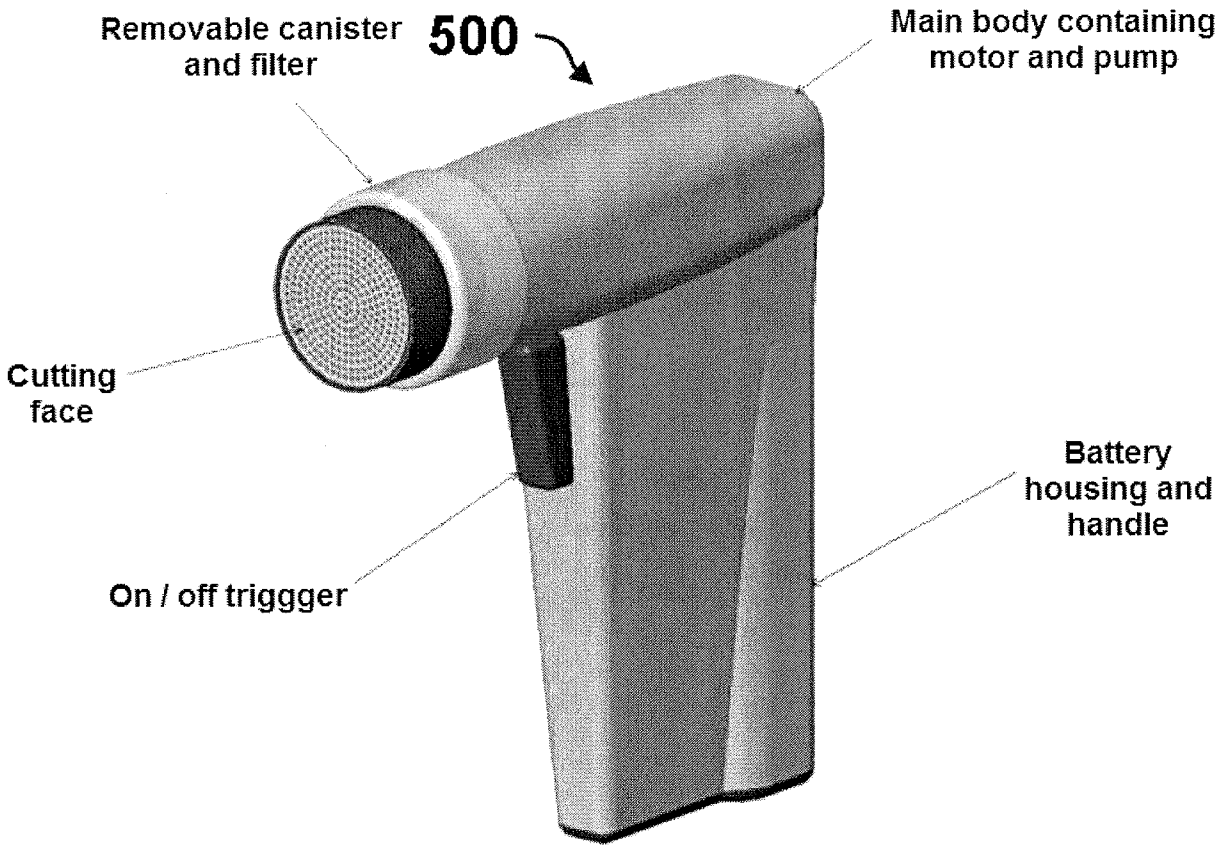
Removable canister and filter
500
Main body containing motor and pump
Cutting face
Battery housing and handle
On / off triggger

FIG. 19

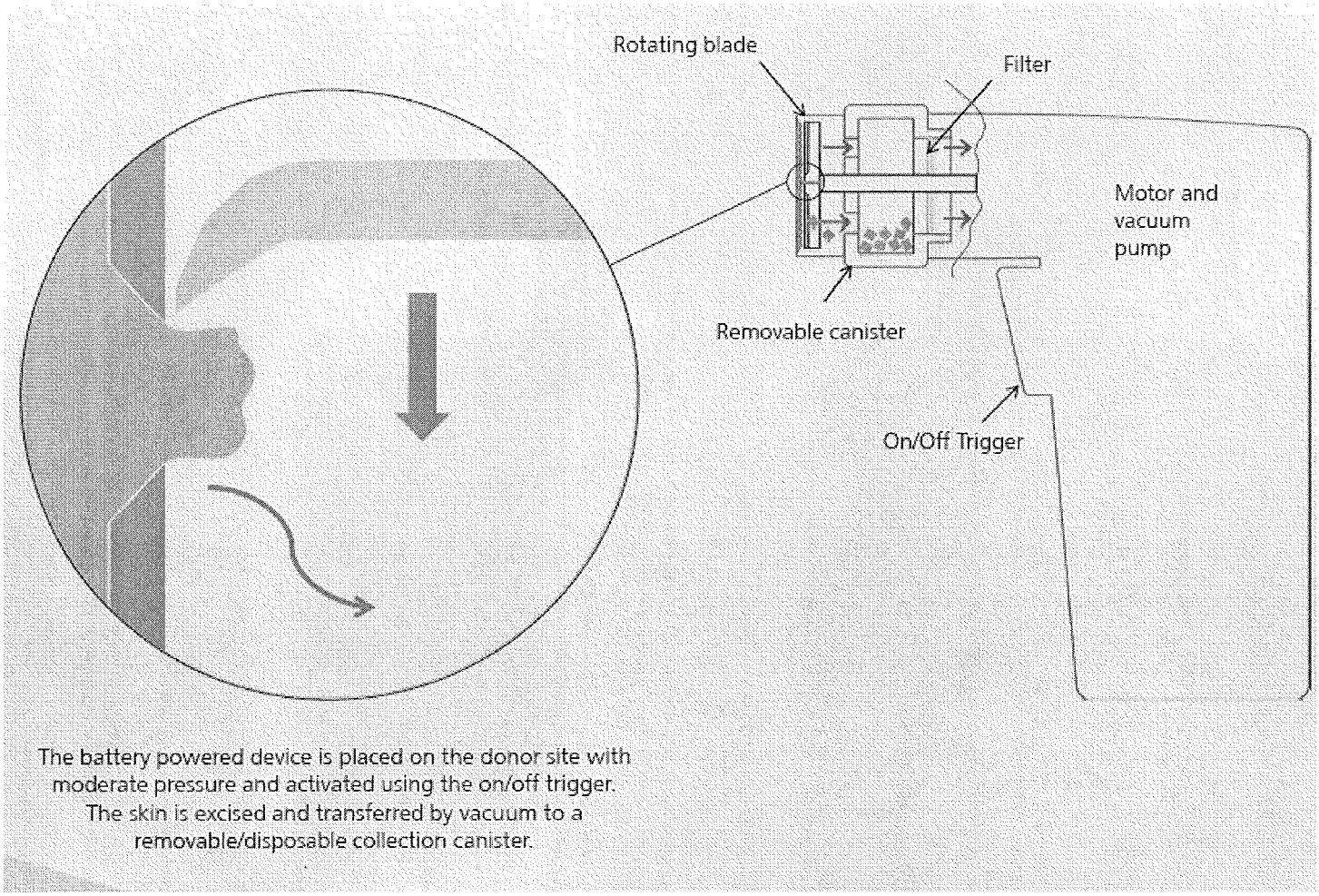
Rotating blade
Filter
Motor and vacuum pump
Removable canister
On/Off Trigger
The battery powered device is placed on the donor site with moderate pressure and activated using the on/off trigger. The skin is excised and transferred by vacuum to a removable/disposable collection canister.

FIG. 20

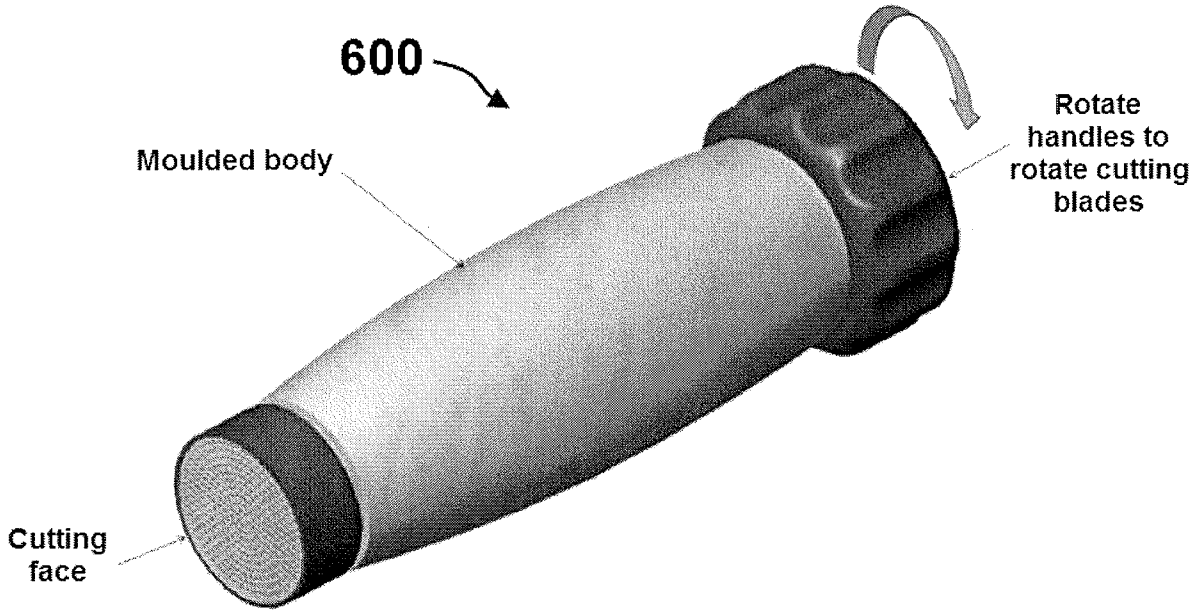
600
Moulded body
Rotate handles to rotate cutting blades
Cutting face

FIG. 21

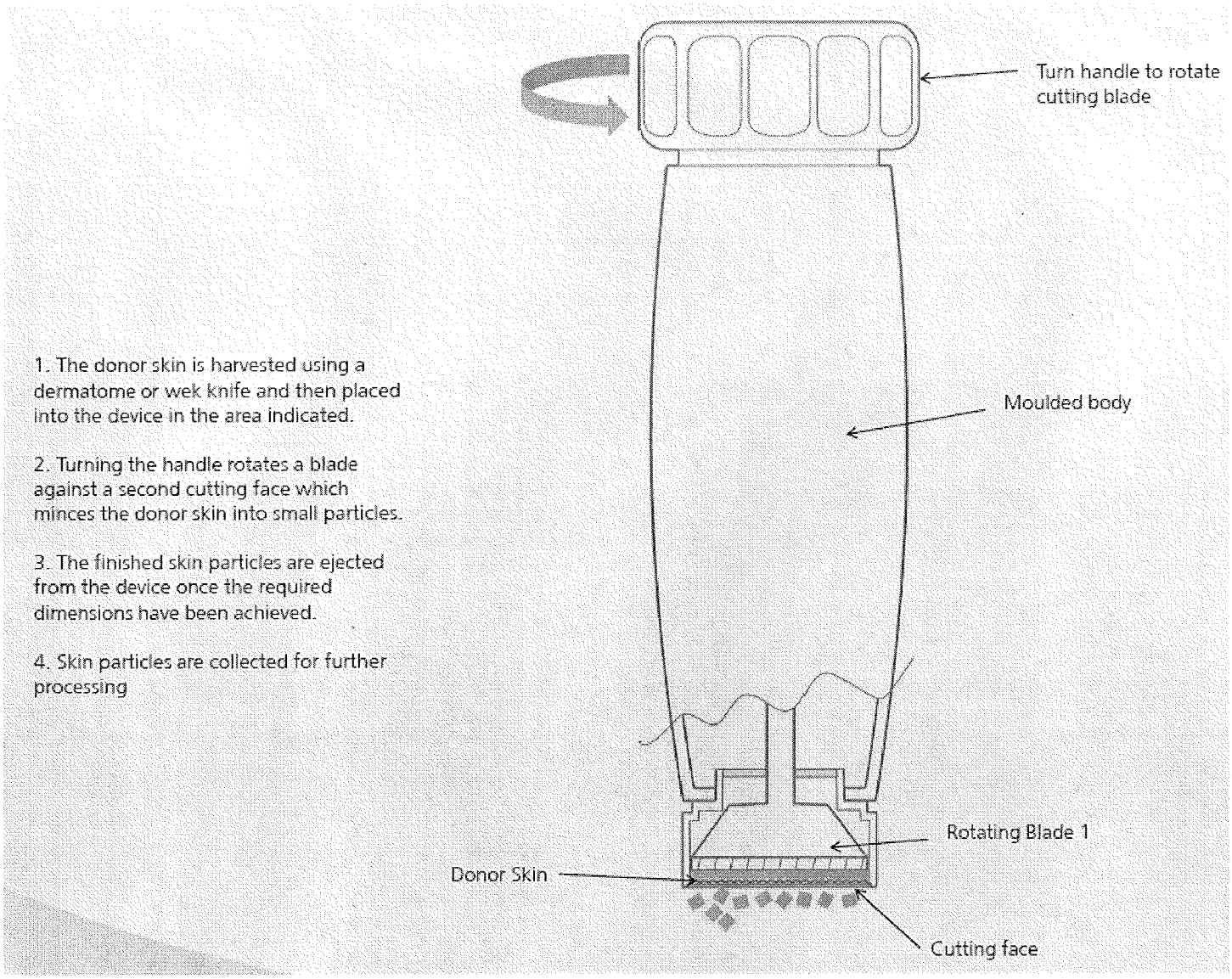
1. The donor skin is harvested using a dermatome or wek knife and then placed into the device in the area indicated.
2. Turning the handle rotates a blade against a second cutting face which minces the donor skin into small particles.
3. The finished skin particles are ejected from the device once the required dimensions have been achieved.
4. Skin particles are collected for further processing
Turn handle to rotate cutting blade
Moulded body
Rotating Blade 1
Donor Skin
Cutting face

FIG. 22

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/034241

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B17/322 A61F13/00 A61B17/3205
ADD. A61B17/00 A61B17/30 A61B10/02

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 A61F

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	US 5 697 901 A (ERIKSSON ELOF [US]) 16 December 1997 (1997-12-16) column 5, line 22 - column 6, line 52; figures 1,2,3a,3b	1,4-10
X	WO 2009/146068 A1 (GEN HOSPITAL CORP [US]; ANDERSON RICHARD ROX [US]; HAMBLIN MICHAEL R [] 3 December 2009 (2009-12-03) page 17, lines 7-22; figure 7	1,4-6, 8-10
A	WO 2007/015232 A1 (HAWK MEDICAL TECHNOLOGIES LTD [IL]; DANENBERG NOAM [IL]; NESHER ORI [I]) 8 February 2007 (2007-02-08) page 8, line 12 - page 10, line 7; figures 1,2A,2B	1-10

☐ 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
22 June 2012	08/10/2012

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	Maier, Christian

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/034241

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. [X] Claims Nos.: 11-13
because they relate to subject matter not required to be searched by this Authority, namely:

see FURTHER INFORMATION sheet PCT/ISA/210

2. [ ] Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. [ ] Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. [ ] As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. [ ] As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. [ ] As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. [X] No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-10

Remark on Protest

[ ] The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

[ ] The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

[ ] No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2012/034241

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5697901 A	16-12-1997	NONE	
WO 2009146068 A1	03-12-2009	AU 2009251617 A1	03-12-2009
		CA 2739097 A1	03-12-2009
		CN 102119006 A	06-07-2011
		EP 2265197 A1	29-12-2010
		JP 2011516169 A	26-05-2011
		KR 20100135864 A	27-12-2010
		US 2012041430 A1	16-02-2012
		WO 2009146068 A1	03-12-2009
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		EP 1915116 A1	30-04-2008
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		JP 2009507773 A	26-02-2009
		US 2008221548 A1	11-09-2008
		WO 2007015232 A1	08-02-2007

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-10

A device for obtaining a plurality of skin tissue particles for use in skin grafting, the device comprising a plurality of hollow needles and a housing with a first aperture configured to be coupled to a vacuum source, so that skin tissue can be aspirated with the needles.

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2. claims: 14-20

A device for obtaining a plurality of skin tissue particles for use in skin grafting, the device comprising a processor with first and second cutting surfaces configured to process skin tissue in to a plurality of skin tissue particles.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.1

Claims Nos.: 11-13

Pursuant to Article 17(2)(a)(i) PCT, this Authority is not required to search the subject-matter of claims 11-13, since a method of obtaining a plurality of skin tissue particles for use in skin grafting comprising the step of removing a first plurality of skin tissue particles from a first donor site as defined in claim 11 represents a method for treatment of the human or animal body by surgery (Rule 39.1(iv) and Rule 43bis PCT).