



Disinfection system for patients

Ou, Yiyu; Petersen, Paul Michael

Publication date:
2024

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):
Ou, Y., & Petersen, P. M. (2024). Disinfection system for patients. (Patent No. WO2024012961).

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.



- (51) International Patent Classification:
A61C 8/00 (2006.01) A61N 5/06 (2006.01)
- (21) International Application Number:
PCT/EP2023/068622
- (22) International Filing Date:
05 July 2023 (05.07.2023)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
22184292.5 12 July 2022 (12.07.2022) EP
- (71) Applicant: DANMARKS TEKNISKE UNIVERSITET [DK/DK]; Anker Engelunds Vej 101, 2800 Kongens Lyngby (DK).
- (72) Inventors: OU, Yiyu; c/o Danmarks Tekniske Universitet, Anker Engelunds Vej 101, 2800 Kongens Lyngby (DK). PETERSEN, Paul Michael; c/o Danmarks Tekniske Universitet, Anker Engelunds Vej 101, 2800 Kongens Lyngby (DK).
- (74) Agent: PLOUGMANN VINGTOFT A/S; Strandvejen 70, 2900 Hellerup (DK).

- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:
— of inventorship (Rule 4.17(iv))

(54) Title: DISINFECTION SYSTEM FOR PATIENTS

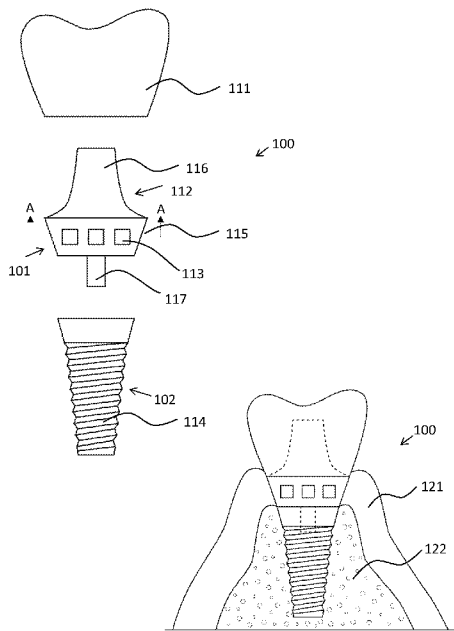


Fig. 1

(57) Abstract: The invention relates to an implant system for a patient, comprising an implant body adapted to be implanted in or on a body part of the patient, a disinfection portion comprising one or more depressions formed on an exterior surface of the disinfection portion, a plurality of light units, wherein each light unit comprises a light emitter and an electromagnetic coil arranged to power the light emitter when the electromagnetic coil is exposed to a magnetic flux and wherein the plurality of light units are at least partly contained within the one or more depressions.



WO 2024/012961 A1

Published:

— *with international search report (Art. 21(3))*

DISINFECTION SYSTEM FOR PATIENTS

FIELD OF THE INVENTION

The invention relates to UV light disinfection systems for disinfection of body
5 tissue of humans or animal.

BACKGROUND OF THE INVENTION

Implants are commonly used in dental surgery for restoring teeth. It is a
prosthesis device designed to be implanted into the gingival tissue beneath the
10 periosteal layer and within the bone.

Many dental implants suffer from bacterial infection. Presently, no efficient
therapies, neither surgical nor non-surgical, are available to fight the destructive
inflammatory process on tissues surrounding the implants with bone loss.
15 Recurrence of infections after requiring re-treatment is often seen. Current
solutions comprises use of antibiotics, removal of damaged bone and tissues by
surgery. These methods are not effective and suffers from being expensive,
painful, invasive and time consuming leading to a huge cost of medical and social
resources.

20

Not only dental implants suffer from infection problems, but also other implants
such as pacemaker and bone implants.

WO2019/088939A1 discloses a dental implant healing cap with an integrated LED
25 light source comprising at least one titanium body, at least one screw part for
screwing into a female screw part within the implant, at least one main case
which has holes, at least one top cover which is screwed onto the body which has
a recess in the middle to allow the operator to turn the cover with a multi-sided
key, at least one light module (3) for light emission, at least one control unit and
30 at least one battery cell, at least one integrated LED source placed on the lateral
sides of the implant facing toward the gingival.

Whereas WO2019/088939A1 presents a solution for treating dental disinfection,
the present inventors have devised the present invention for further improvement
35 of disinfection systems.

SUMMARY OF THE INVENTION

It is an object of the invention to develop an effective disinfection system addressing the above mentioned problems with current methods and to improve current UV light disinfection systems.

5

In a first aspect of the invention an implant system for a patient is presented which comprises

- an implant body adapted to be implanted in or on a body part of the patient,
 - a disinfection portion comprising one or more depressions formed on an exterior
- 10 surface of the disinfection portion,
- a plurality of light units, wherein each light unit comprises a light emitter, such as a light emitter, and an electromagnetic coil arranged to power the light emitter when the electromagnetic coil is exposed to a magnetic flux and wherein the plurality of light units are at least partly contained within the one or more
- 15 depressions.

Advantageously, the light units are configured as a single unit containing both the power source, in the form of a coil, and the light emitter. The coil may be configured as windings of an electrical conductor, e.g. planar windings on a

20 substrate, configured as a traditional toroidal coil, or configured in general as 2D or 3D windings on a plane or in a 3D space. The compactness of the light units and the unnecessary need for other electrical components provides for a simple manufacturing and a robust implant system.

25 Further, due to the compactness of the light units, an entire light unit can be contained within a depression, while it is also possible that a portion of the light unit may protrude out of the depressions. For example the lower portion of the light unit, such as a substrate thereof can be fixed to the bottom of a depression.

30 Advantageously, the emitted light, such as UV light, can eradicate bacteria without doing any surgeries.

Further advantages, low power consumption and low heat generation due to the directly power light emitters and the particularly that there is no risk of battery

35 leakage.

The one or more depressions may be formed as holes or as one or more notches in the exterior surface of the disinfection portion.

According to an embodiment, the implant system is a dental implant system
5 wherein the implant body is adapted to be implanted in the gingival tissue of the patient.

According to an embodiment, the implant system comprises an abutment,
wherein the abutment comprises the disinfection portion.

10

Advantageously, when the light units are integrated on the abutment surface, the disinfection is most efficient since the oral bacterial infection often take place on the abutment surface or in a region where the abutment surface is in contact with the gum tissue.

15

Thus, according to an embodiment, the dental implant may be configured so that an exterior surface of the abutment faces the gingival tissue when implanted in a patent.

20 According to an embodiment, the dental implant comprises a dental crown, wherein the abutment is arranged between the implant body and the dental crown. For example, the abutment may comprises a connection portion for attachment of a dental crown.

25 According to an embodiment, the disinfection portion comprises a bio-compatible protection layer, such as TiO₂, covering the depressions. Besides improving the bio-compatible properties, the protection layer protects the light units from body liquids such as the mouth liquids.

30 According to an embodiment, each of the light units comprises a substrate such as a silicon wafer wherein the electromagnetic coil is arranged on the substrate. Advantageously, the coil may be manufactured as a coil-layer on a substrate such as silicon wafer. Additionally, the light emitter may be arranged on the substrate are at least electrically connected to the substrate, wherein the substrate

comprises an electrical connection connecting the light emitter and the electromagnetic coil.

The light unit may have a footprint with a largest dimension being less than 1 mm, preferably less than 500 μm , more preferably less than 200 μm , such as less than 50 μm .

According to an embodiment, the light emitter is configured to emit light in the wavelength range from 200 to 400 nm such as from 280 to 320 nm.

- 10 A second aspect of the invention relates to a method for manufacturing a disinfection portion for an implant system according to claim 1, the method comprises
- providing a body part for the disinfection portion,
 - forming one or more depressions in the body part so that each of the one or
 - 15 more depressions forms an opening in an exterior surface of the body part,
 - providing a plurality of light units, wherein each light unit comprises a light emitter and an electromagnetic coil arranged to power the light emitter when the electromagnetic coil is exposed to a magnetic flux,
 - mounting the plurality of light units in the one or more depressions so that the
 - 20 light units are at least partly contained within the one or more depressions.

A third aspect of the invention relates to a disinfection system, comprising

- the implant system according to any of claims 1-13 and
- a flux generator for generating and transmitting the magnetic flux to the
- 25 electromagnetic coils of the light units.

The implant system may be used for a dental implant, a hearing aid implant, a pacemaker, a bone implant such as a hip implant, a knee implant or an ankle implant. Particularly, the implant system may be used for maintaining a healthy

30 body tissue, and may be used by the patient, e.g. in the patient's home, although the implant system may also be used by healthcare professionals. Accordingly, the implant system need not necessarily be used for curing a disinfection but may be used for dental hygiene similarly to tooth brushing.

In general, the various aspects and embodiments of the invention may be combined and coupled in any way possible within the scope of the invention. These and other aspects, features and/or advantages of the invention will be apparent from and elucidated with reference to the embodiments described
5 hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will be described, by way of example only, with reference to the drawings, in which

10

Fig. 1 shows a dental implant system,

Fig. 2 shows a cross-sectional view of a portion of the dental implant system and a detail view of the light unit,

Fig. 3 shows a method for manufacturing the disinfection portion,

15 Fig. 4 a general implant system and flux generator for generating the magnetic flux for generating a current in the coil of the implant system.

DESCRIPTION OF EMBODIMENTS

Fig. 1 shows a dental implant system 100 for a patient. The dental implant system
20 comprises an implant body 102 adapted to be implanted in the gingival tissue 121 of the patient, e.g. by a thread 114 comprised by the implant body and intended to be screwed into the bone part 122.

The dental implant system 100 further comprises a disinfection portion 101. The
25 disinfection portion 101 is often termed as an abutment 112 of a dental implant.

The disinfection portion 101 comprises one or more depressions 211 formed on an exterior surface 115 of the disinfection portion 101. Each of the depressions 211 has an opening on the exterior surface 212 and extends, e.g. in a radial direction,
30 into the material of the disinfection portion. The depressions may be holes such as cylindrical holes. Alternatively, the one or more depressions are formed as elongate holes extending along at least a fraction of the circumference of the exterior surface 212. In an example, a single elongate hole is formed as a notch or a ridge in the exterior surface that circumscribes the annular shape of the
35 disinfection portion 101.

In case of cylindrical holes, each hole may have a diameter equal to or less than 3mm, such as less than 1mm, such as less than 0,5mm, such as less than 0,3mm such as less than 0,1mm. The depth of the holes may be up to 0,5mm, such as up to 1mm or up to 2 to 3 mm. In general the diameter or a corresponding lateral
5 dimension of the depressions 211 should be larger than the corresponding lateral dimension of the light unit 220 to enable glue to seal the components of the light unit. Similarly, the depth of the depressions 211 may be chosen to be larger than height of the light units 220 to ensure that the light emitter 113 does not protrude beyond the exterior surface 115 or boundary of the disinfection portion 101.

10

When the dental implant system is implanted in a patient the exterior surface 115 of the abutment 112 will normally face the gingival tissue 121, at least when the gingival tissue 121 is healthy.

15 The one or more depressions may be formed by drilling, laser processing, etching or by other suitable method.

The dental implant system 100 further comprises a plurality of light units 220. Each light unit 220 comprises a light emitter 113 such as a LED or a laser diode
20 and an electromagnetic coil 223 electrically connected to the light emitter 113 for powering the light emitter 113. The light emitter 113 may be a UV light emitter.

The light emitter is energized by exposing the electromagnetic coil to a magnetic flux such as a magnetic flux with varying flux amplitude and/or flux direction.

25

Fig. 2 shows a cross-sectional view along cross-section A-A, depressions 211 and the light unit 220.

As shown in Fig. 2, each of the light units 220 are completely contained within
30 their associated holes 211. That is, the outermost surface of the light emitter 113, i.e. the surface located radially farthest away from the axial center axis of the abutment 112, is located within the circumference of the exterior surface 115. Thereby, no part of the light unit 220 extends radially beyond the exterior surface 115 of the abutment 112. The space or a part of the space in the depressions 211
35 between the outermost surface of the light emitter 113 and the outer

circumference of the abutment 112 may be filled with a bio-compatible protection material, such as TiO₂, thereby filling the depressions to form a smooth exterior surface 115 over the depressions 211. Alternatively, a part of the light units 220 such as a part of the light emitters may protrude out of the depressions, i.e. 5 beyond the circumference of the exterior surface 115.

The electromagnetic coil 223 of each light unit 220 may be arranged on a substrate such as a silicon substrate or wafer. For example, the electromagnetic coil 223 may be formed by printing a conductive metal coil, or by etching or laser 10 processing a deposited metal layer to form a coil on the substrate. The light emitter may be electrically connected to the coil via an electrical connection on the substrate.

For example, the coil may be a MEMS coil bonded together with the light emitter 15 onto a substrate.

The light unit 220 may further comprise an electronic circuit 222 comprising rectifier electronics and a voltage controller or limiter to ensure that the light emitter 113 is supplied with a DC voltage within a maximum voltage limit. 20

The emitted light 225 has a spectral range within a UV range such as within a wavelength range from 200 to 400 nm such as within 280 to 320 nm or within the UVB spectral range. The UVB range is safe for humans and can effectively eradicate biofilms of oral bacteria. 25

The abutment 112 is arranged between the implant body 102 and the dental crown 111.

The abutment 112 comprises a connection portion 116 such as a tapered 30 extension upon which the dental crown 111 can be attached e.g. by use of a dental glue. The abutment 112 may further comprise a connection part 117 such as a pin which can be connected to a corresponding hole in the implant body 102, e.g. by gluing or by some mechanical fixation such as threads provided on the pin and the hole in the implant body 102. Alternatively, the abutment part 112 and 35 implant body 102 can be formed as a single piece.

One or more of the components of the light unit 220, such as the light emitter 113 and the coil 223 could be arranged on top of each other as illustrated in Fig. 2. Alternatively, the light emitter 113 and the coil 223 could be arranged on the same plane of the substrate 224, e.g. side by side.

5

The light unit 220 has a very small footprint. The largest dimension D of the footprint, such as the diameter D of a circular footprint, is less than 1 mm, often less than 500 μm , could be less than 200 μm , such as less than 50 μm .

10 Fig. 3 shows a possible principal method for manufacturing the disinfection portion 101. In a first step A, a body part 401 is provided for manufacturing the disinfection portion. The body part 401 may be made from Titanium. In a second step B one or more depressions 211 such as bore holes are made in the exterior surface 115. In step C, a plurality of light units 220 are provided. The light units
15 220 may be been manufactured in a previous separate step. Further in step C, the light units 220 are mounted in the depressions such as by fixing, e.g. by gluing, one light unit 220 in each depression 211 or by fixing a plurality of light units 220 in an elongate depression 211 such as a groove. Optionally, in step D a layer of bio-compatible material 301, such as TiO_2 , is deposited on the abutment surface,
20 i.e. the exterior surface 115 so that the layer at least covers the outward facing surface of the light units 220 such as the outward facing surface of the light emitters 113. For example, the bio-compatible material 301 may be applied so that the material at least fills the depressions 211 up to the circumference of the exterior surface 115. TiO_2 is the natural oxidation layer of Ti material from with
25 the disinfection portion 101 is made, no additional oxidation layer needs to be applied to the exterior surface 115 besides the depressions.

Fig. 4 shows a disinfection system 400. The disinfection system 400 comprises the implant system 100 with the implant body 102 adapted to be implanted in or on a
30 body part of the patient and the a disinfection portion 101 comprising one or more depressions 211 and mounted light units 220.

The implant system 100 in Fig. 4 may be dental implant system, or an implant system configured as a hearing aid implant, a pacemaker, a bone implant such as
35 a hip, knee or ankle implant.

Thus, the implant system 100 may be configured for other uses than dental prostheses, but is based on the same general characteristic where the implant system generally comprises an implant body 102 adapted to be implanted in or on a body part of the patient, and a disinfection portion 101 comprising one or more 5 depressions 211 and a plurality of light units arranged at least partly within the one or more depressions.

The disinfection system 400 further comprises a flux generator 401 configured for generating and transmitting a magnetic flux to the electromagnetic coils of the 10 light units 220. The flux generator may comprise a power source arranged for generating an alternating electric current. The flux generator further comprises a coil arranged to be powered by the alternating electric current for generating the alternating magnetic flux. The flux generator may further comprise an electronic circuit for controlling e.g. the AC current supplied to the flux generator. The 15 electrically conducting coil of the flux generator 401 may be a separate device which is electrically connectable with the power source and electronic part of the flux generator 401. For example, the coil of the flux generator may be arranged to be placed near the implant system 100, e.g. in the mouth in case of a dental implant system.

20

The disinfection system 400 and the implant system 100 may be used for humans or animals. Thus, the patient referred to above may be a human or an animal.

CLAIMS

1. An implant system (100) for a patient, comprising
 - an implant body (102) adapted to be implanted in or on a body part of the patient,
 - 5 - a disinfection portion (101) comprising one or more depressions (211) formed on an exterior surface (115) of the disinfection portion,
 - a plurality of light units (220), wherein each light unit comprises a light emitter (113) and an electromagnetic coil (223) arranged to power the light emitter when the electromagnetic coil is exposed to a magnetic flux and wherein the plurality of
 - 10 light units are at least partly contained within the one or more depressions.

2. An implant system according to claim 1, wherein the implant system is a dental implant system and wherein the implant body is adapted to be implanted in the gingival tissue (121) of the patient.
- 15
3. A dental implant system according to claim 2, wherein the implant system comprises an abutment (112) and wherein the abutment comprises the disinfection portion.

- 20 4. An implant system according to claim 3, wherein the dental implant is configured so that an exterior surface (115) of the abutment faces the gingival tissue when implanted in a patient.

5. An implant system according to any of claims 3-4, wherein the dental implant
- 25 comprises a dental crown (111) and wherein the abutment is arranged between the implant body (102) and the dental crown.

6. An implant system according to any of claims 3-5, wherein the abutment comprises a connection portion (116) for attachment of a dental crown.
- 30
7. An implant system according to any of the preceding claims, wherein the disinfection portion comprises a bio-compatible protection layer (301), such as TiO₂, covering the depressions.

8. An implant system according to any of the preceding claims, wherein each of the light units comprises a substrate (224) such as a silicon wafer and wherein the electromagnetic coil (223) is arranged on the substrate.
- 5 9. An implant system according to claim 8, wherein the light emitter (113) is arranged on the substrate and wherein the substrate comprises an electrical connection connecting the light emitter and the electromagnetic coil.
- 10 10. An implant system according to any of the preceding claims, wherein the light unit has a footprint which largest dimension (D) is less than 1 mm, preferably less than 500 μm , more preferably less than 200 μm , such as less than 50 μm .
11. An implant system according to any of the preceding claims, wherein the one or more depressions are formed as a plurality of holes.
- 15 12. An implant system according to any of claims 1-10, wherein the one or more depressions is formed as a notch or a ridge.
- 20 13. An implant system according to any of the preceding claims, wherein the light emitter is configured to emit light in the wavelength range from 200 to 400 nm such as from 280 to 320 nm.
14. A method for manufacturing a disinfection portion (101) for an implant system (100) according to claim 1, the method comprises
- 25 - providing a body part (401) for the disinfection portion,
- forming one or more depressions (211) in the body part so that each of the one or more depressions forms an opening in an exterior surface (115) of the body part,
- providing a plurality of light units (220), wherein each light unit comprises a
30 light emitter (113) and an electromagnetic coil (223) arranged to power the light emitter when the electromagnetic coil is exposed to a magnetic flux,
- mounting the plurality of light units in the one or more depressions so that the light units are at least partly contained within the one or more depressions.
- 35 15. A disinfection system (400), comprising

- the implant system (100) according to any of claims 1-13 and
- a flux generator (401) for generating and transmitting the magnetic flux to the electromagnetic coils (223) of the light units (220).

1/4

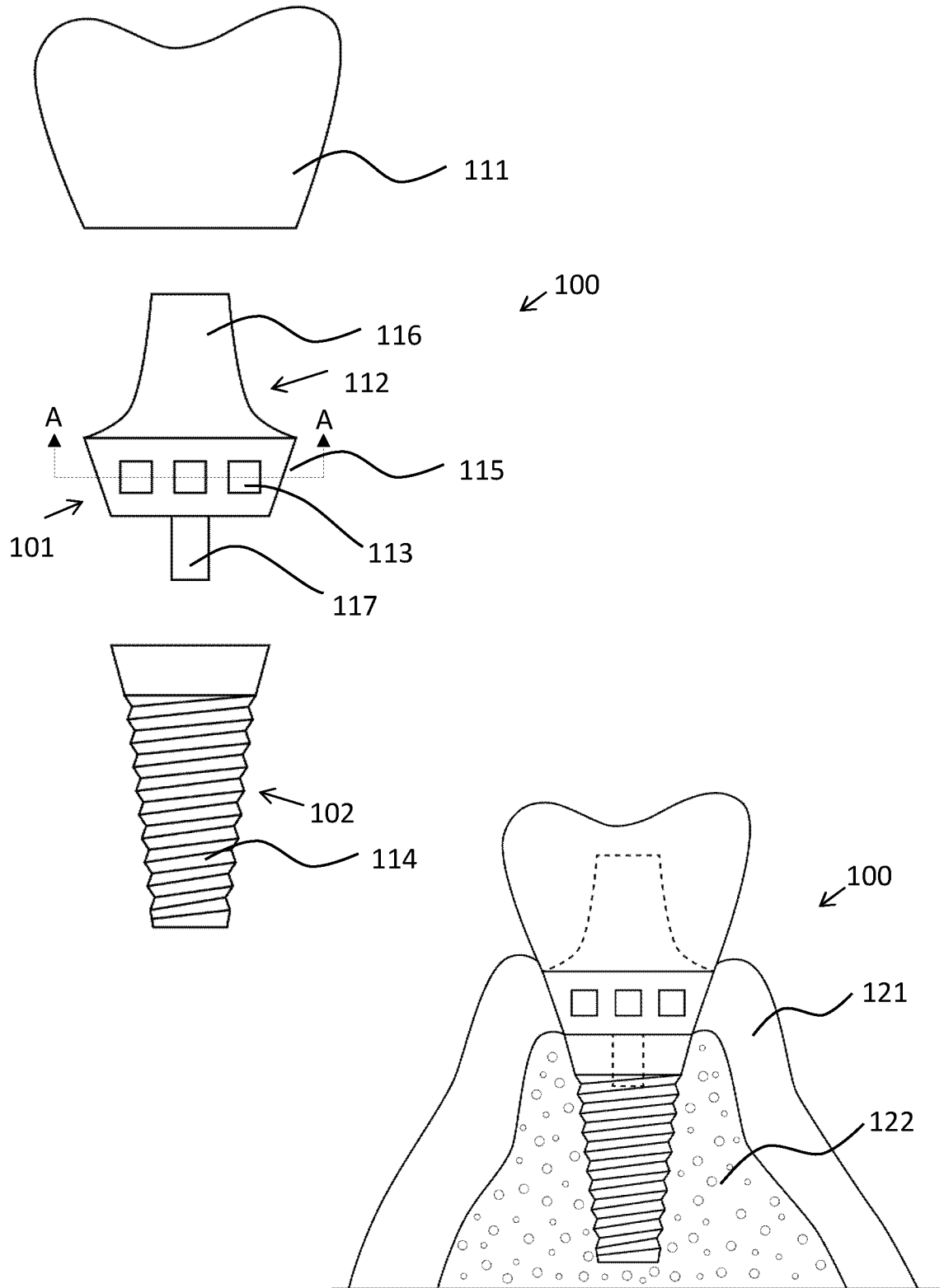


Fig. 1

2/4

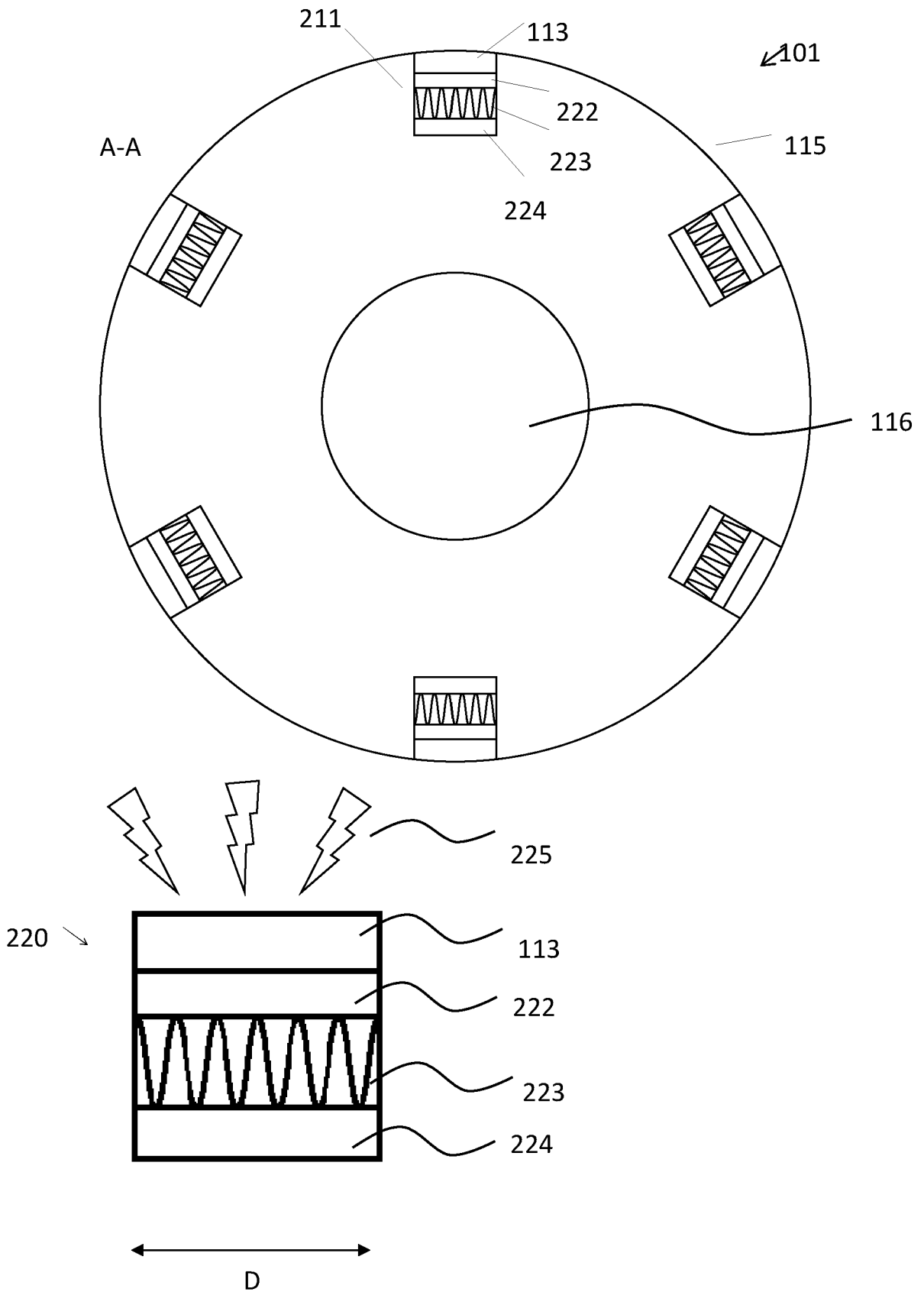


Fig. 2

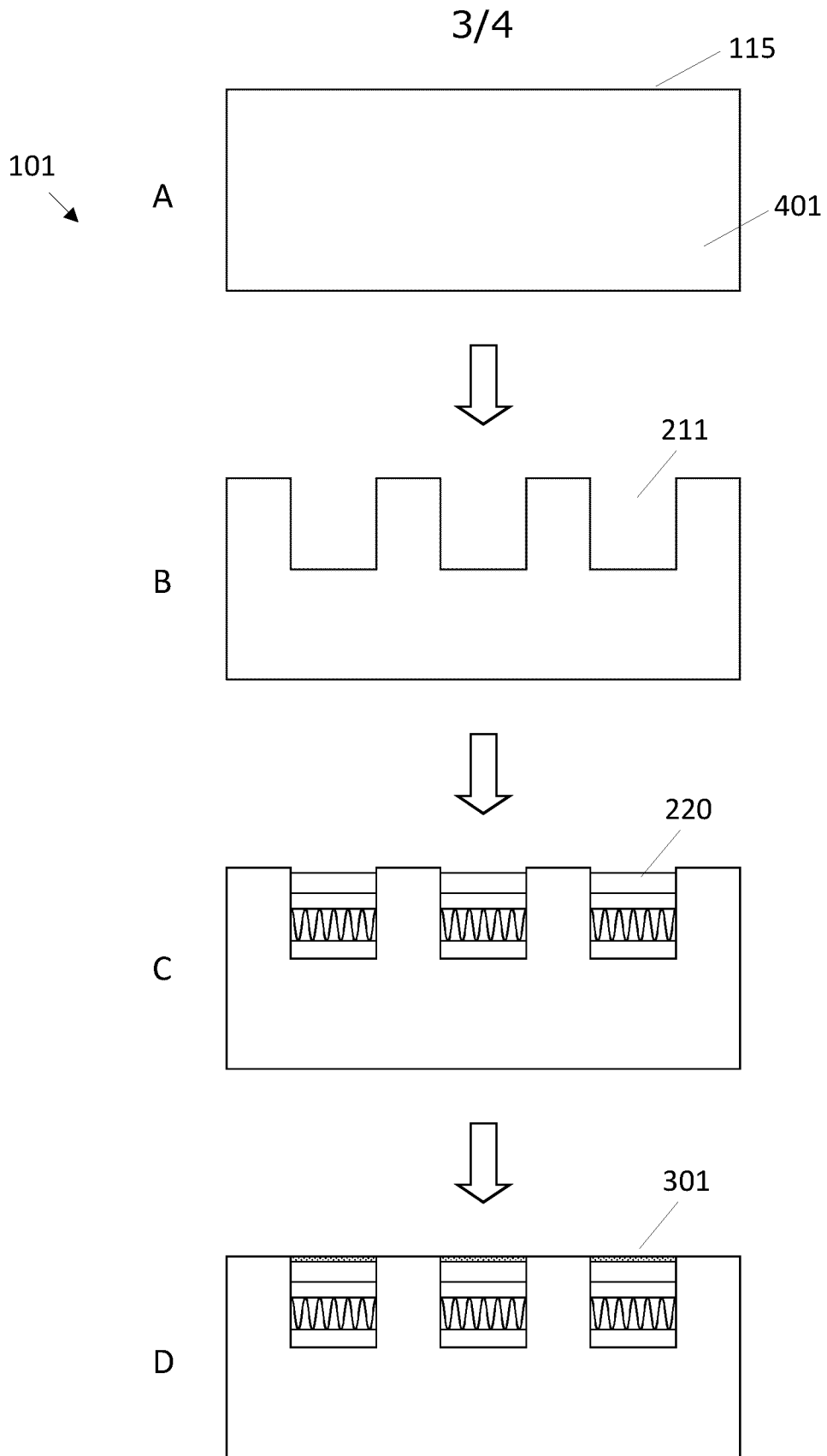


Fig. 3

4/4

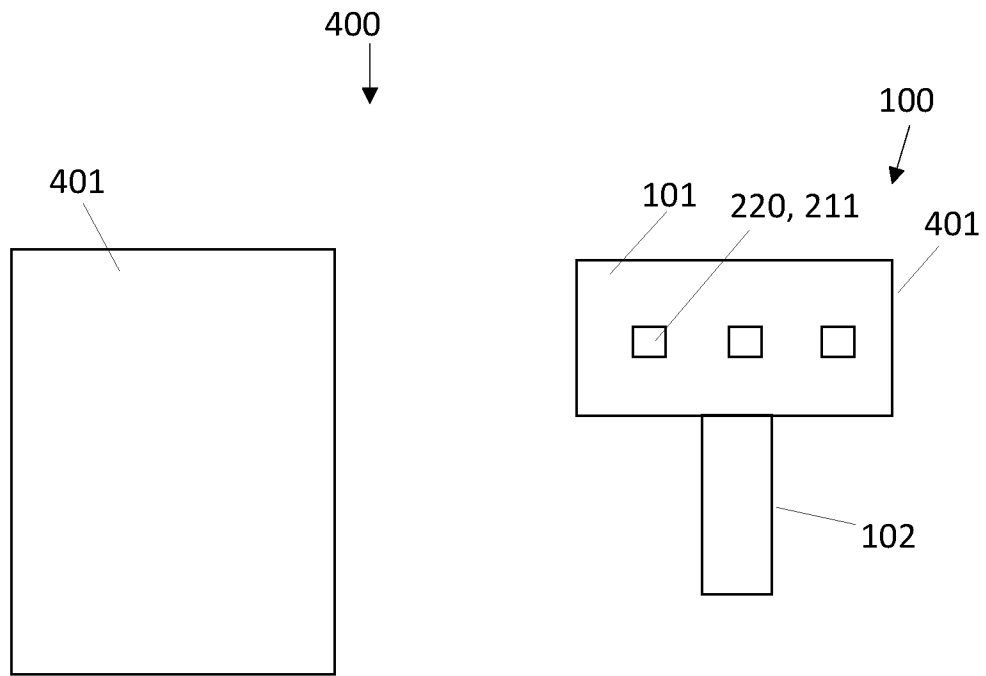


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2023/068622

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61C8/00 A61N5/06
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)
A61C A61N

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.
A	WO 2019/088939 A1 (BENLIOGLU MUSFIK [TR]) 9 May 2019 (2019-05-09) cited in the application the whole document -----	1-15
A	CN 113 209 491 A (INST SEMICONDUCTORS CAS; UNIV PEKING SCHOOL STOMATOLOGY) 6 August 2021 (2021-08-06) the whole document -----	1-15
A	WO 2021/252999 A1 (UNIV PENNSYLVANIA [US]; KIM ALBERT [US]; UNIV TEMPLE [US]) 16 December 2021 (2021-12-16) pages 10,13; figure * -----	1-15
A	KR 2018 0115919 A (TECOZYME INC [KR]) 24 October 2018 (2018-10-24) the whole document -----	1-15
	-/--	

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p>
---	---

Date of the actual completion of the international search 12 September 2023	Date of mailing of the international search report 20/09/2023
---	---

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

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2023/068622

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 110 917 502 A (UNIV SUN YAT SEN) 27 March 2020 (2020-03-27) the whole document -----	1-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2023/068622

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2019088939	A1	09-05-2019	NONE

CN 113209491	A	06-08-2021	NONE

WO 2021252999	A1	16-12-2021	CA 3186866 A1 16-12-2021
		CN 116458051 A	18-07-2023
		EP 4165769 A1	19-04-2023
		JP 2023538182 A	07-09-2023
		US 2023107743 A1	06-04-2023
		WO 2021252999 A1	16-12-2021

KR 20180115919	A	24-10-2018	NONE

CN 110917502	A	27-03-2020	NONE
