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HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN,
KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD,
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(54) Title: A SPRING-LOADED DENTAL MIRROR

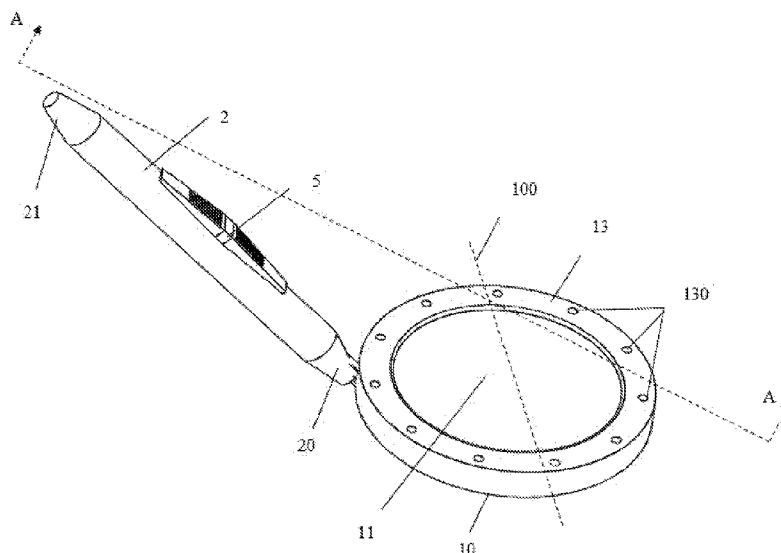


FIG. 1

(57) Abstract: The present disclosure provides a dental mirror that may include a mirror compartment having a flat base with a central axis, a reflective surface, and a spiral spring with a first end and a second end, the spiral spring is sandwiched between the flat base and the reflective surface; and a handle connected from a proximal end to the mirror compartment.



Declarations under Rule 4.17:

- *as to the identity of the inventor (Rule 4.17(i))*
- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Published:

- *with international search report (Art. 21(3))*
- *in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE*

A SPRING-LOADED DENTAL MIRROR

TECHNICAL FIELD

[01] The present disclosure relates to dental instruments in general, and more particularly to dental mirrors with self-cleaning capabilities.

BACKGROUND

[02] Dental mirrors have long been utilized by dental practitioners in various procedures, particularly when the visibility of a patient's oral cavity is a challenge, in order to enable better diagnosis and treatment. A stereotypical dental mirror comprises of a glass mirror mounted on a reflective surface which is pivoted at a certain angle to a stainless handle. During use, the efficiency and operation of a dental mirror is compromised due to the deposition of water droplets, tooth debris, and dental material on its surface. Consequently, practitioners must continuously remove, manually clean, reposition, and apply a surface tension reducer to the dental mirror in order to overcome the resulting poor sight and fogging. This is a tedious, time consuming, and costly process. Accordingly, numerous attempts have been made to introduce novel configurations and self-cleaning methods for dental mirrors in order to eliminate the previously mentioned problems. For instance, the United States patent number 4261637 discloses the incorporation of an electromagnetic motor which drives mirror rotation with sufficient velocity to prevent accumulation of moisture droplets on the surface of the mirror.

[03] The United States patent number 005736 discloses an illuminated dental mirror which includes an LED housing disposed in a mirror handle, which is designed to retain at least one LED, and a reflector attached to a distal end of a housing body. Simultaneously, the reflector has an inwardly tapered activity covering an LED lens envelope for focusing illumination from at least one LED onto a portion of the light entrance surface of the mirror.

[04] The United States patent number 0074719 discloses a self-cleaning dental mirror which includes air and water orifices that are integrated into its handle and operated by positioned pushbuttons. The dental mirror can be connected and disconnected to air and water supply

lines, thus directing the air and water orifices at the removable reflective surface to blow debris and any obscuring liquid off the mirror.

[05] The United States patent number 4993945 discloses a heated dental mirror which includes two reflecting surfaces, a rechargeable battery, a resistance type heater mounted adjacent to the reflecting surfaces and illumination means to direct a light beam upon one of the reflecting surfaces at all times when the device is in use. The rechargeable battery along with electrical circuit are positioned within a handle of the dental mirror, wherein sufficient energy generated from the heater circuit is thermally conducted to the reflecting surfaces. Consequently, the temperature of both reflecting surfaces is elevated to a temperature at or above the dew point temperature of the air in the patient's mouth, giving rise to anti-fog properties of the dental mirror.

[06] The United States patent number 0076019 discloses a dental mirror which includes a head portion, a handle portion, and a mirror assembly. The head portion includes a housing, a rotor assembly, and rotor drive means. The mirror assembly includes a secondary member having a reflective surface, attachment means for removably attaching the secondary membrane with respect to the rotor assembly for relative rotation, and bearing means for supporting rotor assembly relative to the housing. By means of centrifugal forces, the rotor drive means spins the rotor assembly along with the reflective surface to dispel fluids and debris from the mirror surface.

[07] None of the prior art documents discloses a self-cleaning dental mirror having a rotatable reflective surface which is fixed to a spiral spring. The incorporated spiral spring rotates the mirror clockwise and anti-clockwise, significantly reducing any operational inconvenience and inefficiency caused by water droplets interfering with the reflective capacity of a mirror in a highly moisturized ambient.

SUMMARY

- [008] An object of this disclosure is to provide an oral examination instrument, particularly a spring-loaded dental mirror, intended to enhance visibility inside a patient's oral cavity while getting rid of the fluid droplets and debris accumulating on the reflective surface thereof without the need to remove the mirror from the patient's oral cavity.
- [009] In aspects of the present disclosure, there is provided a dental mirror that may include a mirror compartment having a flat base with a central axis, a reflective surface, and a spiral spring with a first end and a second end, the spiral spring is sandwiched between the flat base and the reflective surface; and a handle connected from a proximal end to the mirror compartment.
- [010] In some aspects, the mirror compartment may further include a cap connected to the flat base, the cap may be configured to secure a sandwiched configuration of the spiral spring between the flat base and the reflective surface.
- [011] In aspects of the present disclosure, the reflective surface may be rotatable within the cap.
- [012] In some aspects, the cap may include a plurality of light sources configured to illuminate an oral cavity of a patient.
- [013] In aspects of the present disclosure, the dental mirror may further include a first cable connected to the first end of the spiral spring.
- [014] In aspects of the present disclosure, the dental mirror may further include a second cable connected to the spiral spring at maximum displacement from the first end of the spiral spring that is collinear with the first end of the spiral spring through the central axis.
- [015] In aspects of the present disclosure, the dental mirror may further include a pull button connected to the first cable and the second cable.
- [016] In aspects of the present disclosure, the handle may include a groove configured to receive the pull button.

[017] In aspects of the present disclosure, the pull button may be slidable within the groove when a user applies a force on such pull button.

[018] In some aspects of the present disclosure, the second end of the spiral spring may be connected to the reflective surface such that any oscillation of the spiral spring is translated into a rotational motion of the reflective surface.

[019] In aspects of the present disclosure, the dental mirror is autoclavable.

BRIEF DESCRIPTION OF THE DRAWINGS

[020] A more complete understanding of the invention may be gained through the review of the following illustrations of the invention in which:

[021] FIG. 1 is a perspective view of the dental mirror configured in accordance with embodiments of the present disclosure.

[022] FIG. 2 illustrates a sectional view of the dental mirror configured in accordance with embodiments of the present disclosure, wherein the section is taken across the line A-A of FIG. 1.

[023] FIG. 3 illustrates an exploded view of the dental mirror configured in accordance with embodiments of the present disclosure.

[024] FIG. 4 illustrates a perspective view of a spiral spring, pull button, a first cable, and a second cable of a dental mirror configured in accordance with embodiments of the present disclosure.

DETAILED DESCRIPTION

[025] FIGS. 1-4 illustrate a spring-loaded dental mirror configured in accordance with the present disclosure. The spring-loaded dental mirror may include a mirror compartment 1 having a flat base 10, a reflective surface 11, a spiral spring 3 sandwiched between the flat base 10 and the reflective surface 11, and an illuminating cap 13 connected to the flat base 10 and configured to enclose a portion of the reflective surface 11 as well as the spiral spring 12. The spring-

loaded dental mirror of the present disclosure may further include an elongated handle 2 with a proximal end 20, a distal end 21, and a groove 22, wherein the proximal end 20 may be fixedly connected to the mirror compartment 1 at a certain angle. For the sake of simplicity and illustration, the mirror compartment 1 has a virtual central axis 100 that is parallel to the flat base 10 and that passes through the center of the flat base.

[026] In embodiments of the present disclosure, the spiral spring 12 may have a first end 120, a second end 121, wherein a first cable 3 may be connected to the first end 120 of the spiral spring 120 and a second cable 4 may be connected to the spiral spring 12 at a maximum displacement from the first end 120 that is collinear with the first end 120 at the virtual central axis 100. The second end 121 may be connected to a lower surface of the reflective surface 11 such that any oscillation of the spiral spring 12 is transferred to a rotational motion of the reflective surface 11 within the illuminating cap 13.

[027] The spring-loaded dental mirror of the present disclosure may also include a pull button 5 that is operably connected to the first and second cables 3, 4, wherein the groove 22 of the elongated handle 2 may be configured to receive the pull button 5 and allow such pull button 5 to slide within such groove 2 when a user applies a force thereon.

[028] In operation, when a use applies a force on the pull button 5 allowing it to slide towards the distal end 21 of the handle 2. This sliding movement will be transmitted through the first and second cables 3, 4 to the spiral spring 12, resulting in a deformation of the spiral spring 12. Conversely, as the pull button 5 is allowed to slide in the opposite direction, i.e. towards the proximal end 20 of the handle 2, the first and second cables 3, 4 become relaxed, thus releasing the force transmitted to the spiral spring 12. As a result of force release, the spiral spring 12 will start oscillating in clockwise and counterclockwise directions to reach its return back to its default state by means of rotational inertia. This oscillation will cause the reflective surface 11 to oscillate as well. As the reflective surface 11 oscillates, accumulating moisture and debris thereon are flung off, without the need to continuously removing the mirror compartment 1 from the oral cavity of the patient to wipe/clean such compartment to remove debris and moisture accumulated thereon.

[029] In some embodiments of the present disclosure, the reflective surface 11 may have a protrusion extending vertically from a lower surface of such reflective surface with a central pass-through opening 110. Also, the flat base 10 may have a central protrusion 1100 extending vertically from a center of an upper surface of the flat base 10, and a plurality of tiny protrusions 101 extending vertically from the circumference or perimeter of the flat base 10. The pass-through opening of the reflective surface 11 may be configured to receive the central protrusion 1100 of the flat base 10, and each of the plurality of tiny protrusions 101 may be configured to engage with the illuminating cap 13.

[030] In embodiments of the present disclosure, the illuminating cap 13 may have a plurality of holes (not shown) configured to incorporate a plurality of miniature light sources 130. This integration of illumination housing with reflective surface results in overall increased performance efficiency of the dental mirror as well as enhanced visibility of oral cavity, enabling a more precise examination and diagnosis by dental practitioners. The plurality of miniature light sources 130 may be powered by a battery (not shown) positioned within the handle 2.

[031] In embodiments of the present disclosure, the angular speed of the reflective surface 11 is merely dependent on the stiffness and number of turns of the spiral spring 12, as well as the magnitude of the force applied by the user on the pull button 5. Any alteration in the speed of the reflective surface 11 rotation may require either alteration in the magnitude of the force applied to the pull button 5 and/or the specifications of the spiral spring 12.

[032] The spring-loaded dental mirror described herein in accordance with embodiments of the present disclosure may be manufactured from a suitable and low-heat absorbing materials which permit their sterilization by autoclaving.

[033] While embodiments of the present disclosure have been described in detail and with reference to specific embodiments thereof, it will be apparent to one skilled in the art that various additions, omissions, and modifications can be made without departing from the spirit and scope thereof.

CLAIMS

What is claimed is:

1. A dental mirror comprising a mirror compartment having a flat base with a central axis, a reflective surface, and a spiral spring with a first end and a second end, the spiral spring is sandwiched between the flat base and the reflective surface; and a handle connected from a proximal end to the mirror compartment.
2. The dental mirror of claim 1, wherein the mirror compartment further comprises a cap connected to the flat base, the cap is configured to secure a sandwiched configuration of the spiral spring between the flat base and the reflective surface.
3. The dental mirror of claim 2, wherein the reflective surface is rotatable within the cap.
4. The dental mirror of claim 2, wherein the cap comprises a plurality of light sources configured to illuminate an oral cavity of a patient.
5. The dental mirror of claim 1, further comprises a first cable connected to the first end of the spiral spring.
6. The dental mirror of claim 1, further comprises a second cable connected to spiral spring at maximum displacement from the first end of the spiral spring that is collinear with the first end of the spiral spring through the central axis.
7. The dental mirror of claims 5 or 6, further comprises a pull button connected to the first cable and the second cable.
8. The dental mirror of claims 1 or 7, wherein the handle comprises a groove configured to receive the pull button.
9. The dental mirror of claim 8, wherein the pull button is slidable within the groove when a user applies a force on such pull button.

10. The dental mirror of claim 1, wherein the second end of the spiral spring is connected to the reflective surface such that any oscillation of the spiral spring is translated into a rotational motion of the reflective surface.
11. The dental mirror of claim 1, wherein such dental mirror is autoclavable.

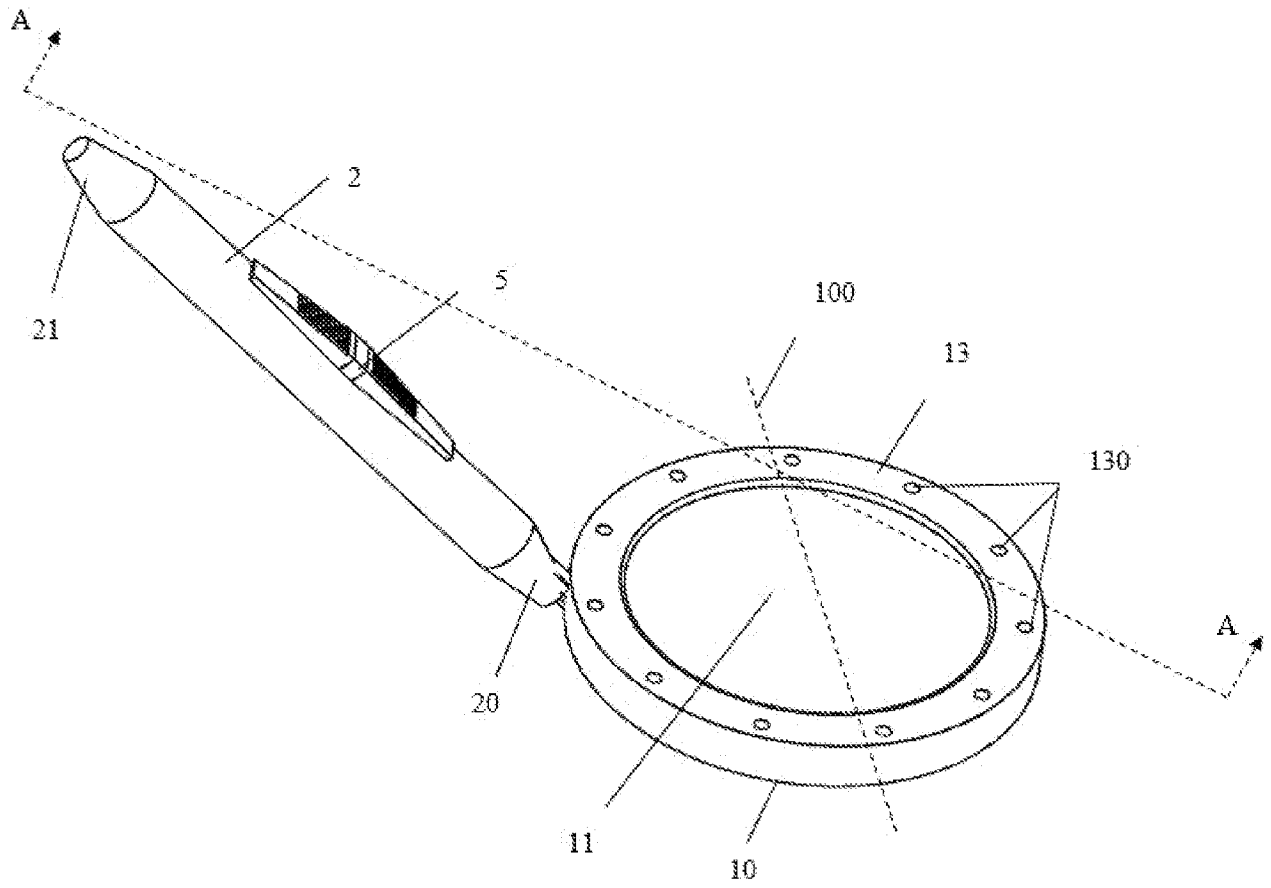


FIG. 1

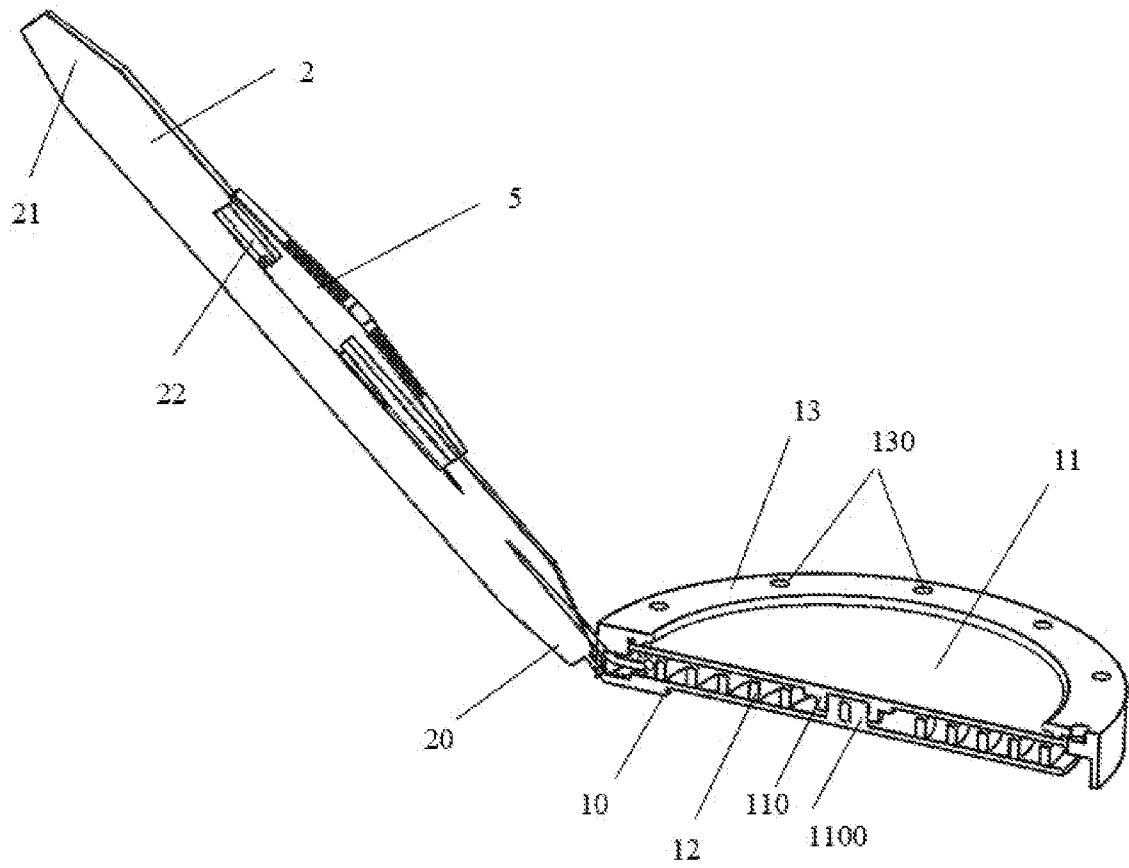


FIG. 2

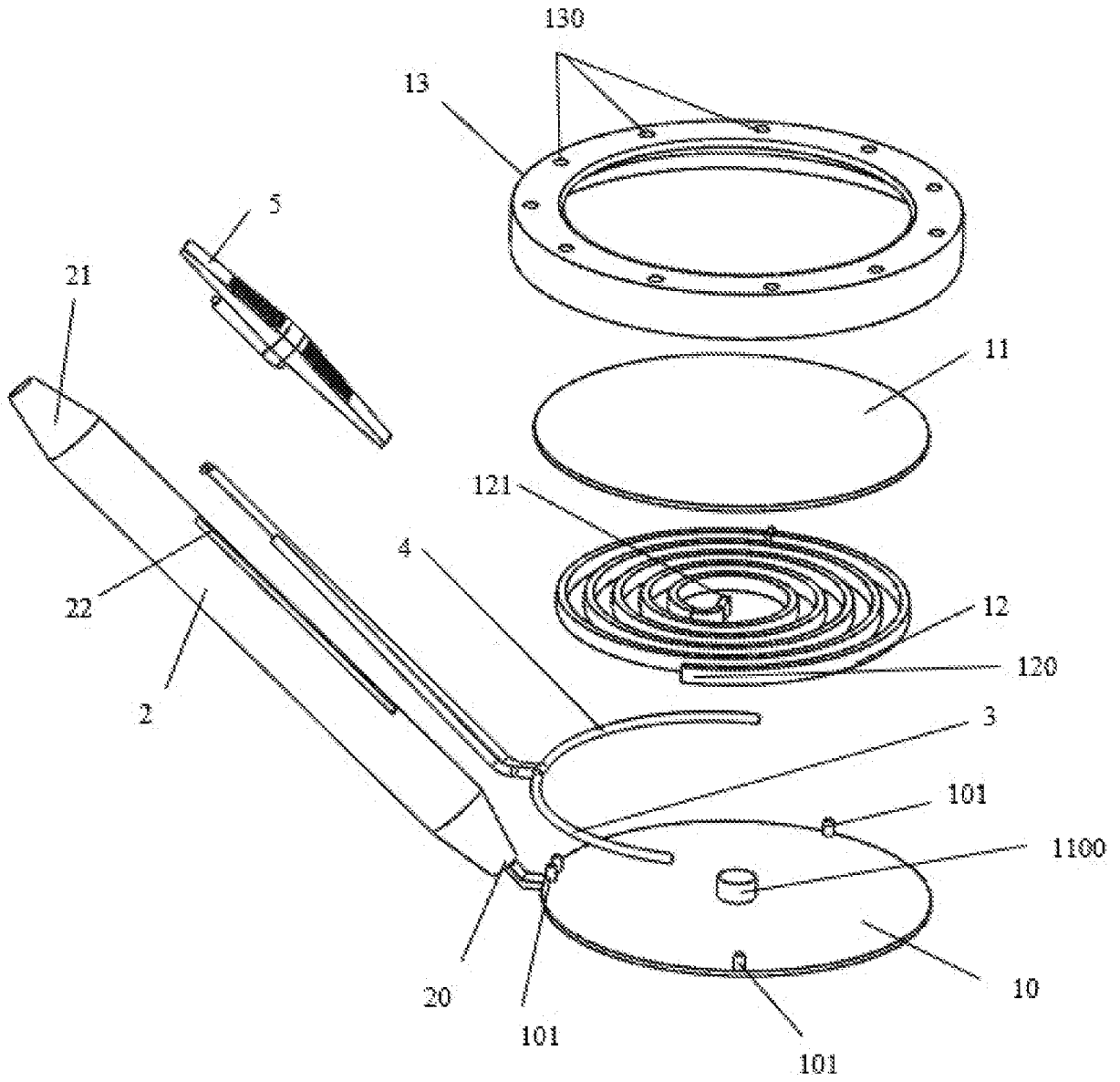


FIG. 3

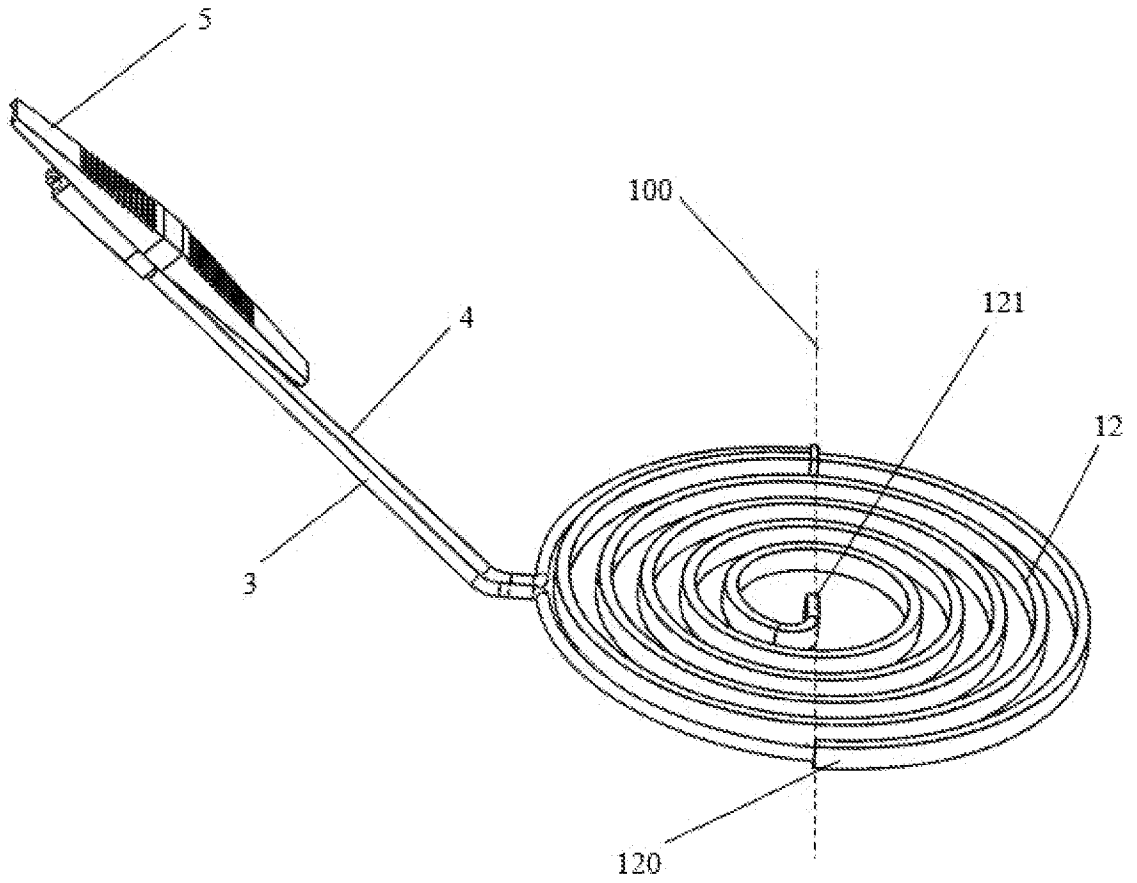


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JO 21/50016

A. CLASSIFICATION OF SUBJECT MATTER

IPC - A61B 1/253, A61B 1/247, A61B 1/24, A61C 17/06, A61C 17/08 (2021.01)

CPC - A61B 1/253, A61B 1/247, A61B 1/24, A61B 1/06, H05B 3/845, A61C 17/06, A61C 17/08, A61C 17/088

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)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y --- A	US 4,261,637 A (King) 14 April 1981 (14.04.1981), entire document, especially Fig. 1, 2, 4; col 1, ln 55-63; col 2, ln 20-34; col 2, ln 35-37; col 2, ln 5-19;	1-6, 10-11 ----- 7/(5-6)
Y --- A	US 4,435,667 A (Kolm et al.) 06 March 1984 (06.03.1984), entire document, especially Fig. 1, 2, 4, 5; col 3, ln 23-31; col 3, ln 32-49;	1-6, 10-11 ----- 7/(5-6)
Y	US 2004/0023184 A1 (de Josselin de Jong et al.) 05 February 2004 (05.02.2004), entire document, especially Fig. 3; para[0030];	4
Y	US 2019/0150724 A1 (Dantal SmartMirror, Inc.) 23 May 2019 (23.05.2019), entire document, especially Fig. 1, 2; para[0057]; para[0058];	11
A	US 4,408,991 A (Engel) 11 October 1983 (11.10.1983), entire document	1-6, 7/(5-6), 10-11
A	US 3,102,338 A (Warriner) 03 September 1963 (03.09.1963), entire document	1-6, 7/(5-6), 10-11
A	GB 942,100 A (Sic Products Ltd.) 20 November 1963 (20.11.1963), entire document	1-6, 7/(5-6), 10-11
A	US 2,192,103 A (Preston) 27 February 1940 (27.02.1940), entire document	1-6, 7/(5-6), 10-11
A	US 2004/0076019 A1 (Tsimmerman et al.) 22 April 2004 (22.04.2004), entire document	1-6, 7/(5-6), 10-11

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"D" document cited by the applicant in the international application	"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
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"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	

Date of the actual completion of the international search 29 December 2021	Date of mailing of the international search report FEB 04 2022
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer Kari Rodriguez Telephone No. PCT Helpdesk: 571-272-4300

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JO 21/50016

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. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

- 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. 8-9
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:

- 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 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. 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.:

- 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.