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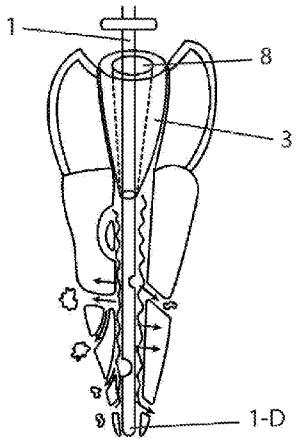
(54) Title: INJECTION SYSTEMS IN THE RADICULAR CANAL SYSTEM AND USE THEREOF

FIG. 9



(57) Abstract: System for injection of endodontic cement into the radicular canal system comprising a closed-end cannula and at least one side orifice. System comprising a sleeve to be positioned between the cannula and the tooth, for injection of intra-radicular material, obliterating the aperture of the dental canal. System comprising a moldable tip for a closed-end intra-radicular material injection cannula. Use of said injection systems for the injection of endodontic cement.

[Continued on next page]

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"INJECTION SYSTEMS IN THE RADICULAR CANAL SYSTEM AND USE THEREOF"

Field of the Invention

[0001] The present invention pertains to the field of dentistry, more specifically, to endodontic cement injection systems in the radicular canal system and use thereof.

Background of the Invention

[0002] Endodontic canal treatment techniques commonly involve processes of removal of diseased pulp tissue, mechanical and chemical cleaning of the canal with limes and irrigating agents, removal of bacteria and contaminated organic and inorganic content from the interior of the canal and its walls and, finally, filling specific materials such as gutta-percha and endodontic cement.

[0003] In order to fill the canal with gutta-percha and endodontic cement, the endodontic cement is usually applied inside the canal, followed by filling with gutta-percha. Optionally, the cones of gutta-percha are covered with endodontic cement and later inserted in the canal, and the filling techniques may involve, for example, the use of single cone, lateral condensation, Tagger's Hybrid technique, Buchanan's technique or even injection of heated gutta-percha.

[0004] Examples of systems used for filling the dental canal may be seen, for example, in publications such EP 0078258 (SOLAR ENERGY TECHNOLOGY, INC.); EP 1006923 (LIGHTSPEED TECHNOLOGY, INC.); EP 1951144 (COLTENE WHALEDENT GMBH & CO KG), among others.

[0005] Technical problems that exist in traditional

filling techniques include the need to apply high pressure so that the cement conforms to the shape of the lumen of the main canal and penetrates the whole radicular canal system formed by main canal, collateral canal, lateral canal, secondary canal, accessory canal, interconduct, recurrent canal, reticular canal and apical delta, without mentioning the risk of cement to leak beyond the main canal (apical foramen) and to lodge in the periapical tissue outside the root behaving like a foreign body by not being reabsorbed by the organism. In addition, however, much pressure is applied to the cement, it may simply leak out of the upper canal aperture rather than fill the radicular canals system, wherein the absence of filling may cause bacterial growth and, as a result, undesirable effects such as inflammation, infection, and reabsorption of the bone surrounding the tooth.

[0006] The present invention aims to solve the problems observed in the prior art by providing a system for injecting endodontic cement into the radicular canal system as well as its production process.

SUMMARY OF THE INVENTION

[0007] To solve the problems described above, the present invention will provide significant differentials regarding the current systems for injecting endodontic cement into the radicular system. In a first main embodiment, the object of the present invention is to provide a system for injecting endodontic cement into the radicular canal system comprising a closed-end cannula and at least one side orifice. In a second main embodiment, the object of the present invention is to provide a system comprising a sleeve to be positioned between the cannula

and the tooth, for injecting intra-radicular material, obliterating the aperture of the dental canal. In a third embodiment, the object the present invention is to provide a system comprising a moldable tip for a closed-end intra-radicular material injection cannula. Further, the object of the present invention is to provide the use of said injection system for injecting endodontic cement.

Brief Description of the Figures

[0008] The structure and operation of the present invention, together with additional differentials thereof, may be better understood regarding the accompanying drawings and the following description:

[0009] Figure 1 illustrates the cannula of one of the main embodiments of the present invention, its closed-ends, and side orifices.

[00010] Figure 2A illustrates a healthy tooth with prominence for its canal system.

[00011] Figure 2B illustrates a canal where the cleaning with limes was performed, evidencing the irregular shape of the main conduit and the difficulty of cleaning and filling the secondary canals.

[00012] Figure 2C illustrates the introduction of the cement injection cannula positioned within the canal after cleaning and biomechanical preparation thereof with the cannula positioned to inject the endodontic cement through the side orifices and the termination of the cannula sealing the apex of the root.

[00013] Figure 2D illustrates, with directional arrows, the direction taken by the endodontic cement when it is injected through the cannula.

[00014] Figure 3 illustrates examples of cross-

sectional shapes of the cannula.

[00015] Figure 4 illustrates examples of closed-end shapes of the cannula.

[00016] Figure 5 illustrates how to measure (diameter) the end of the cannula, which may have standard diameters to those used in endodontic limes (0.25 to 1.40 mm) in the case of cylindrically shaped cannula.

[00017] Figure 6 illustrates examples of side orifices shapes of the cannula.

[00018] Figure 7 illustrates an example of distance or depth marking in the cannula body.

[00019] Figures 8A-8E illustrate examples of sleeves of another main embodiment of the present invention: with central passing through recess (8A); wherein the central recess terminates near the distal portion of the sleeve (8B); wherein the central recess extends horizontally to the side of the sleeve, in tape format, creating a tear on the side along the long axis of the sleeve (8C); wherein the sleeve comprises a central portion of rigid material (inner cone around the central recess) and an outer portion of more flexible or compressible material of the present invention (outer cone) (8D); wherein the central recess terminates near the distal portion of the sleeve (8E).

[00020] Figure 9 illustrates a system concomitantly comprising the cannula containing a closed-end according to one of the embodiments of the present invention and a sleeve according to another embodiment of the present invention, inserted into the dental canal.

[00021] Figure 10 illustrates an alternative embodiment, wherein the lower portion of the length of the cannula is replaced by a rod.

[00022] Figure 11 illustrates another principal embodiment of the present invention, wherein the cannula has a tip of moldable material.

[00023] Figure 12 illustrates the optional system comprised by the present invention, wherein the cannula is connected to a simple body auxiliary compression system through a dome.

[00024] Figure 13 illustrates another optional system comprised by the present invention, wherein the cannula is connected to an auxiliary dual body compression system through a dome, which additionally contains a system that promotes mixing of endodontic materials at the time of injection.

Detailed Description of the Invention

[00025] According to a first principal embodiment, the present invention consists of a system for injecting endodontic cement into the radicular canal system comprising: a cannula (1) with a closed-end (1-D) and at least one side orifice (2).

[00026] According to a second main embodiment, the present invention consists of a system for injecting intra-radicular material comprising a sleeve (3), containing a central recess (8) to be positioned between a cannula (1) and the tooth, for injecting intra-radicular material, obliterating the aperture of the dental canal.

[00027] According to a third main embodiment, the present invention consists of a system for injecting intra-radicular material comprising a moldable tip (6) for a closed-end (1-D) intra-radicular material injection cannula (1).

[00028] The endodontic cement injection system of

the present invention further comprises an auxiliary compression system (4), wherein the single or double auxiliary compression system (4) can be coupled to the cannula (1) through a dome (5), as shown in Figures 12 and 13. A mixer of the materials (9) is present for the double system.

[00029] According to the present invention, the auxiliary compression system (4) must be understood as a device which transfers a fluid material under pressure to the cannula of the present system.

[00030] Examples of auxiliary compression system (4) may be plunger syringes, capsule guns, compressible tubes, or mechanical or pneumatic pumping systems.

[00031] According to the present invention, the dome (5) must be understood as the connection positioned on the upper portion of the cannula (1) to connect it to the auxiliary compression system (4). According to the present invention, the endodontic cement must be understood as the dental material for application and deposition in the endodontic canal, with the purpose of filling, adhesion and disinfection, for example: filling cements (temporary and definitive), adhesives cements, resin cements and ionometric cements. Just as an example, some brands of endodontic cement currently used are EndoSequence - Brasseler/USA, Metapaste-Temporary Root Canal Filling Material - MetaBiomed/South Korea, BIO-C Sealer - Angelus/Brazil, Dual Resin Cement Relyx U200 - 3M ESPE/USA, Glass Ionomer Cement Meron-Voco/Germany.

[00032] According to the present invention, intra-radicular material must be understood as any dental material for application to the dental canal, for example,

for purposes of sealing, disinfecting, cleaning, drying, visualizing, contrasting, etc.

[00033] Regarding the physical characteristics of the endodontic cement, it is interesting to have, at the same time, a good penetration rate in the radicular canal system and to avoid excessive flow or drainage, for example, when the cannula is withdrawn from the main canal. In this context, according to an optional aspect, the viscosity (η) of the endodontic cement may be, for example, in the range of 4 to 7 Pa.s for a shear rate ($\dot{\gamma}$) of 60, 80 and 100 s-1, and a thixotropy (T) between 1 and 10 (KPa/s) for the shear cycle rate ($\dot{\gamma}$) from 0 to 100 s-1.

[00034] According to the present invention, the radicular canal system must be understood as the dental system formed by the main canal, collateral canal, lateral canal, secondary canal, accessory canal, interconduct, recurrent canal, reticular canal and apical delta.

[00035] According to the present invention, a cannula (1) must be understood as a tubular element for guiding the endodontic material into the radicular canal system.

[00036] The cross-section of the said cannula (1) can be triangular, square, pentagonal, hexagonal, octagonal, oval or round, with or without internal or external grooves.

[00037] Furthermore, the cannula (1) may have a cylindrical or conical shape with variations in diameter along its length. For example, it may have a conical shape, similar to the shape of commercial endodontic limes (0.25 to 1.40mm). When cylindrical it can have the same standardized diameter of the tips of the endodontic limes

throughout its length (0.25 to 1.40 mm).

[00038] The length of the cannula (1) may be in the range of 10 to 42 mm, preferably 17 mm to 31 mm, according to the length of endodontic limes.

[00039] The cannula (1) may also have distance or depth markings, for example, like a ruler, with marks, to indicate the depth with which it was inserted into the dental canal.

[00040] The cannula can have standardized colors like those used in the endodontic limes that define its diameter, facilitating its identification by the professional.

[00041] Regarding the material, the cannula (1) may be produced from various rigid or flexible materials including: metal, polymer, elastomer, association thereof or polymer-containing composite material and inorganic fibers selected from the group consisting of kevlar, glass, carbon or mixtures thereof, being interesting metal and polymer options.

[00042] In an alternative embodiment, the cannula (1) may be made of gutta-percha or other biocompatible material which may be left as a filler material in the dental canal without the need for removal part of the cannula after injection of the endodontic cement.

[00043] According to the present invention, the end (1-D) of the cannula (1) must be understood as the portion of the cannula which will be inserted deeper into the dental canal, as shown in Figure 2C.

[00044] The end (1-D) of the cannula (1) may have a circular or oval shape, as shown in Figure 4. In addition, the end (1-D) of the cannula may have a diameter selected

from 0.25 mm to 1.4 mm, standardized with the final diameters of the commercial endodontic limes.

[00045] According to the present invention, the side aperture (2) must be understood as the aperture in the wall of the cannula (1) which allows the entrance of dental cement into the radicular canal system, as shown in Figure 1, wherein the cannula (1) can have only one or multiple side orifices (2).

[00046] Said side orifice (2) may have a shape selected from one or more of the group formed by: hole, screen, longitudinal cut, transverse cut, oblique cut or spiral cut, preferably a hole, as shown by the Figure 6.

[00047] In addition, the one or more side orifice (2) may be constructed or positioned to direct the endodontic cement in multiple directions regarding the cross-section of the cannula (1) and/or at different angles relative to the longitudinal axis of the cannula (1), as shown in Figure 2D.

[00048] According to the present invention, the sleeve (3) must be understood as an element to be positioned in the cannula (1), functioning as a plug in the aperture of the canal. In an optional construction, the sleeve (3) can be slid longitudinally into the cannula or further molded around the cannula, filling the aperture of the dental canal.

[00049] According to the present invention, the sleeve (3) can be made of compressible and moldable materials at the aperture of the dental canal, such as, but not limited to: polymers, elastomers, silicones or combinations thereof. An interesting option may be, for example, the use of silicone, with hardness between 30 and

90 Shore A.

[00050] In addition, the sleeve (3) of the present invention may have various shapes, such as cylindrical, conical or ogival with a central recess (8), as shown in Figures 8A to 8E.

[00051] In the sleeve (3) of the present invention, the central recess (8) may pass through, i.e. the central recess (8) leads from the upper end to the distal end of the sleeve, as shown in Figure 8, or the central recess (8) of the sleeve may extend from the upper end of the sleeve and be terminated next to the distal end thereof so that the distal portion of the sleeve may be perforated at the time of use, as shown in Figures 8B and 8E.

[00052] Furthermore, the central recess (8) of the sleeve (3) of the present invention may extend horizontally to the side of the sleeve, in a tape format, creating a tear on the side along the long axis of the sleeve, and may also pass through or be with close finishing the end, as shown in Figure 8C.

[00053] In an alternative embodiment, the sleeve (3) may be produced with rigid material in its central portion and may be malleable in its outer portion, for example using a rigid polymer, externally coated with an elastomer, as shown in Figure 8D.

[00054] In addition, the central recess in the sleeve may be moldable to the shape of the cannula so as to seal the space between the cannula and the sleeve, and the outer portion of the sleeve may be moldable to the shape of the aperture of the orifice in the dental canal.

[00055] The sleeve (3) of the present invention may have different lengths. Interesting options may vary from

3.0 to 8.0 millimeters, more specifically, about 5 millimeters.

[00056] According to the present invention, the sleeve (3) can have different diameters. In the case of sleeves of conical or oval shape, it may be of interest the diameter at the top of 1.0 to 5.0 millimeters, more specifically about 3.0 millimeters and diameter at the bottom, of 0.3 to 1.0 millimeter, more specifically about 0.5 millimeters.

[00057] As illustrated in Figure 11, in an alternative embodiment, the cannula may have a tip (6) forming its end. In interesting optional embodiments, the tip (6) may be made of a material other than the material of the cannula, preferably more flexible and/or compressible. The tip (6) can have various lengths and diameters, for example, length from 0.3 to 2.0 mm and diameters selected between 0.25 mm 2 mm, standardized with final diameters of commercial endodontic limes.

[00058] Furthermore, said tip (6) may be made of compressible and moldable materials to the distal portion of the dental canal, such as, but not limited to: polymers, elastomers, silicones, or combinations thereof. An interesting option may be, for example, the use of moldable and biocompatible materials, such as gutta-percha, which can be left in the dental canal.

[00059] In addition, in an alternative embodiment, the lower portion of the cannula can be replaced by a rod (7), with endings in the standardized diameters to those of the endodontic limes, as shown in Figure 10.

[00060] In an alternative embodiment, the cannula (1) may exhibit standard color marks in accordance with

standards used for diameters of the distal portion of commercial endodontic limes: red (0.25 mm, 0.55 mm and 1.10 mm), blue (0.30 mm, 0.60 mm and 1.20 mm), green (0.35 mm, 0.70 mm and 1.30 mm), black (0.40 mm, 0.80 mm and 1, 40 mm), white (0.45 mm and 0.90 mm), yellow (0.50 mm and 1.00 mm).

[00061] Finally, the present invention comprises systems and the use of such injection systems described herein alone, together two by two, all three together, or in assemblies with other optional additional systems.

[00062] Thus, although only have been shown some embodiments of the present invention, it will be understood that various omissions, substitutions and changes in the system for endodontic material injection can be made by a person skilled in the art without departing from the spirit and scope of the present invention.

[00063] It is expressly provided that all combinations of elements performing the same function, in substantially the same manner to achieve the same results, are within the scope of the invention. Substitutions of elements from one embodiment to another are also fully intended and contemplated.

[00064] It is also must be understand that the drawings are not necessarily in scale, since they have only a conceptual nature. The intention is, therefore, to be limited, as indicated by the scope of the appended claims.

CLAIMS

1. System for injecting endodontic cement into the radicular canal system **characterized in that** it comprises a closed-end (1-D) cannula (1) and at least one side orifice (2).

2. System, according to claim 1, **characterized in that** it further comprises simple or double auxiliary compression systems (4) coupled to the cannula (1) through a dome (5).

3. System, according to claim 1, **characterized in that** the at least one side orifice (2) of the cannula (1) can be a hole, screen, longitudinal cut, transverse cut, oblique cut or spiral cut, preferably a hole.

4. System, according to claim 1, **characterized in that** the material of the cannula (1) is selected from: metal, polymer, elastomer, association between thereof or polymer-containing compound material and inorganic fibers selected from the group consisting of kevlar, glass, carbon or mixtures thereof.

5. System, according to claim 4, **characterized in that** the material of the cannula (1) is preferably metal or polymer.

6. System, according to claims 4 and 5, **characterized in that** the material of the cannula (1) can still be gutta-percha or other biocompatible material.

7. System, according to claim 1, **characterized in that** the cannula (1) has a length between 10 and 42 mm, preferably 17 mm and 31 mm.

8. System, according to claim 1, **characterized in that** the cannula (1) has distance or depth markings along its length.

9. System, according to claim 1, **characterized in that**

the shape of the cannula (1) can be cylindrical or conical with variations in diameter along its length.

10. System, according to claim 1, **characterized in that** the cross-section of the cannula (1) can be: triangular, square, pentagonal, hexagonal, octagonal, oval or round.

11. System, according to claim 1, **characterized in that** the closed-end (1-D) of the cannula (1) has a circular or ogival shape.

12. System, according to claim 2, **characterized in that** the auxiliary compression system is selected from: plunger syringes, pistols with capsules, compressible tubes and mechanical or pneumatic pumping systems.

13. System, according to claim 1, **characterized in that** the end (1-D) of the cannula (1) can be formed by a tip (6).

14. System for injection of intra-radicular material **characterized in that** it comprises a sleeve (3) comprising a central recess (8) to be positioned between the cannula (1) and the tooth, for injection of intra-radicular material, obliterating the aperture of the dental canal.

15. System, according to claim 14, **characterized in that** the material of said sleeve (3) is selected from: silicone, TPV, TPE, polypropylene, polyethylene, polycarbonate, or the join of one or more of these materials.

16. System, according to claim 14, **characterized in that** the said sleeve (3) is cylindrical, conical or ogival shaped.

17. System, according to claim 14, **characterized in that** the central recess (8) of the sleeve (3) can start at

the upper end of the sleeve and terminate at the distal end of the sleeve.

18. System, according to claim 14, **characterized in that** the central recess (8) of the sleeve (3) can start at the upper end of the sleeve and terminate close to the distal end thereof.

19. System, according to claim 14, **characterized in that** the central recess (8) of the sleeve (3) can extend horizontally to the side of the sleeve (3), forming a tear on the side of the long axis of the sleeve, which may pass through or be close to the end.

20. System, according to claim 14, **characterized in that** the central recess (8) of the sleeve (3) can be molded to the shape of the cannula (1).

21. System, according to claim 14, **characterized in that** the outer portion of the sleeve (3) can be molded to the shape of the orifice aperture in the dental canal.

22. System, according to claim 14, **characterized in that** said sleeve (3) can have a length of 3.0 to 8.0 millimeters, more preferably about 5 millimeters.

23. System for injection of intra-radicular material **characterized in that** it comprises a moldable tip (6) for a closed-end (1-D) intra-radicular material injection cannula (1).

24. System, according to claim 23, **characterized in that** the material of the tip (6) of the cannula (1) is flexible, selected from polymers, elastomers, silicones or mixtures thereof.

25. System, according to claim 23, **characterized in that** said tip (6) has a length between 0.3 and 2 mm and diameter between 0.25 mm and 1.4 mm.

26. System, according to claim 23, **characterized in that** the end (1-D) of the cannula (1) has a rod (7).

27. Use of injection system, according to the preceding claims, **characterized by** being for injecting endodontic cement.

28. Use, according to claim 27, **characterized in that** the viscosity (η) of the endodontic cement is in the range of 4 to 7 Pa.s for a shear rate (ẏ) between 60 and 100 sec-1, and a thixotropy (T) between 1 and 10 (KPa/s) for the cycle of shear rate (ẏ) between 0 and 100 s-1.

FIG. 1

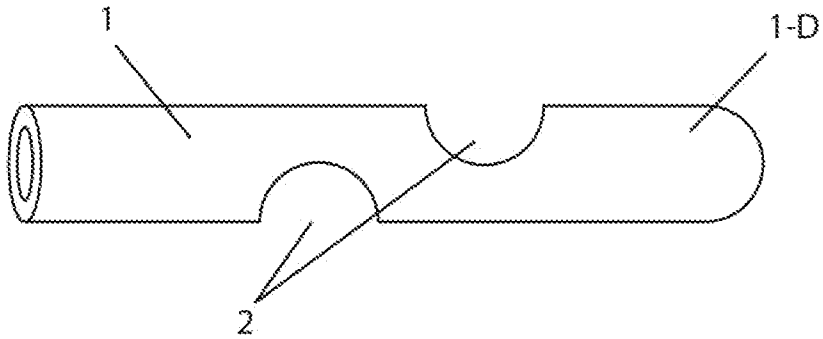


FIG. 2A

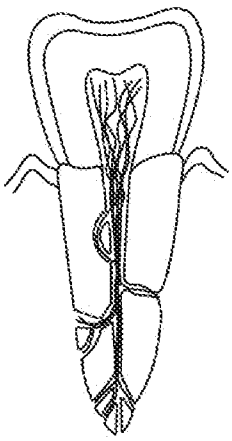


FIG. 2B

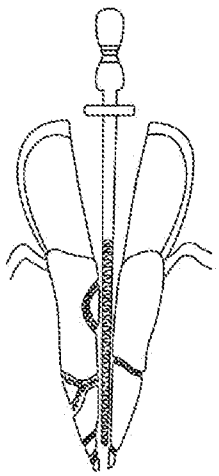


FIG. 2C

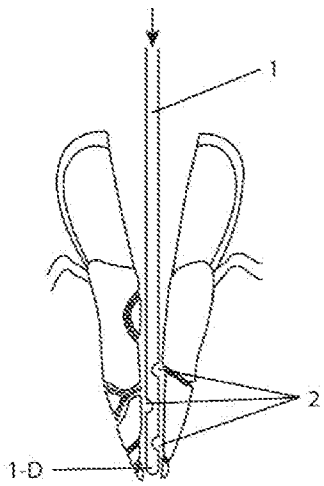


FIG. 2D

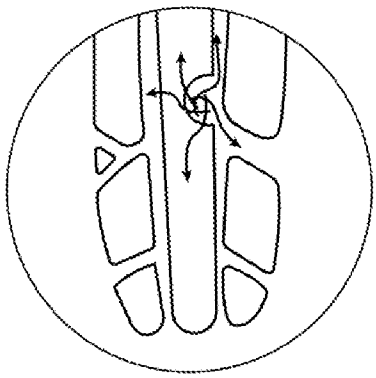


FIG. 3

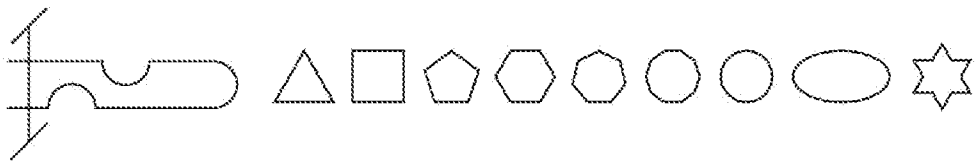


FIG. 4

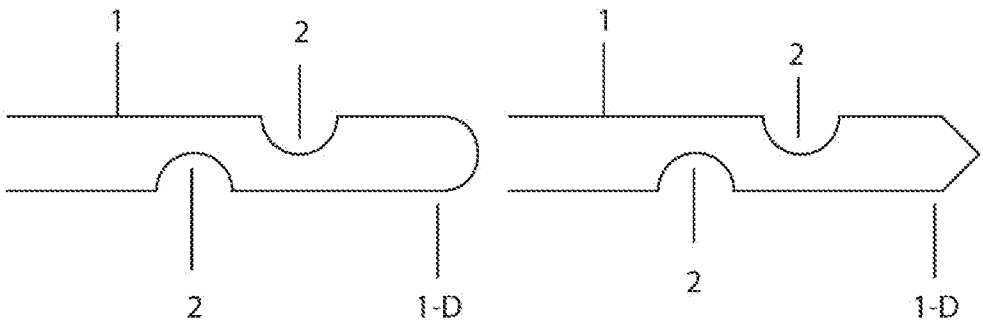


FIG. 5

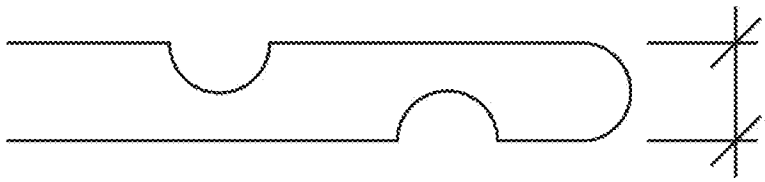


FIG. 6

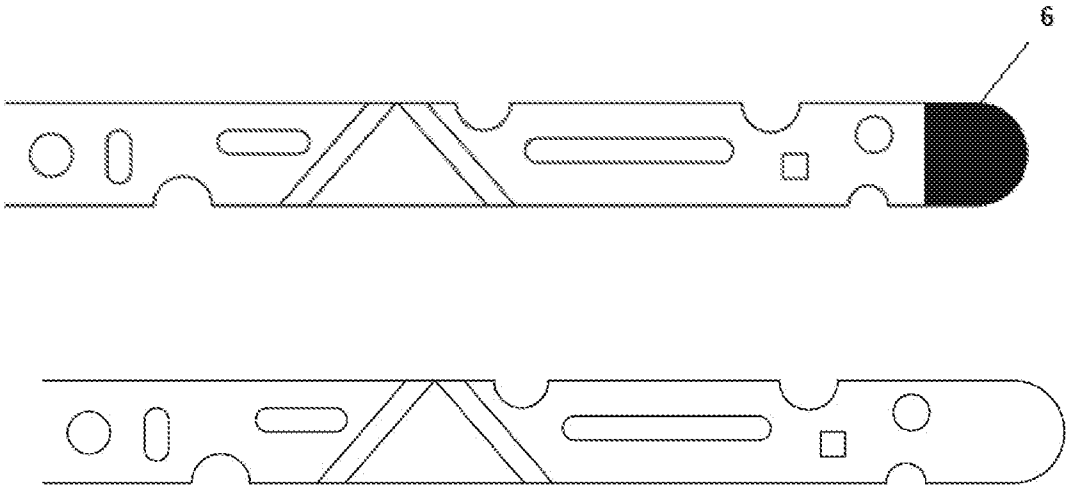


FIG. 7

FIG. 8A FIG. 8B FIG. 8C FIG. 8D FIG. 8E

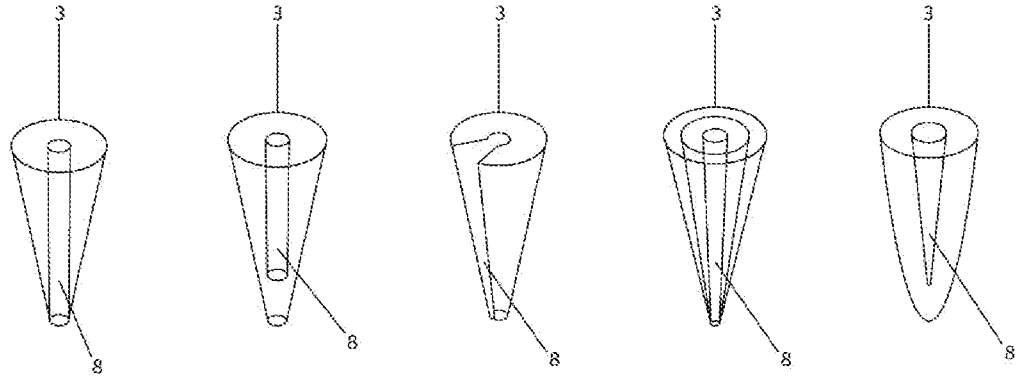


FIG. 9

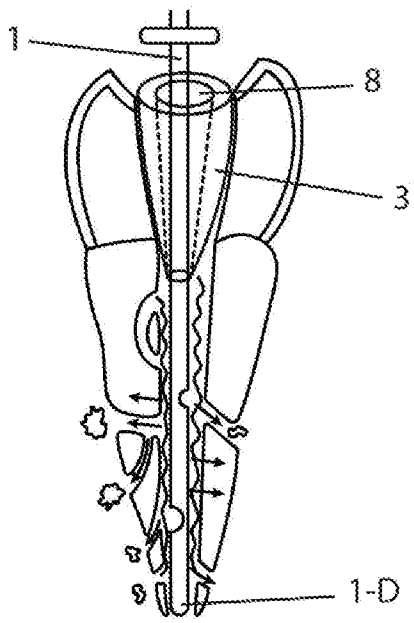


FIG. 10

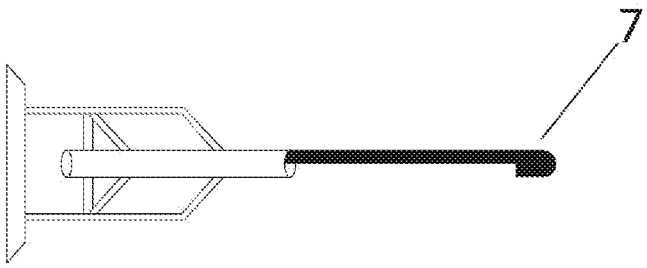


FIG. 11

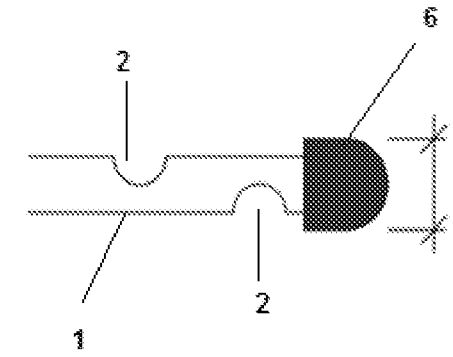


FIG. 12

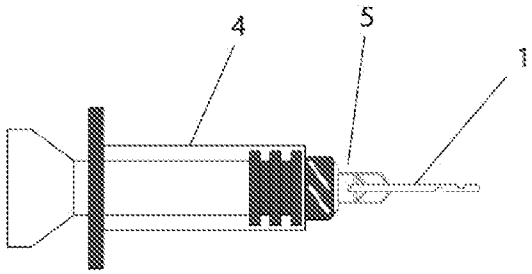
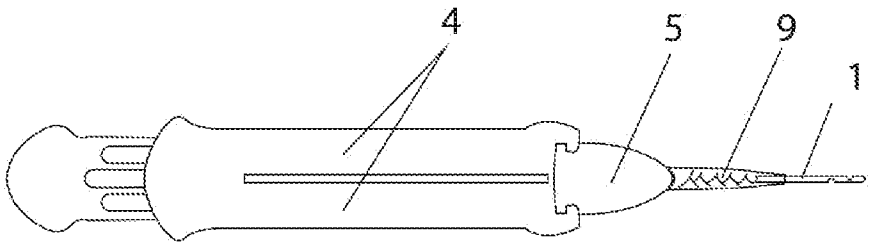


FIG. 13



INTERNATIONAL SEARCH REPORT

International application No
PCT/BR2018/050285

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61C5/50
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

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2017/011507 A1 (ORMCO CORP [US]) 19 January 2017 (2017-01-19) paragraph [00110] paragraph [00137] paragraph [00171] paragraph [00256] paragraph [00309] - paragraph [00310] figures	1-13

X	WO 2014/097131 A1 (TONINI RICCARDO [IT]) 26 June 2014 (2014-06-26)	1
A	figures	2-13

X	US 2009/004621 A1 (QUAN NANCY [US] ET AL) 1 January 2009 (2009-01-01)	1
A	paragraph [0084] - paragraph [0114] figure 1d	2-13

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[X] Further documents are listed in the continuation of Box C.

[X] 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
21 December 2018	26/04/2019

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	Fortune, Bruce

INTERNATIONAL SEARCH REPORT

International application No
PCT/BR2018/050285

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 82/03761 A1 (SOLAR ENERGY TECHN INC [US]) 11 November 1982 (1982-11-11) page 6, line 13 - page 12, line 13 figures	1-13

INTERNATIONAL SEARCH REPORT

International application No.
PCT/BR2018/050285

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.: 27, 28
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.:

1-13

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-13

   System for injecting endodontic cement into the radicular canal system comprising a closed-end cannula and at least one side orifice.

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2. claims: 14-22

   System for injection of intra-radicular material, comprising a sleeve comprising a central recess to be positioned between the cannula and the tooth, for injection of intra-radicular material, obliterating the aperture of the dental canal.

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3. claims: 23-26

   System for injection of intra-radicular material comprising a moldable tip for a closed-end intra-radicular material injection cannula.

Continuation of Box II.1

Claims Nos.: 27, 28

Rule 39.1(iv) PCT - Method for treatment of the human or animal body by surgery Claim 27 defines the use of an injection system, according to claims 1-26 of the present application, for injecting endodontic cement. Thereforem this defined use encompasses the injection of endodontic cement into the root canal of a tooth. This step is considered as a surgical step (since the structure of the patient's body is modified) which encompasses substantial risks for the patient's health (like perforating the apical foramen of the root canal. Therefore, claim 27 defines a method for treatment of the human or animal body by surgery under Rule 39.1(iv) PCT. Claim 28 depends on claim 27. Therefore, claim 28 encompasses all the technical features of claim 27 (Rule 6.4(a) PCT). Therefore, claim 28 comprises the above-mentioned surgical step. Therefore, claim 28 defines also a method for treatment of the human or animal body by surgery under Rule 39.1(iv) PCT. No search for such methods is required (Article 17(2)(a)(i) PCT, Rule 39.1(iv) PCT). Therefore, claims 27 and 28 are not searched.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/BR2018/050285

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		EP 3322378 A1	23-05-2018
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