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(54) Title: ATTACHMENT PILLAR FOR REMOVABLE DENTAL PROSTHESIS WITH SELF-DIRECTED CONNECTION, MANUAL WRENCH AND TORQUE WRENCH THEREOF

(57) Abstract: Described herein is an attachment pillar for removable dental prosthesis which provides four retentions. The Self-directed Connection Pillar with Four Retentions (SDCP-FR) consists of a pillar (1), a capsule (2) and a retentive means (3). The pillar (1) and the retentive means (3) have a magnetic means (M) on the inside, whereby the attraction created by the magnetic field allows clearance at the time of placing the dental prosthesis (B) it being self-directed towards the pillar (1). Two wrenches - a manual wrench and a torque wrench - are herein proposed, which, with an outer field and inner field, fit perfectly into existing voids in the pillar (1), fixing it to the dental implant. These two wrenches are composed of a magnetic means on the inside which, in addition to a perfect fit, potentiates the attraction phenomenon between the pillar (1) and the wrench being used, preventing the pillar from falling or becoming detached while being handled.

Figure 1
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

"ATTACHMENT PILLAR FOR REMOVABLE DENTAL PROSTHESIS WITH SELF-DIRECTED CONNECTION, MANUAL WRENCH AND TORQUE WRENCH THEREOF"

Technical domain

The present application relates to an attachment pillar for removable dental prosthesis, specifically a Self-Directed Connection Pillar with Four Retentions (SDCP-FR).

Background

Currently, in the field of removable dental prosthesis attachment and within medical and dental practice in the application of such products, 2 types of difficulties arise which definitely influence the prosthesis functionality and hence the benefit/usefulness of the product: 1 - on the one hand, some patients’ expectations regarding the performance of the attachment are greater than those which effectively come to be observed; this is because the expectation is always that the prosthesis shall be as adjusted as possible; however, the joint between the attachment and the prosthesis ultimately never comes to be as adjusted as expected by the patient; 2 - then, on the other hand, in senior patients or patients with motor disability of the upper limbs, due to either physical disabilities or chronic disease, placing the dental prosthesis in the mouth can cause a very troublesome traumatic situation, which involves anxiety and disturbance; in fact, for this group of patients, given the lack of skill or physical agility, it becomes difficult to find the joining point of the attachment with the prosthesis; and since not immediately finding the joining point, they persist until they obtain the stabilization of the retention device; moreover it
turns out that the difficulty is such that they end up only being able to achieve placement with the help of another person who places the prosthesis inside their mouth.

Thus, there is a need for a more capable product which provides, not only stability and placement ease, but also an improved retention of total or partial prostheses.

The development of Self-Directed Connection Pillar with Four retentions (SDCP-FR) arises from such need, as well as from the importance of oral health condition which affects life in general. SDCP-FR is a novel product, since going beyond the current industrial technique, wherein no solution to overcome the difficulty in placing a prosthesis is available.

To date there is no product providing four retentions and which, at the same time, ensures an attraction-type capture of the SDCP-FR pillar (1) with the SDCP-FR retentive means (3), thus allowing support and stability to the dental prosthesis.

**Summary**

The present application is related to an attachment pillar for removable dental prosthesis with self-directed connection comprising a pillar (1), a capsule (2), and a retentive means (3), wherein the pillar (1) and the retentive means (3) have a magnetic means (M) on the inside.

In one embodiment, the pillar has four retentions by means of two curves on the outside thereof (15) (16), a void (17) and the magnetic field (18) created between the magnetic
means of the pillar and the magnetic means of the retentive means.

In another embodiment, the pillar has a small hole which drains saliva.

In yet another embodiment, the pillar and capsule material is titanium and the retentive means material is nylon.

The present application also relates to a manual wrench and a torque wrench for implementing the attachment pillar for removable dental prosthesis with self-directed connection comprising a magnetic means therein.

**General Description**

The SDCP-FR is composed of a pillar (1), a capsule (2), and a retentive means (3), wherein the pillar (1) and the retentive means (3) have a magnetic means inside.

The SDCP-FR has four retentions, summarized in the following terms: the pillar (1) has two curves in its [outer] shape, so that a double retention occurs, also having a void that will provide a third retention; the fourth retention is obtained by means of the magnetic field created between the pillar (1) and the retentive means (3) (they shall attach through the attraction phenomenon caused between the magnetic means inside them) - Figure 2.

Within the existing void in the pillar there is still a small hole that drains saliva - Figures 6 and 8.
The magnetic attraction created between the pillar (1) and the retentive means (3) causes the dental prosthesis to be immediately self-directed - Figure 1.

The psychological aspect in oral rehabilitation is important. By ensuring the attraction-type capture of the pillar (1) with the retentive means (3), this product provides firm support and unwavering stability to the dental prosthesis; the vitality of this reciprocal action enhances quality of life and well-being to patients.

Specifying, by using SDCP-FR, obtaining a more secure attachment of the dental prosthesis is made possible, preventing the prosthesis from being released from the respective fittings, which hinders chew action and causes irritation to the gum, in addition to the consequent pain, inconvenience and discomfort that such a situation involves; moreover, in the presence of a partial dental prosthesis, a less secure prosthesis may cause damage to natural teeth since the teeth supporting the partial prosthesis are at higher risk of developing problems arising from increased pressure and movements; so, and in the context of partial prosthesis, by reducing the movements, it is important to bear in mind that SDCP-FR helps protect the natural teeth of the patient.

The properties / materials of SDCP-FR components are:
- Pillar (1): Titanium and Magnetic means;
- Capsule (2): Titanium;

Two wrenches - a manual wrench (5) and a torque wrench (6) - are further proposed, which, with an outer field and
inner field, fit perfectly into existing voids in the pillar (1), fixing it to the dental implant. In order to eliminate the risk of accidents or complications, a magnetic means is inserted on the inside thereof which, in addition to a perfect fit, potentiates the phenomenon of attraction between the pillar (1) and the wrench being used, preventing the pillar from falling or becoming detached while being handled - Figures 32 and 33.

Also, since the type of retention shall always be assessed by the odontological health care professional, and bearing in mind the particular case needs, some intermediate attachment solutions are further proposed which are detailed in Figures 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29 and 30.

**Brief Description of the Figures**

For an easier understanding of the present application drawings are herein attached, which represent preferred embodiments which, however, are not intended to limit the technique herein disclosed.

Figures 1 and 2 illustrate the placement of the dental prosthesis, wherein reference numbers represent:
A - Tooth
B - Dental Prothesis
C - Acryllic
D - Gum
E - Bone
F - Dental Implant
M - Magnetic Means
1 - SDCP-FR Pillar
2 - SDCP-FR Capsule
3 - SDCP-FR Retentive Means

Figure 3 illustrates the QR-PCAD, in a perspective view, wherein reference numbers represent:
1 - SDCP-FR Pillar
2 - SDCP-FR Capsule
3 - SDCP-FR Retentive Means

Figures 4 and 5 illustrate the SDCP-FR, in a section view, wherein reference numbers represent:
1 - SDCP-FR Pillar
2 - SDCP-FR Capsule
3 - SDCP-FR Retentive Means
M - Magnetic Means
15 - 1st Retention
16 - 2nd Retention
17 - 3rd Retention
18 - 4th Retention

Figure 6 illustrates the pillar, in a perspective view, wherein reference numbers represent:
1 - SDCP-FR Pillar

Figures 7 and 8 illustrate the pillar, in a section view, wherein reference numbers represent:
1 - SDCP-FR Pillar
M - Magnetic Means
19 - Insulation Zone
20 - Hexagonal Star

Figure 9 illustrates the capsule, in a perspective view, wherein reference numbers represent:
2 - SDCP-FR Capsule
21 - 3 Ribs

Figure 10 illustrates the capsule, in a section view, wherein the reference number represents:
2 - SDCP-FR Capsule

Figure 11 illustrates the retentive means, in a perspective view, wherein the reference number represents:
3 - SDCP-FR Retentive Means

Figures 12 and 13 illustrate the retentive means, in a section view, wherein reference numbers represent:
3 - SDCP-FR Retentive Means
M - Magnetic means

Figure 14 illustrates a retentive means providing 3 retentions, in a perspective view, wherein the reference number represents:
7 - Retentive means with 3 retentions

Figures 15 and 16 illustrate the retentive means providing 3 retentions, in a section view, wherein reference numbers represent:
7 - Retentive means with 3 retentions
M - Magnetic means acting as 3rd retention
15 - 1st Retention
16 - 2nd Retention

Figure 17 illustrates a retentive means providing 2 retentions, in a perspective view, wherein the reference number represents:
4 - Retentive means with 2 retentions
Figures 18 and 19 illustrate the retentive means providing 2 retentions, in a section view, wherein reference numbers represent:

4 - Retentive means with 2 retentions
M - Magnetic means acting as 2\textsuperscript{nd} retention
15 - 1\textsuperscript{st} Retention

Figure 20 illustrates a retentive means also providing 3 retentions, in a perspective view, wherein the reference number represents:

13 - Retentive means with 3 retentions

Figures 21 and 22 illustrate the retentive means providing 3 retentions, in a section view, wherein reference numbers represent:

13 - Retentive means with 3 retentions
M - Magnetic means acting as 3\textsuperscript{rd} retention
15 - 1\textsuperscript{st} Retention
16 - 2\textsuperscript{nd} Retention

Figure 23 illustrates a retentive means with no magnetic means providing 2 retentions, in a perspective view, wherein the reference number represents:

8 - Retentive means with 2 retentions

Figure 24 illustrates the retentive means with no magnetic means providing 2 retentions, in a section view, wherein the reference numbers represent:

8 - Retentive means with 2 retentions
15 - 1\textsuperscript{st} Retention
16 - 2\textsuperscript{nd} Retention
Figure 25 illustrates a retentive means with no magnetic means providing 1 retention, in a perspective view, wherein the reference number represents:
9 - Retentive means with 1 retention

Figure 26 illustrates a retentive means with no magnetic means providing 1 retention, in a section view, wherein the reference numbers represent:
9 - Retentive means with 1 retention
15 - 1\textsuperscript{st} Retention

Figure 27 illustrates a retentive means with no magnetic means providing 2 retentions, in a perspective view, wherein the reference number represents:
10 - Retentive means with 2 retentions

Figure 28 illustrates a retentive means with no magnetic means providing 2 retentions, in a section view, wherein the reference numbers represent:
10 - Retentive means with 2 retentions
15 - 1\textsuperscript{st} Retention
16 - 2\textsuperscript{nd} Retention

Figure 29 illustrates a retentive means with no magnetic means providing 3 retentions, in a perspective view, wherein the reference number represents:
11 - Retentive means with 3 retentions

Figure 30 illustrates a retentive means with no magnetic means providing 3 retentions, in a section view, wherein the reference numbers represent:
11 - Retentive means with 3 retentions
15 - 1\textsuperscript{st} Retention
16 - 2\textsuperscript{nd} Retention
17 - 3\textsuperscript{rd} Retention

Figure 31 illustrates the manual wrench (5) in a perspective view.

Figure 32 illustrates the torque wrench, in a perspective view, wherein reference numbers represent:
6 - Torque wrench
M - Magnetic means

Figure 33 illustrates the manual wrench, in a section view, and operation thereof, wherein the reference numbers represent:
5 - Manual wrench
1 - SDCP-FR Pillar
M - Magnetic means

Figure 34 illustrates printing samples (14). A print is performed to the pillar (1), which has been placed on the implant, which will serve to hold the prosthesis in laboratory; this printing is done by splinted impression to ensure the positional stability of the pillar placed on the implant.

Figure 35 illustrates a replica of the pillar to be worked in laboratory (12). One pillar replica is subsequently placed on the printing sample so that the working model is later created in laboratory to produce the dental prosthesis.
Description of the embodiments

Referring to the figures, some embodiments shall now be described in more detail, which are not however intended to limit the scope of the present application.

The SDCP-FR is thus composed of a pillar (1), a capsule (2) and a retentive means (3). The pillar (1) and retentive means (3) have a magnetic means inside. It has four retentions: the pillar (1) has two curves in its [outer] shape, so that a double retention occurs, having a void that will provide a third retention; the fourth retention is obtained by means of the magnetic field created between the SDCP-FR pillar (1) and the SDCP-FR retentive means (3) - Figures 1 and 2.

The capsule (2) has a curved shape inside, in order to predict the existence of any strength applied onto the implant by masticatory movements, so that some freedom is created in its movement relative to the retentive means (3), which is embedded in the pillar (1). The latter is attached to a dental implant, thereby leaving some freedom for rotary motion so that the capsule does not disengage from the pillar (1).

The capsule (2) has three ribs to annul the effects of horizontal forces applied onto the dental prosthesis, which prevents the capsule (2) from being released from the dental prostheses; these ribs also have some cuts to annul the possibility of a capsule rotating within the dental prosthesis.

The type of retention shall always be assessed by the odontological health care professional taking the
individual case needs into account. Therefore, for situations requiring intermediate attachment, the following solutions are further proposed:

- The retentive means (7) is herein composed of three retentions: an outer retention, an inner retention and a third magnetic retention, which are detailed in Figures 14, 15 and 16;

- The retentive means (4) is herein composed of two retentions: an outer retention, and a second magnetic retention, which are detailed in Figures 17, 18 and 19;

- The retentive means (13) is herein composed of three retentions: two outer retentions, and a third magnetic retention, which are detailed in Figures 20, 21 and 22;

- The retentive means (8) is herein composed of two retentions: two outer retentions, which are detailed in Figures 23 and 24;

- The retentive means (9) is herein composed of one retention: an outer retention, which is detailed in Figures 25 and 26;

- The retentive means (10) is herein composed of two retentions: an outer retention, and a second inner retention, which are detailed in Figures 27, and 28;

- The retentive means (11) is herein composed of three retentions: two outer retentions, and a third inner retention, which are detailed in Figures 29, and 30.

The voids in the pillar (1) form an hexagonal star = three holes inside the pillar (1) and three other holes on the outside of the pillar (1) - Figure 8. These holes are designed for the fitting of a manual wrench (5) and a
torque wrench (6), which are detailed in Figures 31 and 32, respectively.

The manual wrench (5) and torque wrench (6) is a tool formed by two fields, an outer and an inner field, which fit perfectly into the voids in the pillar (1) (those forming said hexagonal star), attaching it to the dental implant.

In order to eliminate the risk of accidents or complications, yet another innovation in these wrenches is proposed, marked by stabilizing the tool with the product, which is exactly the introduction of a magnetic means therein, which, in addition to a perfect fit, potentiates the attraction phenomenon between the pillar (1) and the wrench being used; so being, this prevents the pillar (1) from falling or becoming detached from the wrench while being handled, thus contributing to greater safety and comfort at the time of placing or removing the pillar (1) from the dental implant.

The present disclosure is of course in no way restricted to the embodiments herein described and a person of ordinary skill in the art will be capable of providing many modification possibilities without departing from the general idea of the invention as defined in the claims. Preferred embodiments described above are obviously combinable with each other. The following claims further define preferred embodiments.
CLAIMS

1. Attachment pillar for removable dental prosthesis with self-directed connection characterized in that it comprises a pillar (1), a capsule (2), and a retentive means (3), wherein the pillar (1) and the retentive means (3) have a magnetic means (M) inside.

2. Attachment pillar for removable dental prosthesis with self-directed connection according to the preceding claim, characterized in that the pillar has four retentions by means of two curves on the outside thereof (15) (16), a void (17), and the magnetic field (18) created between the magnetic means of the pillar and the magnetic means of the retentive means.

3. Attachment pillar for removable dental prosthesis with self-directed connection according to the preceding claims, characterized in that the pillar has a small hole which drains saliva.

4. Attachment pillar for removable dental prosthesis with self-directed connection according to the preceding claims, characterized in that the pillar and capsule material is titanium and the retentive means material is nylon.

5. Manual wrench for applying the attachment pillar for removable dental prosthesis with self-directed connection as described in claims 1 to 4, characterized in that it comprises a magnetic means inside.

6. Torque wrench for applying the attachment pillar for removable dental prosthesis with self-directed connection
described in claims 1 to 4, characterized in that it comprises a magnetic means inside.
**INTERNATIONAL SEARCH REPORT**

**International application No**
PCT/IB2016/056678

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**A. CLASSIFICATION OF SUBJECT MATTER**
INV. A61C8/00  A61C13/235  A61C13/265

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**B. FIELDS SEARCHED**
Minimum documentation searched: (classification system followed by classification symbols)
A61C

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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

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**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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

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* 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)

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"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

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Date of the actual completion of the international search: 30 January 2017

Date of mailing of the international search report: 13/04/2017

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Name and mailing address of the ISA/
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Authorized officer: Rivera Pons, Carlos
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.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 8.4(a).

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 fee, 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.: 1-4

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

1. claims: 1-4
   
   Attachment pillar for removable dental prosthesis with self-directed connection characterized in that it comprises a pillar, a capsule and a retentive means, wherein the pillar and the retentive means have a magnetic means inside.
   
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2. claims: 5, 6
   
   Manual and torque wrenches for applying the attachment pillar for removable dental prosthesis with self-directed connection as described in claims 1 to 4, characterized in that they comprises a magnetic means inside.
   
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