

[54] ANCHOR FOR ATTACHING DENTAL PARTIAL OR FULL ARTIFICIAL DENTURE

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[52] U.S. Cl. 32/5

[51] Int. Cl. A61c 13/22

[58] Field of Search 32/5, 6, 7, 13, 12

[56] References Cited

UNITED STATES PATENTS

866,304 9/1907 Roach..... 32/5

FOREIGN PATENTS OR APPLICATIONS

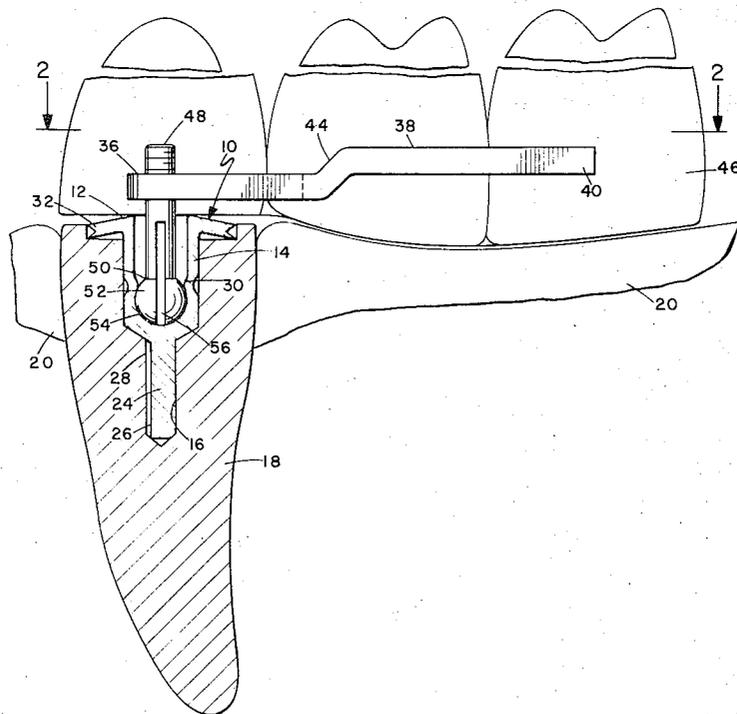
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[57] ABSTRACT

Method and apparatus for anchoring a dental partial or full artificial denture to the root of a natural tooth that has been cut off at the tissue line during endodontic treatment. The anchor includes a sleeve which extends into the root, the sleeve including a retaining shoulder which cooperates with a shoulder on a pin for removably retaining the pin within the sleeve and is provided with an arcuate rest for the pin, the pin having complementing surface which bears on the rest. The pin is fixed to a dental partial or full artificial denture.

25 Claims, 9 Drawing Figures



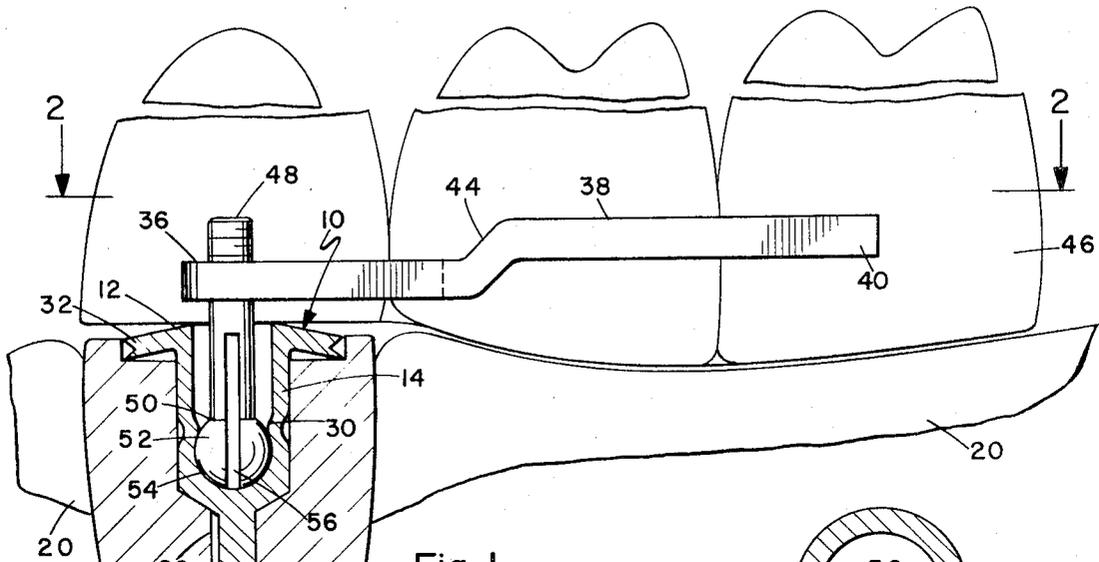


Fig. 1

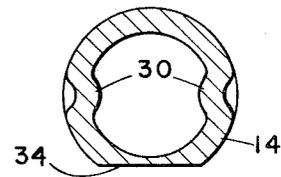


Fig. 4

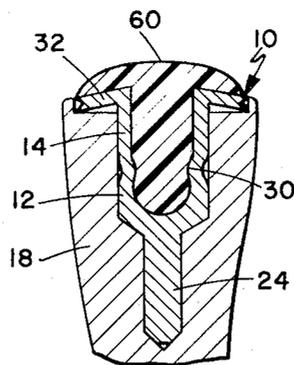


Fig. 5

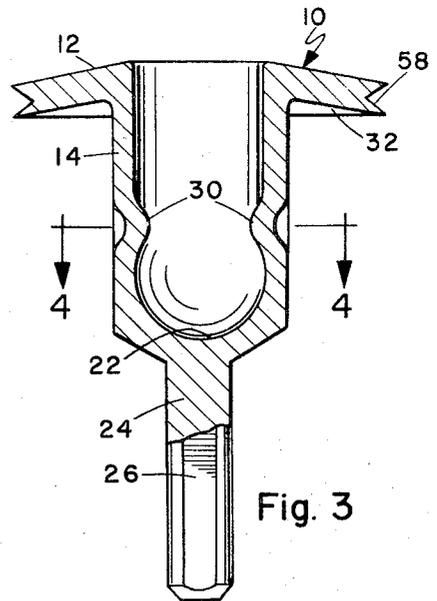


Fig. 3

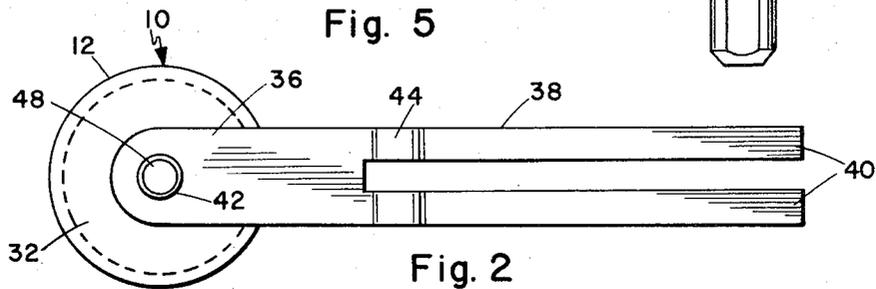


Fig. 2

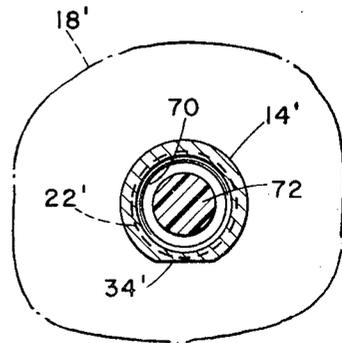
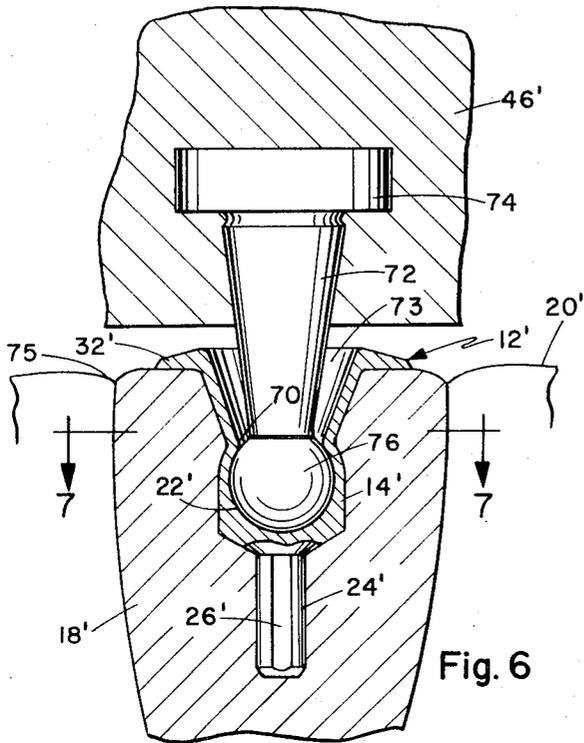


Fig. 7

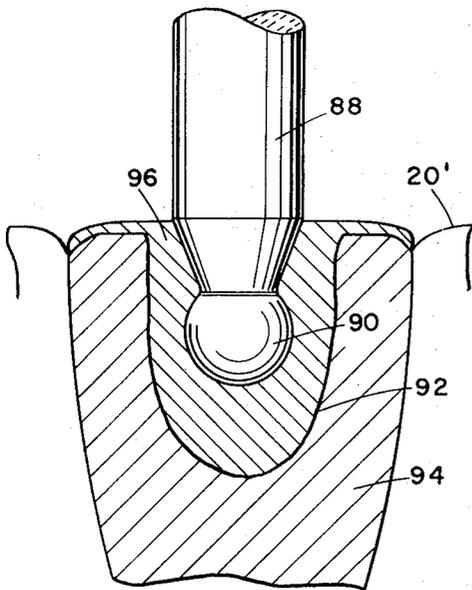


Fig. 9

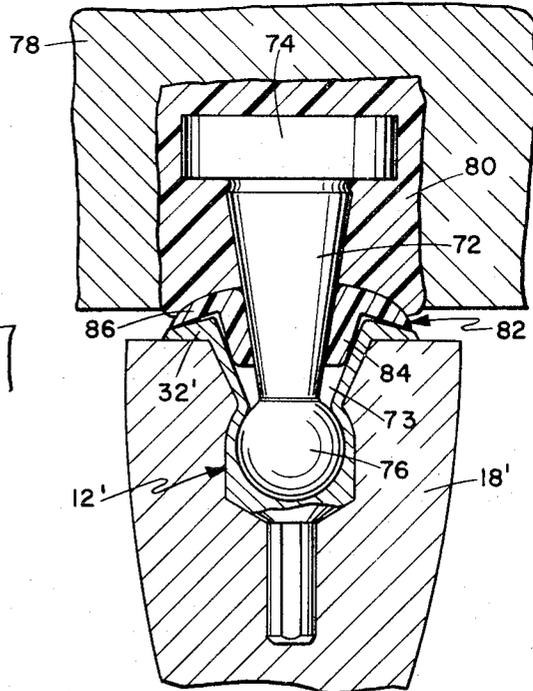


Fig. 8

ANCHOR FOR ATTACHING DENTAL PARTIAL OR FULL ARTIFICIAL DENTURE

CROSS REFERENCE TO RELATED APPLICATION

The present application is a continuation-in-part of the inventor's copending application, Ser. No. 104,939 filed Jan. 8, 1971 and now abandoned.

BACKGROUND OF THE INVENTION

The invention relates to anchors for removably retaining a dental partial or full artificial denture that is attached to the root of a natural tooth after endodontia is performed.

The closest prior art known to applicant is the disclosure in the U.S. Pat. to Roach, No. 866,304 issued Sept. 17, 1907. That disclosure requires a radial grinding of the root for receiving the bulged portion *b2* of the sleeve. Applicant does not require such radial grinding and further applicant provides a rest for the pin, the rest for the pin having the shape of a segment of a sphere and the pin having a surface complementing the curvature of the rest and engageable therewith.

SUMMARY OF THE INVENTION

The method and anchor for attaching a partial to the root of a tooth comprises a sleeve which extends into the nerve channel of the root and is provided with a radially inwardly extending shoulder and with a rest that extends longitudinally inwardly beyond the shoulder, the rest having a curvature simulating a segment of a sphere.

A pin which is fixed to the dental partial is provided with a radially outwardly extending shoulder that extends longitudinally inwardly of the shoulder on the sleeve and is removably engageable with the shoulder on the sleeve. Either the sleeve or the pin can be resiliently flexed at the respective shoulders whereby the pin is removably latched to the sleeve. The pin is provided with a curved surface that complements the curvature of the rest and is engageable with the rest.

The primary force transmitting contact between the denture and the root is between complementary curved surfaces of the pin and sleeve rest surface. Since this contact point is below the gum line within the root, lateral forces are transferred from the denture to the root at a location where the root can better support them. The use of such an anchor additionally preserves roots and thus prevents a loss of bone that results from extraction of a tooth. The anchor also provides a solid support that eliminates irritation of tissue adjacent to the teeth. The low cost of an anchor according to the present invention makes it practical to preserve questionable teeth. Thus the method and apparatus provides a positive rest factor on the root but no torque factor in an installation wherein a low percentage of root is used in a minus factor in crown root ratio.

Other features and the advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the invention are illustrated.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross sectional view of a root of a tooth with an anchor according to one embodiment shown in

elevation and showing a fragment of a dental partial and fragments of a gum in cross section.

FIG. 2 is a top plan view of the anchor of FIG. 1.

FIG. 3 is a view similar to FIG. 1, but on a larger scale, and showing the sleeve in cross section.

FIG. 4 is a sectional view taken along line 4-4 of FIG. 3.

FIG. 5 is a sectional view showing the socket of FIG. 1 being used to mount an auxiliary support button.

FIG. 6 is a partial cross sectional view of an anchor according to another embodiment of the present invention.

FIG. 7 is a view of the socket of the anchor of FIG. 6 taken across section 7-7.

FIG. 8 shows the pin of the embodiment of FIG. 6 being installed in a denture.

FIG. 9 is a partially sectioned view of yet another embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 through 5, a first embodiment is described. An anchor 10 includes a socket 12 including a sleeve 14 which is embedded in the cylindrically drilled hole 16 in the root 18 of a natural tooth that has been cut off at the tissue line during endodontic treatment. The upper portion of the hole is larger in diameter than the lower portion. The gum of the patient is shown at 20.

The sleeve 14 is closed at its inner end to form a spherical concaved rest 22. The socket 12 includes an extension 24 and one side 26 thereof is flat to provide a channel 28 with the lower portion of the cylindrical hole in the tooth root. At least one shoulder 30 is formed intermediate the ends of the sleeve 14. Two such shoulders are shown. The socket 12 includes a cope 32 that rests on the outer end of the root.

The sleeve 14 and the extension 24 are cemented in the cylindrical hole in the root. One side 34 of the sleeve is flat. Some cement will be extruded along the flat of side 34 of the extension and sleeve at the time the extension and sleeve are pushed into the hold and thus cement will extend between the cope and the outer side of the root to also cement the cope in position.

The anchor 10 also includes a unit 36 including an anchor lug 38 having tines 40 at one end and a threaded hole 42 adjacent the outer end. An intermediate section of the lug is bent as at 44. The tines 40 and the section 44 are embedded in the partial 46.

A pivot pin 48 is threadedly fastened in the threaded hole 42 in the anchor lug and the pin extends into the socket 12. The inner end of the pin 48 is enlarged to form at least one shoulder 50. The inner end of the pin is in the form of a spherically shaped head 52. As herein shown as an example, the outer surface 54 of the head complements the concaved spherical surface of the rest 22 of the sleeve 14. Thus the spherical surfaces of rest 22 and the pin head 52 have a gimbal effect to assure limited nutatable movements of the partial 46 relative to the root 18.

The unit 36 is removably latched to the tooth root 18 by providing resilient connection between the pin 48 and the sleeve 14. The sleeve may be resilient adjacent the shoulders 30, or as herein shown, the pin is resilient at the head 52. The pin is slit, as at 56, longitudinally throughout the major portion thereof including

throughout the head 52. The head is resiliently biased outwardly, below the shoulders 20 on the sleeve so that the head 52 of the pin 48 is urged laterally radially outwardly and downwardly. Either the socket 12 or the pin 48 or both are formed of material or materials such as rubber, plastic, metal, as herein shown, the material being sufficiently sturdy for retention of the desired retaining factor therebetween, yet sufficiently resilient so that the pin can be withdrawn from or inserted into the socket. The position of the respective shoulders 30 and 50 are such that they abut one another to thereby latch the pin in position. However, by exerting pressure outwardly on the unit 36, it can be detached from the socket 12. The rest 22 not only assures a gimbal effect between the gum 20 and the dental partial 46, but also provides a solid rest for the dental partial.

Referring to FIG. 3 it will be observed that the cope 32 is provided with a peripheral notch 58 into which cement flows when the socket is pushed in position in the hole to thereby assure peripheral attaching of the cope to the root by cement. If desirable, the cope can be cast so that the notch on outer edge extends to the periphery of the tooth root and under the adjacent gum.

Referring to FIG. 5, a plug 60 is disposed in the socket 12 to fill the opening. This lug is inserted into the socket in the tooth root at the time when a tooth is not needed for retention, or when the partial is being repaired. The plug 60 may be formed of rubber, plastic, Nylon or metal. A second embodiment of the present invention is described with respect to FIGS. 6 through 8. Those portions of FIGS. 6 through 8 which are substantially the same as corresponding portions of the embodiment of FIGS. 1 through 5 have been given the same reference numbers with a "' added. Referring to FIG. 6, a socket element 12' is inserted in a tooth root 18' and is very similar to that which has been described before. One of the differences is the use of a circular shoulder 70 which, as can best be seen from FIG. 7, extends inward on the inner surface of the sleeve 14' and extends completely therearound. The socket element 12' is preferably made from a stainless steel material.

A pivot pin 72 is embedded in the denture 46' and includes an enlarged head 74 which firmly holds the pin 72 in the denture. The opposite end of the pin includes a solid spherical head 76 which is received within the spherical concave rest surface 22' of the socket 12'. The pin 72 is constructed of a resilient material, at least at its spherical head 76. The spherical head 76 is made to have a diameter that is slightly larger than the diameter opening provided past the circular shoulder 70. The resiliency of the material of the pin 72 and its dimensions relative to that of the socket 12' are chosen to permit manual insertion and removal of the pin 72 from the socket 12' by the wearer of the denture. The use of a resilient material, such as Nylon resin, for the entire pin 72 minimizes side or lateral impact loading on the root 18' by absorbing shock. It is necessary that the partial be able to pivot in line with the sleeve 12', without side movement of the root. In this embodiment with the wide divergent opening 73, the top of pin 72 at the partial can move laterally. The twist is at the ball giving a gimbal rotation of ball 76. The Nylon construction also allows bending, so that side stresses are absorbed. Pin 72 has a tapered shape to increase its strength to side torques and bending loads. Also the wide divergent

opening 73 allows easier location of the opening and entry into the opening of the sleeve 12', and thus easier positioning of the partial. The material in the pin 72 also must have resistance to saliva of the wearer.

Since the spherical head 76 is made of a resilient material that may be compressed and inserted through the opening defined by the circular sleeve 70, no slit in the pin 72 is provided. The slit 56 of the pin 48 in the embodiment of FIG. 1 contributes to the resiliency of the pin. This compressibility of the spherical head 76 at any point therearound also permits the shoulder 70 to extend entirely around the interior surface of the socket 12', thus providing more holding surface that prevents accidental removal of the pin 72 from the socket 12'. While there is a need to allow the partial to pivot in line with the sleeve without moving the root, it is also necessary to have maximum downward support to support positive downward force without resiliency. It is undesirable to have the partial and pin 72 pumped up and down. This will allow the denture to go up and down and thus work on the gum 20' around the teeth or tooth that can cause the gums to recede. So it is important that the pin 72 have a firm rest factor while having means for handling torque factors.

Installation of the socket 12 of FIGS. 1 through 5 or the socket 12' of FIGS. 6 and 7 is preferably installed after drilling the hole in the root, with the use of a diamond sizing burr that is substantially the same size and shape as the socket to be installed in the root. After appropriate pilot hole has been drilled in the root, the sizing burr is employed to enlarge the pilot hole into a shape roughly corresponding to that of the socket to be installed. The socket is then cemented into the hole and a plug 60 (FIG. 5) is preferably inserted into the socket in order to keep it clean while the remaining procedure in installing the anchor of the present invention is completed. sleeve vertical

Referring to FIG. 8, the installation of the pin 72 into a denture 78 is illustrated. A recess 80 is made in the underside of the denture 78 that is large enough to receive the enlarged head 74 of the pin 72. The pin 72 is snapped into the anchor 12' with the use of a centering sleeve 82. The sleeve 82 is circular in top view (not shown) with a depending cylindrical portion 84 of the size to fit within the cylindrical interior of the socket 12' and hold the pin 72 firmly therein and substantially equi-distant from the interior walls of the socket 12'. The centering sleeve 82 is supported against vertical movement downward into the socket 12' by a flange 86.

Any commonly used self-curing acrylic is placed into the recess 80 of the denture without the pin 72 therein until the recess 80 is about three-quarters full. The denture 78 is then positioned over the root 18'. The recess 80 with acrylic therein surrounds the pin 72. The centering sleeve 82 prevents acrylic from running down into the socket 12' and additionally creates a contoured relief in the denture. After the acrylic has set, the pin 72 is firmly held by the denture. The denture is then removed and the centering sleeve 82 is removed from the pin 72 and discarded. The centering sleeve 82 is intended for use only during fabrication of the anchor as shown in FIG. 8.

If the pin 72 is to be inserted in the denture 78 in the laboratory, rather than in the dentist's office, the socket 12' is installed in the root as before but rather than the pin 72 being inserted therein, another pin (not shown)

similar to pin 72 but having a smaller diameter spherical head is positioned within the socket 12' after insertion through a centering sleeve 82. This is a temporary pin, usually of softer material, to be used to make an impression of the mouth. This temporary pin is not held as firmly within the socket 12' as is the pin 72. An impression is made with the temporary pin so placed. When the impression is removed from the patient's mouth, the temporary pin is easily removed as part of the impression. A spare socket 12' is then placed over the temporary pin and a model of the patient's mouth is poured directly into the impression including the spare socket. The impression material and temporary pin are then removed from the model. The lab technician now has a model of the patient's mouth the proceeds to insert the pin 72 in a proper position within the denture 78 just as a dentist does directly in the patient's mouth, as described with respect to FIG. 8.

The material preferred for use in the pin 72 of the embodiment of FIGS. 6 through 8 is a molded resin. A Nylon resin manufactured by the duPont Corporation under their identification of Zytel 101 has been found to have satisfactory mechanical properties for this application. Various other flexible resinous materials, such as polypropylene, polycarbonate, and composite fluorocarbons, may also be employed so long as they are stable in saliva.

The mechanical properties of the above identified Zytel Nylon which are believed to make it useful in this application are as follows:

Tensile strength — 11,800 p.s.i. at 73° F.

Yield stress — 11,800 p.s.i. at 73° F.

Shear strength — 9,600 p.s.i.

Flexural Modulus — 410,000 p.s.i. at 73° F.

Compressive stress at 1 percent deformation — 4,900 p.s.i.

Hardness, Rockwell — R118, M79

Izod impact strength at 73° F. — 1.0 foot pounds per inch

Thermal conductivity — 1.7 B.T.U./hour/square foot/degree F./inch

Water absorption in 24 hours — 1.5 percent

Mold shrinkage — 0.015 inch per inch

An advantage of the embodiments described above is that the use of a prefabricated socket 12 or 12' eliminates the time and cost of an individual cast coping for each patient anchor installation. However, there may be some circumstances where an individual case coping is desired. Referring to FIG. 9, another embodiment of the present invention is illustrated wherein a ceramic rod 88 has a rounded end 90 that serves as a mold for the interior surface of a socket. A cavity 92 is prepared within a tooth root 94. Normal dentistry coping impression techniques are employed. The coping 96 is cast with the ceramic rod 88 therein. After casting and investment removal, the excess length of the ceramic rod 88 may be broken off and discarded. Remains of the ceramic rod within the cast coping are removed by leaching overnight in concentrated hydrofluoric acid. The finished coping 96 is then cemented within the cavity 92 of the root 94 to provide a socket for receiving a pin 72 described with respect to FIGS. 6 through 8.

It should be recognized and understood that while the method and apparatus for anchoring a dental partial or full artificial denture is described in the preferred embodiment relative to attachment to the root

of a natural tooth, this is inclusive of using the method and apparatus to anchor dental partials or full artificial dentures to the jaw bone or to implants in jaw bones, which installations are made the same way and provide the same results.

The various aspects of the present invention have been described with respect to detailed embodiments thereof, but it is understood that the invention is entitled to protection within the full scope of the appended claims.

Having described my invention, I now claim.

1. An anchor for attaching a dental partial or full artificial denture to the root of a tooth, said anchor comprising in combination,

means having a sleeve shaped opening for being inserted into an opening in the root of a tooth below the gum line of the tooth,

said sleeve opening having a lower recess with a spherical shaped concave rest surface and a radially inwardly extending shoulder above said recess,

a pin for extending into said sleeve opening with a spherical shaped lower end for fitting against said spherical rest surface and said shoulder preventing upward and downward movement of said pin in said sleeve opening,

said lower end of said pin having a diameter larger than the diameter of the shoulder opening defined by said shoulder and having sufficient resilience therebetween to squeeze said lower end of said pin through said shoulder opening,

said pin above said lower end having a smaller diameter at said shoulder than the diameter of said shoulder opening,

said lower end of said pin having a diameter sufficient to fit against the spherical surface of said recess to allow rotational movement therebetween and lateral movement of the upper end of said pin, and means for connecting the upper end of said pin to the dental partial or full artificial denture.

2. An anchor as defined in claim 1 in which, the lower end of the pin is a resilient means that is expandible outwardly.

3. An anchor as defined in claim 1 in which, said shoulder is resiliently biased inwardly.

4. An anchor as defined in claim 1 in which, said means having a sleeve shaped opening comprising a coping inserted in the opening in the root of the tooth, which coping has said sleeve shaped opening.

5. An anchor as defined in claim 1 in which, said means having a sleeve shaped opening comprising a sleeve member.

6. An anchor as defined in claim 5 in which, said sleeve member having an axially aligned longitudinal lower extension of smaller diameter for extending into the root of the tooth beyond the lower end of said sleeve.

7. An anchor as defined in claim 1 in which, said lower end of said pin forming a ball, said lower recess having the shape of a ball corresponding to the shape of said lower end of said pin,

and said ball shape in said recess extending to said shoulder, forming a socket for said lower end of said pin.

8. An anchor as defined in claim 1 in which,

said sleeve shaped opening having cylindrically shaped sides, and said pin having a diameter substantially less than the diameter of said opening.

9. An anchor as defined in claim 1 in which, said connecting means having means for rigidly connecting said pin to the dental partial or full artificial denture.

10. An anchor as defined in claim 9 in which, said sleeve shaped opening having a longitudinal opening therein with sides that diverge outwardly from said shoulder, said pin having outwardly tapering sides extending from said lower end, and said longitudinal opening having a substantially larger diameter than the diameter of said pin for allowing lateral gimbal movement of said lower end of said pin in said recess without said pin contacting the sides of said longitudinal opening.

11. An anchor as defined in claim 10 in which, said pin being of sufficiently flexible material to allow bending upon lateral movement of the dental partial or full artificial denture with out side movements of said sleeve opening means.

12. An anchor as defined in claim 11 in which, said pin being made of a flexible material such as Nylon resin or the like.

13. An anchor as defined in claim 10 in which, a second sleeve element for being mounted on said pin and fitting between said pin and said diverging opening in said sleeve shaped opening, and said second sleeve element functioning to seal the opening between said sleeve shaped opening and said pin and for holding the pin in upright position in said sleeve shaped opening.

14. An anchor as defined in claim 13 in which, said sleeve shaped opening means having an upper cope for fitting against the upper surface of the tooth root, and said second sleeve element having an outwardly extending cope that fits over the said cope of said sleeve shaped opening means.

15. An anchor as defined in claim 1 in which, said sleeve shaped opening means being formed into a cope for fitting into a larger opening in the root of a tooth.

16. An anchor as defined in claim 10 in which, said connecting means comprising an enlarged head on the upper end of said pin, with said head and upper end of said pin being embedded in the dental partial of full artificial denture.

17. An anchor as defined in claim 6 in which, said sleeve member and said lower extension having a flat outer side for passing holding cement for holding said sleeve member in a hole in the tooth root.

18. An anchor as defined in claim 1 in which, said connecting means spaces the adjacent surface of the dental partial or full artificial denture from said sleeve shaped opening means and the upper surface of the tooth root.

19. The method of attaching a dental partial or full artificial denture to the root of a tooth when the tooth has been cut off at the tissue line, comprising the steps of, drilling a vertical hole into the tooth root below the gum line,

forming a spherical shaped socket in the hole in the tooth with a shoulder around an opening to the socket, fixing a pin to the denture which pin has a spherical shaped lower head for fitting into the socket through the opening and over the shoulder, and making the socket opening and the pin with a relative space therebetween so that the denture can move laterally with the spherical pin head rotating in the socket without causing side forces to be applied to the tooth, and the lower head abutting the shoulder and the surface of the socket preventing up and down longitudinal movement of the pin in the socket.

20. The method as claimed in claim 19, including the step of, inserting a socket receptical into the hole and cementing the receptical therein, which receptical has the internal spherical shaped socket.

21. The method as claimed in claim 20 being characterized by, the pin head being resilient for snapping through the shoulder opening of the socket.

22. The method as claimed in claim 21 including the steps of, positioning the pin in the socket with a desired position axial with the tooth root, providing a recess in the denture that when the denture is in the correct position in the mouth the upper end of the pin is in the recess, and filling the recess with a holding material that surrounds the upper end of the pin when the pin is inserted into the recess, which material hardens holding the end of the pin in the denture so that the pin may be removed from the socket in the root with the pin and denture and root socket aligned.

23. In the method as claimed in claim 22 including the step of, inserting a sleeve between the pin and the upper opening of the root socket, which sleeve holds the pin in centered alignment in the socket and seals the socket from receiving the holding material.

24. In the method as claimed in claim 27 including the steps of, inserting a pin having a smaller diameter spherical head than the socket into the socket, making an impression of the mouth and teeth with the temporary pin in position, removing the pin from the socket with the impression, placing a temporary socket over the temporary pin and making a model of the patient's mouth by pouring molding material into the impression including the temporary socket, and then forming a denture with a pin to correspond with the model and socket.

25. The method as claimed in claim 19 including the steps of, placing a material in the hole in the tooth root, placing a denture in the mouth with the end of the pin projected into the molding material, casting the material with the pin therein, after casting and investment removal, removing the rod from the cast by leaching or the like, and then cementing the casting into the hole to provide the socket for receiving a pin in a denture.

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