

Feb. 22, 1938.

F. MAULEN

2,109,138

TOOTH PINS FOR ARTIFICIAL TEETH

Filed Sept. 28, 1935

Fig. 1

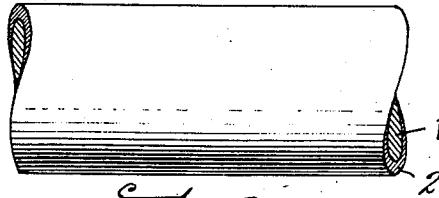


Fig. 2

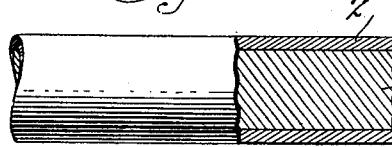


Fig. 7

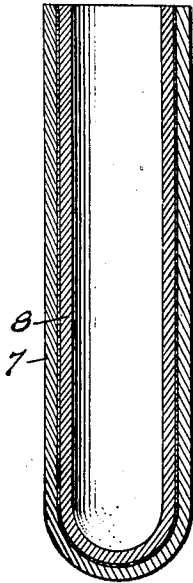


Fig. 8

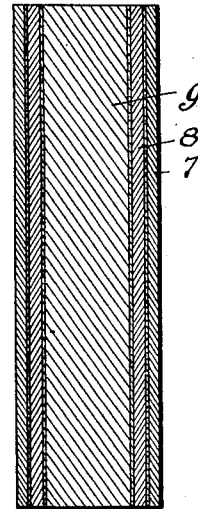


Fig. 3

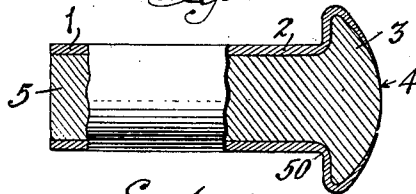


Fig. 4

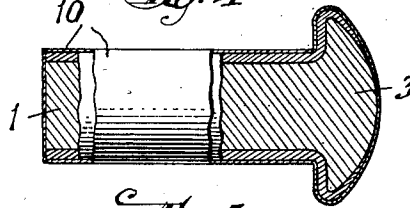


Fig. 5

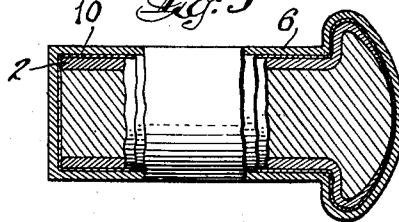


Fig. 6

INVENTOR
Frederick Mauleu,
BY
Harry B. Look,
ATTORNEY

UNITED STATES PATENT OFFICE

2,109,138

TOOTH PINS FOR ARTIFICIAL TEETH

Frederick Maulen, East Orange, N. J., assignor to
Baker & Company, Inc., a corporation of New
Jersey

Application September 28, 1935, Serial No. 42,639
In Canada October 5, 1934

17 Claims. (Cl. 32-10)

The invention relates particularly to tooth pins for artificial teeth and methods of making them, i. e., pins that are used for attaching artificial teeth to vulcanite backings or other supports, although the invention is susceptible for use in and for making other dental accessories. More specifically the invention is directed to the manufacture of tooth pins of the type including cores of base metal, such as nickel or nickel alloys, having a plurality of superposed layers or coatings of metals capable of resisting corrosion under influence of fluids in the mouth, and capable of withstanding soldering temperatures incident to attachment of the pins to teeth or supports; for example, metals of the platinum group such as platinum or palladium, or gold, or silver, or alloys of two or more of these metals, for example palladium-silver or platinum-gold or palladium-gold-silver alloys.

Tooth pins including a core of base metal having a single coating of gold have been used for many years. These pins have been made by slipping a tube of gold over a rod of base metal and then rolling and drawing the composite rod into fine wire. However, it has not been possible to prevent scratching, tearing or cracking of the coating layer by hard particles in the drawing stone or in drawing the coating eccentric to the core, during this operation, which results in a weakening of the protective coating or exposure of the base metal to corrosion. Moreover, the use of single coatings of gold or gold-platinum alloys, has been restricted by the high cost, since thick layers (25% by weight of the core) are necessary to provide the desired protection against corrosion of the core either by the soldering operation or mouth fluids.

These disadvantages led to the production of a pin having a base metal core and two or more superposed thin coating layers of different metals or alloys, the inner layer being of a metal of the platinum group, for example platinum or palladium, or silver, or an alloy of two or more of these metals, or an alloy of one or more of said metals and gold, while the outer layer is formed of gold or gold alloy. The gold outer layer tends to fill in any cracks in the inner coating, while the inner layer serves as a buffer between the core and the outer layer.

Furthermore, by using for the inner or buffer coat a metal of lower specific gravity and less expensive than gold, for example, palladium, a thicker inner coating or buffer layer can be used with a relatively thin outer layer of gold, so that the core with the inner layer can be more easily

drawn or worked with less danger of tearing or cracking, and yet the pin will be less expensive and have corrosion resisting qualities at least equal in strength and durability to known single coated pins.

Where certain metals, for example, palladium and silver, are used for the intermediate or buffer layer, diffusion of the outer layer into it may take place particularly under relatively high temperatures, for example during soldering operations on the pin. This results in weakening of the protective coatings and renders the pin less resistant to corrosion; in addition the desirable gold color may be lost when gold is used for the outer coating.

Therefore prime objects of my invention are to provide a novel and improved method of making a tooth pin or dental accessory of the general character described whereby diffusion of the outer layer into the inner or buffer layers shall be prevented or reduced; and to provide tooth pins or other dental accessories which have a base metal core covered with a plurality of different corrosion resistant, preferably precious, metals or alloys, and an intermediate diffusion preventing layer of metal.

Other objects are to provide a tooth pin or dental accessory of the general character described which shall have a layer of corrosion resistant, preferably precious, metal, for example rhodium or platinum, over the first coating or inner or buffer layer to prevent diffusion of the outer layer or layers into the initial or buffer layer; and to obtain other results and advantages as will be brought out by the following description.

For the purpose of illustrating the principles of the invention, the accompanying drawing shows a tooth pin and the steps in the manufacture thereof according to the preferred form of the invention.

Referring to the drawing in which corresponding and like parts are designated by the same reference characters throughout the several views,

Figure 1 is a fragmentary side elevation, on a greatly enlarged scale, of a base metal rod having a layer or plating of precious metal thereon.

Figure 2 is a similar view, showing the rod after it has been rolled and drawn into wire.

Figure 3 is a view, partially in elevation and partially in longitudinal vertical section, of a tooth pin formed from the wire shown in Figure 2.

Figure 4 is a similar view showing the pin after

the thin diffusion preventing coating has been applied thereto.

Figure 5 is a like view, showing the completed pin after the outer layer of protecting metal has been applied thereto; and

Figures 6, 7, and 8 are sectional views illustrating the steps in another method of applying the inner protective layer to the base metal core.

Specifically describing the preferred manner of carrying out the invention, a protective or buffer layer 2 of precious metal or a precious metal alloy is first applied to a rod 1 of base metal, for example nickel or a nickel alloy. This protective layer 2 may be applied to the rod 1 in any suitable manner, but preferably the layer 2 consists of a tubular shell which is slipped over the core 1 and is then secured on the core under influence of heat and pressure in known manner. Instead of this method a sheet 7 of the protective metal may be soldered on a sheet 8 of base metal as shown in Figure 6, after which the composite sheet can be formed by dies into a tube as shown in Figure 7. Then a solid core 9 can be soldered into the tube as shown in Figure 8, and the whole drawn into a wire of the desired diameter. The composite rod is rolled and drawn into a wire of suitable diameter according to known methods.

Preferably this inner layer 2 is composed of a metal of the platinum group or an alloy thereof, for example platinum, palladium, or platinum-gold alloy, palladium-silver alloy, palladium-gold alloy or palladium-gold-silver, or silver alone may be used where soldering temperatures are low.

The wire shown in Figure 2 is then cut into pieces of the desired length to form tooth pins or other dental accessories, and these pieces may be used as tooth pins with or without heads. Preferably each piece is provided with a head 3 by upsetting the end of the piece as shown in Figure 3. During this operation, the protecting layer 2 at the head of the pin is attenuated and due to the larger cross section area of the head, the coating layer does not entirely cover the end of the head so that a small area 4 of the base metal core is exposed; also the base metal core at the other end of the pin where the piece of wire has been severed is exposed as indicated at 5, and the layer at the juncture of the head with the shank is thinned at 50. Furthermore, the layer 2 may be torn, cracked, or scratched, or drawn eccentrically. The same results occur in pins having two protective layers, and accordingly such pins are inadequately protected against corrosion or oxidation of the core.

In accordance with the invention, after the pins have been formed as described above, a thin or "flash" coating 10 of a corrosion resistant metal is applied over the inner or buffer layer 2, particularly when the latter is of a nature to permit diffusion thereinto of another layer under heat, for example during soldering operations on the pin. For example, palladium or silver or alloys thereof when used to provide the buffer coating, may be covered with a diffusion preventing coating of rhodium or platinum. Preferably the rhodium or platinum or other metal used for the diffusion preventing coating is electrodeposited on the pin, and preferably the pins are wholly submerged in an electroplating solution, the coating being electrodeposited on the pins while the latter are being agitated. In this way the diffusion preventing coating 10 is thus applied to the

whole surface of the pin over the inner layer 2, and the portions 4, 5 and 50 of the core.

After the diffusion preventing layer 10 has been applied to the pins as described above, another protecting layer 6 of precious metal is applied to the pin, preferably by electrodeposition in substantially the same manner in which the layer 10 is applied. This final or outer protecting layer 6 is preferably of gold or a gold alloy, and due to the presence of the diffusion preventing layer 10, the tendency of the gold to diffuse into the inner layer 2 is prevented or reduced. By electrodepositing the layer 6, as described, the layer obtained is smooth, of uniform thickness and of high quality. Also, any cracks, scratches or tears in the inner layer formed during the drawing or rolling operations are filled in and covered by the outer layer 6. The outer layer covers all portions of the pin which are thereby effectually protected against corrosion.

The diffusion preventing layer or coating of platinum or rhodium may consist of from one-quarter to one-half of one percent by weight of the core, although the thickness of layer may be widely varied as desired. With such a diffusion preventing coat less gold is required than without such coat to provide a given degree of corrosion resistance. Also, the thin diffusion preventing coat will so greatly reinforce or supplement corrosion resistance of the silver, that silver may be more generally or widely used in such tooth pins; and thereby due to relative low cost of silver the pins can be made at less cost.

The inner layer may be thick to partially overcome the difficulties encountered in working or drawing of the wire and the outer layer may be relatively thin, and yet provide adequate protection for the core at relatively small cost; this is especially true when the inner layer is of metal less expensive and has a lower specific gravity than gold, such as palladium, and the outer layer is of gold. This is important because it is difficult to electrodeposit thick layers of metal while thin layers can be easily electrodeposited; on the other hand, thin layers can be drawn only with difficulty and thick layers can be easily drawn. The use of a thin outer layer is further facilitated by the diffusion preventing layer 10 which insures that the outer layer shall not diffuse into the inner layer. Accordingly, it is possible to use a thick inner layer 2 of, for example, palladium and a relatively thin outer layer of for example gold, and provide a relatively inexpensive pin, although, of course, the outer layer may be made of any desired thickness. As is known to those skilled in the art, the use of gold as an outer layer is highly desirable because, from long use thereof, dentists have come to believe that it is the best metal for dental purposes and it has an appearance which is pleasing and instantly signifies to the observer that it is of precious metal.

While the thicknesses of the layers 2 and 6 may be widely varied to suit different conditions, in the preferred tooth pins, especially where palladium is used as the inner layer, the layers each consist of about eight per cent by weight of the core.

Obviously, the layers may be formed of different metals as desired, for example, the inner layer might be of gold and the outer layer of platinum, and other metals than those enumerated suitable for the purpose may be utilized.

While for most purposes it is generally sufficient for a tooth pin or the like to be provided, in accordance with this invention, with only two

coatings of different corrosion resistant precious metals, it will be apparent from the foregoing that more than two coatings may be provided, if desired.

5 Having thus described my invention, what I claim is:

1. Dental accessories formed of a base metal covered with a plurality of layers of different corrosion resistant precious metals one of which
10 is of a nature to permit diffusion therinto of another under soldering temperatures, and an intermediate thin coating of a diffusion preventing corrosion resistant metal between said layers, whereby diffusion of the second-mentioned layer
15 into the first-mentioned layer is prevented.

2. Dental accessories as set forth in claim 1 wherein the diffusion preventing layer is formed of rhodium.

3. Dental accessories as set forth in claim 1
20 wherein the diffusion preventing layer is formed of platinum.

4. Dental accessories as set forth in claim 1 wherein the diffusion preventing layer is formed of rhodium and the first layer comprises pal-
25 ladium.

5. Dental accessories as set forth in claim 1 wherein the diffusion preventing layer is formed of platinum and the first layer comprises pal-
ladium.

30 6. Dental accessories as set forth in claim 1 wherein the diffusion preventing layer is formed of rhodium and the first layer comprises palladium and the outer layer consists of gold.

7. Dental accessories as set forth in claim 1
35 wherein the diffusion preventing layer is formed of platinum and the first layer comprises palladium and the outer layer consists of gold.

8. Dental accessories as set forth in claim 1 wherein the diffusion preventing layer is formed
40 of rhodium and the first layer comprises palladium or an alloy thereof, and the outer layer is gold.

9. Dental accessories as set forth in claim 1 wherein the diffusion preventing layer is formed
45 of rhodium in an amount approximately from one-quarter to one-half of one percent by weight of the core, and wherein the first layer and outer layer comprise palladium or an alloy thereof and gold respectively, each in an amount approx-
50 imately eight per cent by weight of the core.

10. Dental accessories formed of a base metal covered with a plurality of layers of different corrosion resistant precious metals one of which
55 is of a nature to permit diffusion therinto of another under soldering temperatures, and an intermediate thin coating of one or more metals

of the group consisting of platinum and rhodium between said layers to prevent diffusion of the second-mentioned layer into the first-mentioned layer.

11. A tooth pin or other metallic dental ac- 5 cessory having a base metal core, an inner layer of silver or an alloy thereof, an outer electro-deposited layer of precious metal and an electro-deposited coating of platinum between said outer layer and said inner layer to prevent diffusion
10 of the outer layer into said inner layer.

12. A tooth pin or other metallic dental ac- cessory having a base metal core and inner and outer electro-deposited layers of corrosion re-
15 sistant precious metals, the inner of which is of a nature to permit diffusion therinto of the outer layer under soldering temperatures, and a diffusion preventing layer of a metal between said inner and outer layers to prevent diffusion of the
20 outer layer into said inner layer.

13. A tooth pin or other metallic dental ac- cessory having a base metal core, an inner layer of palladium or an alloy thereof, an outer electro-deposited layer of precious metal and an electro-
25 deposited coating of rhodium between said outer layer and said inner layer to prevent diffusion of the outer layer into said inner layer.

14. A tooth pin or other metallic dental ac- cessory having a base metal core, an inner layer of palladium or an alloy thereof, an outer elec-
30 trodeposited layer of precious metal and an electro-deposited coating of platinum between said outer layer and said inner layer to prevent diffusion of the outer layer into said inner layer.

15. A tooth pin or other metallic dental ac- 35 cessory having a base metal core, an inner layer of silver or an alloy thereof, an outer electro-deposited layer of precious metal and an electro-deposited coating of rhodium between said outer layer and said inner layer to prevent diffusion of
40 the outer layer into said inner layer.

16. A tooth pin or other metallic dental ac- cessory having a base metal core, an inner layer of palladium or an alloy thereof, an outer electro-
45 deposited layer of gold, and an electrodeposited flash coating of rhodium between said outer layer and said inner layer to prevent diffusion of the outer layer into said inner layer.

17. A tooth pin or other metallic dental ac- cessory having a base metal core, an inner layer
50 of palladium or an alloy thereof, an outer electro-deposited layer of gold, and an electrodeposited flash coating of platinum between said outer layer and said inner layer to prevent diffusion of the
55 outer layer into said inner layer.

FREDERICK MAULEN.