Patented Aug. 29, 1933 1,924,097

UNITED STATES PATENT OFFICE

1,924,097

ALLOY

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No Drawing. Application June 2, 1933.
Serial No. 674,045

7 Claims. (Cl. 75—1)

The object of the invention is to provide a new alloy composed essentially of the precious metals, palladium and gold, and more particularly for the purpose of providing dental auxiliary elements for oral installation constituted of an alloy suitable for dental purposes and shaped in the form of wires, bands, crowns, plates, etc., for appropriate application with reference to the dental condition in connection with which the auxiliary elements are to be used.

Heretofore, in the manufacture of such dental auxiliary elements it has been customary to use alloys in which the percentage of gold predominates over the percentage of all other metals, the gold being ordinarily alloyed with relatively large quantities of platinum of the order of 10% to 22%. Such alloys, while capable of use for their intended purposes, are necessarily expensive.

I have discovered that if the platinum is entirely omitted or permitted to be present only in small percentages of the order of less than 10%, and if a smaller amount of gold is alloyed with a larger proportion of palladium, the alloy also containing copper, silver, and zinc, a superior alloy for dental purposes can be produced at a cost which is approximately half that of the gold-platinum alloys.

In perfecting the composition of the new alloy it was necessary to bear in mind that the alloy must have a high fusion point which is essential for soldering. Although platinum has a higher fusion point than palladium, the fusion point of an alloy of palladium and gold is higher than that of an alloy of platinum and gold. As an increase in the percentage of palladium in the alloy raises its fusion point, and the palladium also possesses or imparts a desirable color, I use an excess of palladium over the amount of gold, these precious metals constituting at least 70 parts of the ultimate alloy. Copper forms a part of the alloy to impart to it the quality of hardness, while zinc imparts the necessary elasticity and toughness and silver aids in securing homogeneity. The alloy possesses the requisite high fusion point, the quality of not losing color in the mouth, and sufficient strength.

A general formula for the new alloy is: approximately 30 to 40 parts gold, approximately 35 to 50 parts palladium, approximately 10 to 23 parts silver, approximately 4 to 20 parts copper, and approximately 2 to 6 parts zinc. In other words, the amount of gold may vary between the limits of 30 to 40 parts, the palladium between about 35 to 50 parts, the copper between about 4 to 20 parts, the silver between about 10 to 23 parts, and the zinc between about 2 to 6 parts. The addition of some platinum not in excess of 10% will not defeat the advantage of the new alloy, though it is preferred to have no platinum present.

A formula which I have found satisfactory, specifically for dental auxiliary elements when shaped to the form of wires, is: gold approximately 33 parts, palladium approximately 39 parts, copper approximately 20 parts, silver approximately 10 parts, and zinc approximately 3 parts. This alloy can be rolled from bars say fifteen inches long and one-fourth inch square to wires approximately one-sixteenth inch square. This can be accomplished without annealing and the alloy does not show any fatigue during the rolling process. Any other comparable metal alloy will break under similar treatment. The property possessed by the new alloy is therefore valuable in saving labor. The new alloy can also be drawn through diamond draw plates to approximately twelve-thousands of an inch, which is as fine as is required for dental uses. The wires may be annealed but in that case temperatures above 1200° F. and preferably of the order of 1800° F. or upwards should be employed, the wires being quenched in water at room temperature. This treatment softens the wire and takes the springiness or elasticity out of it. After such annealing the wire can be readily shaped and orthodontic attachments soldered thereto. Thereupon the dentist heats the product to about 1000° F. and allows it to cool slowly. This treatment tempers the finished product. The wires made of the new alloy possess a high degree of elasticity and will not snap unless very sharply bent.

A formula which I have found satisfactory for an alloy when shaped to the form of and later used as a band is: gold approximately 32 parts, palladium approximately 38 parts, copper approximately 4 parts, silver approximately 23 parts, and zinc approximately 4 parts. A banding material prepared in accordance with the above formula becomes soft after heating to about 1700° F. and quenching in water at room temperature. The tensile strength of the material, after quenching, is about 55,700 pounds per square inch. In this condition the material may be shaped. After being shaped the bands may be again hardened and made stiff by heating to about 900° F. and allowing to cool slowly, when the tensile strength of the material is about 121,000 pounds per square inch. The capacity of being subject to tempering the same as wire is a very desirable feature which will be realized by first rendering the material

soft enough for manipulation and adjustment over natural teeth and then applying the hardening treatment.

The new alloy is easily produced, the zinc, copper, and silver being placed in a furnace or crucible, usually in the form of small pellets, the zinc first, copper on top, and then silver. The gold and palladium are first thoroughly mixed in a separate crucible and the mixture is rolled out and then put into the crucible containing the zinc, copper, and silver.

The melting point of my new alloy for wires is about 2085° F. The Brinell hardness in the softened state is about 202; after tempering at 860° F. and cooling it slowly in thirty minutes, the alloy showed a Brinell hardness of about 426. The tensile strength of this wire, when tempered, is as high as 191,000 pounds per square inch. When it is annealed or softened, the tensile strength is only between 88,000 and 103,600, showing an elongation between 25 and 28 in 2 inches, whereas in the hardened state the elongation is only from 2 to 5.

This new alloy combines with a high fusion point, which is very desirable, an elastic quality of a high degree. It will be noted that the dental auxiliary elements referred to are all of the type which is used in connection with oral installations being shaped so as to be conformable to whatever dental or oral condition may exist with reference to which such an auxiliary element is to be used.

I claim:

1. An alloy constituted of approximately 30 to 40 parts gold, approximately 35 to 50 parts palladium, approximately 10 to 23 parts silver, approximately 4 to 20 parts copper, and approximately 2 to 6 parts zinc.

2. An alloy constituted of approximately 33 parts gold, approximately 39 parts palladium, approximately 10 parts silver, approximately 20 parts copper, and approximately 3 parts zinc.

3. An alloy constituted of approximately 32 parts gold, approximately 38 parts palladium, approximately 23 parts silver, approximately 4 parts copper, and approximately 4 parts zinc.

4. A dental auxiliary element for oral installation in the form of a shaped member conformable to a dental condition, said element being constituted of an alloy composed of approximately 30 to 40 parts gold, approximately 35 to 50 parts palladium, approximately 10 to 23 parts silver, approximately 4 to 20 parts copper, and approximately 2 to 6 parts zinc.

5. A dental auxiliary element for oral installation in the form of a shaped member conformable to a dental condition, said element being constituted of an alloy composed of approximately 33 parts gold, approximately 39 parts palladium, approximately 10 parts silver, approximately 20 parts copper, and approximately 3 parts zinc.

6. A dental auxiliary element for oral installation in the form of a shaped member conformable to a dental condition, said element being constituted of an alloy composed of approximately 32 parts gold, approximately 38 parts palladium, approximately 23 parts silver, approximately 4 parts copper, and approximately 4 parts zinc.

7. A dental auxiliary element for oral installation in the form of a shaped member conformable to a dental condition, said element being constituted of an alloy composed of approximately 30 to 40 parts gold, approximately 35+ to 50 parts palladium, approximately 10 to 23 parts silver, approximately 4 to 20 parts copper, and approximately 2 to 6 parts zinc, the palladium being present in excess of the gold and the gold together with the palladium constituting at least 70 parts of the whole.

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