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3,554,738

DENTAL AMALGAM

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No Drawing. Filed May 21, 1968, Ser. No. 736,921
Int. Cl. C22c 7/00

U.S. Cl. 75—134

3 Claims

ABSTRACT OF THE DISCLOSURE

An improved dental amalgam containing one to ten percent by weight of gallium for adhesion of the amalgam to the tooth surfaces.

This invention relates to an improved dental amalgam and in particular an amalgam to which gallium is added to result in adhesion to the tooth structure.

Dental amalgam or the so called "silver filling" commonly used to fill teeth has the following approximate composition in percentage by weight:

	Percent
Silver	33.0
Mercury	52.0
Tin	12.5
Copper	2.0
Zinc	0.5

In making fillings with amalgam care must be taken to avoid moisture which may come from perspiration on the hand or from the mixing equipment. Moisture will cause excessive expansion and weakening of the hardened alloy. Excess mercury, remaining in the alloy after packing causes excessive expansion and flow. Excessive working of the alloy during amalgamation or packing reduces the expansion which normally occurs. Incomplete amalgamation results in a filling which corrodes readily. Incomplete packing increases corrosion and decreases the strength of the filling.

These and other difficulties are recognized by dentists and considerable skill and experience is required to produce amalgam fillings which are reasonably satisfactory. In this connection reference may be made to a booklet on the subject by Wilmer Souder and George C. Paffenbarger entitled "Physical Properties of Dental Materials," published by the U.S. National Bureau of Standards as Circular C 433, 1942.

The most serious limitation to conventional amalgam fillings is that there is no adhesion to the tooth surfaces. In the absence of adhesion to the tooth surface fillings made with conventional amalgams are held only by mechanical means. In practice it is necessary to undercut the cavity so that the amalgam filling will be locked in mechanically. This requires additional drilling and unnecessary removal of the tooth structure so that the amalgam filling is mechanically wedged or locked in. This also weakens the tooth unnecessarily so that chipping, fracturing and loss of the tooth commonly occurs.

We have found that the addition of about 3% gallium to the amalgam results in adhesion to the tooth structure. This eliminates much of the drilling which has heretofore been found to be necessary with conventional amalgam fillings. It has been necessary up to now to drill a convex cavity to lock in the conventional amalgam fillings. We find that a concave cavity can be filled with the present amalgam due to adhesion to the tooth structure. Also the present invention provides for stronger and longer lasting fillings.

It is therefore an object of this invention to provide

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for an improved dental amalgam which is characterized by good adhesion properties to the tooth surfaces.

It is also an object of this invention to eliminate undercutting and unnecessary drilling of teeth which has been the practice of the prior art with the amalgam fillings heretofore available.

It is also an object of this invention to accomplish these advantages with an improved amalgam alloy which has satisfactory strength, corrosion resistance, conductivity, density, and expansion.

While very satisfactory fillings with good adhesion and good packing characteristics have been made with an amalgam containing about 3% gallium, we have found that up to about 10% gallium can be used to promote adhesive properties to the amalgam.

Therefore the preferred composition range of the present improved amalgam is as follows, all percentages being by weight:

	Range, percent
20 Silver, 32.0%	30 to 34
Mercury, 50.5%	48 to 52
Tin, 12.1%	11 to 13
Copper, 1.9%	1.5 to 2.5
Zinc, 0.5%	.25 to .75
25 Gallium, 3.0%	2 to 4

Also a broader composition range which has been found to be satisfactory is as follows, all percentages being by weight:

	Percent
Silver	25 to 35
Tin	10 to 14
Mercury	45 to 54
35 Copper	1 to 3
Zinc	Up to 1
Gallium	1 to 10

A more limited investigation indicates that other similar elements in Group III of the Periodic Classification of the elements including indium and thallium can be added to dental amalgam with or without gallium to result in adhesion of the filling to the tooth surfaces. For a description of the Periodic Classification of the elements and the Group III elements including gallium, indium and thallium, reference may be made to a book entitled "Elements of Physical Metallurgy," by A. G. Guy, copyright 1959, published by the Addison Wesley Publishing Co. Inc., Reading, Mass.

Having described our invention, it will be understood that the invention may be otherwise embodied within the scope of the following claims.

We claim:

1. An improved dental amalgam containing the following approximate composition by weight:

	Percent
Silver	32.0
Mercury	50.5
60 Tin	12.1
Copper	1.9
Zinc	.5
Gallium	3.0

2. An improved dental amalgam for filling non-convex cavities, the said amalgam being characterized by good adhesion to the surfaces of the said cavities; the said amalgam containing the following approximate composition by weight: silver 30 to about 34%; mercury 48 to about 52%; tin 11 to about 13%; copper 1.5 to about 2.5%; zinc 0.25 to about 0.75%; and gallium 2 to about 4%.

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3. An improved dental amalgam characterized by adhesion of the said amalgam to the tooth surfaces, said amalgam containing the following approximate composition by weight:

	Percent	
Silver -----	30 to 34	5
Mercury -----	48 to 52	
Tin -----	11 to 13	
Copper -----	1½ to 2½	
Zinc -----	¼ to ¾	10
Gallium -----	1 to 10	

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References Cited

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L. DEWAYNE RUTLEDGE, Primary Examiner

ERNEST L. WEISE, Assistant Examiner

U.S. Cl. X.R.

75—169, 173

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,554,738 Dated January 12, 1971

Inventor(s) Victor E. Beldham et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading to the printed specification, lines 3 to 5 "Victor E. Beldham, 552 Arizona Drive, New Kensington, Pa. 15110 and Richard F. Harvey, 5527 Old Carriage Lane, Orchard Lake, Mich. 48033" should read -- Victor E. Beldham, New Kensington, Pa., and Richard F. Harvey, Orchard Lake, Mich., assignors to Metaltronics, Inc., Orchard Lake, Mich., a corporation of Pennsylvania. --.

Signed and sealed this 7th day of September 1971.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patents