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ALLOY

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This invention relates to alloys and more particularly to metal alloys adapted for use in the manufacture of dental castings.

In the art of dental alloy metals it has been recognized that cobalt-chromium basic alloys, that is, alloys whose principal constituents are cobalt and a metal of the chromium group possess certain characteristics which make them particularly advantageous for use as dental castings such as inlays, crowns, dentures and various prosthetic fittings.

On the other hand, gold, platinum and other precious metals and alloys of precious metals have long been used in the manufacture of cast dentures and the like. The use of the precious metals and alloys containing precious metals as their main constituents, while generally satisfactory from the standpoint of construction and use, is naturally attended by large expense due to the market value of the precious metals. Furthermore, a difficulty inherent in precious metal alloy dentures, particularly those high in gold, is their susceptibility to discoloration or tarnish. In some mouths the most expensive precious metal dentures become brown and dull in a few days, although the wearer may follow all the general rules of oral cleanliness. Laboratory tests show that sodium sulphide, and other sulphur containing compounds, rapidly discolor gold and gold alloys. Thus some persons cannot wear a gold bearing denture without having it tarnish, probably because of the presence of sulphides in the mouth or mouth liquids. While the usefulness of the denture is generally not substantially impaired, it becomes unsightly and unsatisfactory to the wearer, who can rarely be convinced that the trouble is within himself.

More recently alloys of non-precious metals, such as the cobalt-chromium and cobalt-chromium-nickel basic alloys, have been used in the art of dental prosthetics and several patents have been issued covering the analyses of non-precious metal alloys adapted to the manufacture of dental appliances. These non-precious metal alloys have obvious advantages over the precious metals in cheapness and frequently in a desirable hardness and denseness of the castings produced, although they are generally not as easily worked and finished as are castings produced with the precious metals.

It is an object of the present invention to provide a new dental alloy which partakes of the desirable qualities of both the precious and the non-precious metals and the use of which is relatively economic as compared with the precious metals or alloys the principal constituents of which are precious metals.

Another object is to provide an improved alloy of the cobalt-chromium basic type containing a relatively small percentage of a precious metal, which alloy is light in weight, has a high lustre, a pleasing precious metal appearance, possesses marked qualities of hardness and density without brittleness, is acid resisting and non-tarnishing and possesses an unexpected ease of fitting and finishing.

A still further object is to provide an economical alloy for cast dentures which has a pleasing precious metal appearance and which is substantially unaffected by acids and sulphur containing compounds found in some oral cavities, so that the brightness and lustre of the denture will remain substantially unimpaired.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description. In the description, for the purpose of example, there have been set forth the best embodiments of the invention now known to me, but such embodiments are to be regarded as typical only of many possible embodiments and the invention is not to be limited thereto.

My invention, generally speaking, comprises according to an embodiment thereof, a cobalt-chromium basic alloy which, as its type indicates, contains the metals cobalt and chromium as its principal constituents. It may contain a small amount of iron and smaller amounts of tungsten and silicon and, of course, very small amounts of other metals occurring as impurities. The carbon content should be maintained as low as possible to avoid brittleness and in any event should not be present in amounts substantially greater than .50%. This alloy of the present invention containing generally the ingredients as just specified, is characterized by the inclusion of about ten parts by weight of a precious metal preferably chosen from the group comprising platinum, palladium and iridium, palladium being generally preferred as its use is more economical than the others.

A very satisfactory alloy according to the present invention may be characterized by the following analysis:

	Per cent
Cobalt	55
Chromium	28
Iron	7
Palladium	9
Tungsten	.50
Silicon	.20
Carbon and impurities	.30

The above alloy possesses all the advantages

of a cobalt-chromium basic non-precious metal alloy in that it is acid resisting and non-tarnishing, very hard and dense, casts easily and comes out of the mold in a smooth and even condition. Carbon should be kept as low as possible to avoid brittleness and the low carbon content also results in considerable ease of polishing and finishing. As previously indicated, the essential characteristic of the alloy is the inclusion of a precious metal from the group comprising platinum, palladium and iridium in approximately the amount specified. There results an alloy having the known characteristics and advantages of a cobalt-chromium basic alloy and which, in addition, partakes of many of the advantages and characteristics of a precious metal or precious metal alloy while at the same time being practically as economical as the ordinary non-precious metal alloy. The inclusion of the precious metal in the manner indicated gives to the alloy an unexpected ease of fitting and finishing and the material presents a pleasing precious metal-like appearance which is highly desirable in the dental prosthetic art.

Nickel may be substituted for iron in the above formula with satisfactory results. The nickel containing alloy is slightly softer and somewhat easier to work, whereas the iron containing alloy is harder and possesses a higher lustre.

While the analysis hereinbefore given is one which provides an alloy which has been found most suitable for use in dental castings, variations may occur in the percentages of the various constituents without departing from the spirit and scope of the invention and the following table lists ranges within which the several preferred constituents of the alloy may be present and afford an alloy having all of the advantages and characteristics previously mentioned:

	Per cent
Cobalt	45 to 65
Chromium	25 to 35
Iron or nickel	not exceeding 10
Palladium	2.50 to 10
Tungsten	.25 to 3
Silicon	.20 to 1
Carbon	not exceeding .50

Thus it will be seen that the alloy of the present invention comprises a cobalt-chromium basic alloy which contains a relatively small amount of a precious metal which adds to the known advantages of non-precious metal dental alloys an unexpected ease of fitting and finishing, together with a very pleasing color without substantially affecting economic utilization of the alloy.

It will be appreciated, of course, that where palladium is set forth in the foregoing formulae, that metal is intended to be illustrative of a metal from the group comprising platinum, palladium and iridium, although palladium is preferred because of its economic advantages.

Alloys prepared according to the formulae of the hereindescribed invention partake of the desirable qualities of both precious and non-precious metals and their use is economically attractive. They are light in weight, have a high lustre, a pleasing precious metal apearance, and possess marked qualities of hardness and density without brittleness. They are non-tarnishing and are resistant to mouth acids and sulphur bearing compounds, so that dentures made therefrom retain indefinitely their original brightness and lustre.

What is claimed is:

1. An alloy comprising cobalt about 55%, chromium about 28%, a metal chosen from the group comprising iron and nickel about 7%, a metal chosen from the group comprising platinum, palladium and iridium about 9%, tungsten about .50%, silicon about .20%, and carbon and impurities about .30%.

2. An alloy comprising cobalt about 55%, chromium about 28%, iron about 7%, palladium about 9%, tungsten about .50%, silicon about .20%, and carbon and impurities about .30%.

3. An alloy consisting of cobalt 45% to 65%, chromium 25% to 35%, a metal chosen from the group comprising iron and nickel not exceeding 10%, a metal chosen from the group comprising platinum, palladium and iridium 2.50% to 10%, tungsten .25% to 3%, silicon .20% to 1%, and carbon not exceeding .50%.

4. An alloy consisting of cobalt 45% to 65%, chromium 25% to 35%, iron not exceeding 10%, palladium 2.50% to 10%, tungsten .25% to 3%, silicon .20% to 1%, and carbon not exceeding .50%.

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