A method of making a dental prosthesis, such as a dental bridge, dental crown or corono-radicular retainer wherein a negative cast of the mouth area is formed by surrounding at least part of the area with a copper ring and introducing a casting material into said ring. Thereafter a plaster positive model is formed by introducing plaster into said cast. The model is fixed to the wall of a container and duplicated by casting a hydrocolloid material about the model and withdrawing said model from said hydrocolloid material upon setting to form a reversible hydrocolloid negative impression. An investment material is used to form a positive representation from the investment material and there is built up with a thin layer of wax on said positive representation the configuration of the prosthesis to be fashioned. Then a lost-wax casting mold is formed about the positive representation with the wax layer thereon and a molten metal is cast in the mold to produce the prosthesis.
METHOD OF MAKING DENTAL BRIDGES, DENTAL CROWNS, AND DENTAL CORONO-RADICULAR RETAINERS

FIELD OF THE INVENTION

This invention relates to a process for fabricating dental bridges, dental crowns and dental corono-radicular retainers made of base-metal alloys (chromium-cobalt alloys) by the one-piece-casting method.

BACKGROUND OF THE INVENTION

There are several procedures for fabricating this type of metallic fixed prosthesis described in the prior art or used heretofore.

Metallic full crowns made of stainless steels are fabricated by swaging, and metallic full crowns made of precious-metal alloys or of semiprecious-metal alloys are fabricated either by swaging or by casting.

Casts are processed in two ways, either as two separate cast units which are then assembled by soldering, or as a single cast unit shaped to the desired size and thickness, the material used to control the thickness being afterwards removed from within the wax pattern.

This last procedure is only followed when the casting material is a precious-metal alloy or a semiprecious-metal alloy.

The disadvantage of these procedures is the great difficulty in using them for making hard alloy cast crowns, since they require finishing operations that can not be carried out readily on hard alloys. Metallic dental bridges made of base-metal alloys, semiprecious-metal alloys and of precious-metal alloys are cast by separately casting their constituent units and afterwards joining them together by soldering. There are also known procedures for making one-piece cast dental bridges, too, but the construction of the type of bridge requires an absolutely accurate fit so that they are only made of precious-metal alloys or of semiprecious-metal alloys.

Stainless steels are very rarely used for construction of such prostheses since it is not possible to obtain cast bodies of great accuracy and fineness from such alloys.

Corono-radicular retainers, too, are generally made of separately cast units (dowel and coping) that are then assembled by soldering, the usual one-piece casting method being only followed when the retainers are to be made of precious-metal alloys or of semiprecious-metal alloys.

The usual procedures have, therefore, the very important disadvantage, that the constituent units of the fixed prosthesis must be separately made and then assembled, the one-piece casting method being only followed when precious and semiprecious alloys are used to fabricate them.

OBJECTS OF THE INVENTION

It is, therefore, the principal object of the present invention to provide an improved method of or process for the manufacture of dental prostheses of the character described which allows accurate devices to be made at relatively low cost and with relative ease, while permitting casting techniques and base metals to be employed.

SUMMARY OF THE INVENTION

The procedure of fabricating dental bridges, dental full crowns and dental corono-radicular retainers, according to our invention, avoids these disadvantages of the usual procedures because, in order to fabricate such fixed prostheses to a given thickness of chromium-cobalt alloys by the one-piece casting procedure, there is used (according to a first variant designed for construction of dental bridges) a little removable model made of hard plaster, reproducing the tooth-stump area and the alveolar crest zone, which runs into an extended model of plaster impression.

According to a second variant designed for construction of metallic full crowns and window crowns, the process of the invention uses removable models made of hard plaster which run into an extended model of impression plaster.

According to a third variant of the invention designed for the construction of corono-radicular retainers, we use a cylindrical model made of hard plaster including the impression of the root canal.

Pursuant to the first and second variants, the little removable model of hard plaster (or, as the process requires, the removable models of hard plaster), contoured to a reduced anatomical shape, are duplicated of investment material, while pursuant to the third variant the cylindrical model of hard plaster including the impression of the root canal is duplicated of investment material by means of a threaded taper dowel which is introduced into the root-canal impression, this complex being further attached to the lid of a former by use of a screw which is fastened into the threaded end of the taper dowel. The reversible hydrocolloid negative impression of the root canal is taken after removing the hard plaster model. A pattern is then waxed up on the investment-duplicated model by applying a wax strip of given thickness (for example 0.4 mm.) to the model; next follows the processing of the mold and the casting of the metal.

Thus, in general terms, the present invention may be said to involve a method of making one of the aforementioned types of dental prostheses by initially forming a negative cast of the mouth by casting material at least in part in a copper ring surrounding the area adapted to receive the prosthesis; thereafter we form a plaster positive model of this region by introducing plaster into the cast thus produced and, as described above, cast a reversible hydrocolloid material into a container into which the model has been inserted and attached to a wall thereof. The investment material is cast into the negative hydrocolloid impression, is separated from the wax pattern which receives a thin layer of wax. A lost-wax casting mold is formed about the wax positive representation, which conforms to the configuration of the prosthesis to be fashioned and the chromium-cobalt alloy is then cast into the mold.

DESCRIPTION OF THE DRAWING

The above and other objects, features and advantages of the present invention will become more readily apparent from the following description, reference being made to the accompanying drawing (relating to three embodiments of the invention) in which:

FIG. 1 is an elevational view of the complex impression, from which can be seen the perimeter of the copper rings filled with thermoplastic impression material, used to take the tooth-stump impressions, over which a plaster impression is taken;

FIG. 2 is an elevational view of the complex impression into which hard plaster has been poured, including the tooth-stump area and the alveolar crest area, in order to obtain a little removable model;

FIG. 3 is a longitudinal section through the complex model obtained after removing the plaster impression containing the little removable model made of hard plaster whose tooth-stump cores are covered with thermoplastic material and copper rings, placed on an extended model made of plaster;

FIG. 4 is a longitudinal section through the hard plaster model in place on an extended model made of plaster, after removal of the copper rings;

FIG. 5 is a longitudinal section through which the tooth-stump models of the little removable model after it has been provided with wax patterns contoured to reproduce the reduced anatomical shape of the abutment-teeth coronal area, the model being in place on an extended model made of plaster;

FIG. 6 is a longitudinal section through the little removable model with waxed tooth-stump model, separated from the extended model of plaster.
FIG. 7 is a longitudinal section through the little removable model, with waxed tooth-stump model, attached to a former lid (in an upturned position);

FIG. 8 is an elevational view of the former lid provided with holes through which melted reversible hydrocolloid will be poured into the former lid;

FIG. 9 is an elevational view of the reversible hydrocolloid negative impression block from which can be seen the perimeter of the little model removed from the negative block, and the cervical contour of the tooth-stump models;

FIG. 10 is an elevational superficial view of the reversible hydrocolloid negative block, into which investment was poured in order to obtain an investment duplicate of the little model mold;

FIG. 11 is a longitudinal section through the investment duplicate of the little model;

FIG. 12 is a longitudinal view through the investment duplicate of the little model, with a wax strip of predetermined thickness attached and shaped to reproduce the anatomical contour of the future crown;

FIG. 13 is a longitudinal section through the investment duplicate of the little model, with wax patterns of the crowns on it, placed on an extended model plaster;

FIG. 14 is a longitudinal view through the investment duplicate of the little model (as shown in FIG. 13) on which the pontic-wax pattern has been fashioned between the two wax patterns of the crowns;

FIG. 15 is a longitudinal section through the investment duplicate of the little model (as shown in FIGS. 13, 14) with the wax pattern of the pontic joined with the wax patterns of the crowns;

FIG. 16 is a longitudinal section through the model wax pattern complex, in place on a former base;

FIG. 17 is a longitudinal section through the model wax pattern complex (as shown in FIG. 16) with the former cylinder laid over in order to obtain an investment mold;

FIG. 17a is a transverse section along plane A—A of FIG. 17 of the model wax pattern complex, after the mold is made;

FIG. 18 is a longitudinal section through the model wax pattern complex placed on the extended model of plaster, provided with removable investment models of the tooth stumps and wax patterns of the crowns;

FIG. 19 is a longitudinal section through the model wax pattern complex placed on a former base, with the former cylinder laid over in order to obtain an investment mold;

FIG. 19a is a transverse section along plane B—B of the model wax pattern complex of FIG. 19 after the mold is made;

FIG. 20 is a proximo-vestibular view of the impression of tooth-stump and radicular canal, taken with a copper-ring and thermoplastic impression material;

FIG. 21 is a longitudinal section through the cylindrical model of hard plaster poured in the complex impression;

FIG. 22 is a longitudinal section through the cylindrical model of hard plaster, including the tooth-stump model and the radicular canal impression;

FIG. 23 is a longitudinal section, as in FIG. 22 with the metallic taper dowel introduced into the radicular canal, the dowel to be further fastened on the former lid;

FIG. 24 is a longitudinal section through a former, with the complex model made of hard plaster fastened inside by means of a metallic taper dowel;

FIG. 25 is a longitudinal section through the block of the complex negative impression taken with reversible hydrocolloid, into which investment material was poured after the hard plaster model was removed, in order to obtain an investment duplicate of the model;

FIG. 25a is an elevational view of the former lid, the screw used to fasten the complex model of hard plaster on the lid;

FIG. 26 is a longitudinal section through the investment duplicate of the model;

FIG. 27 is a longitudinal section through the investment duplicate of the model, provided with the wax pattern of the corono-radicular retainer.

FIG. 28 is a longitudinal section through the model wax pattern complex placed on the former base, with former cylinder laid over, in order to obtain an investment mold; and

FIG. 28a is a transverse section along the plane C—C of FIG. 28 showing the model wax pattern complex after the mold is made.

SPECIFIC DESCRIPTION

EXAMPLE I (FIGS. 1-17)

In order to make dental bridges and full crowns, an impression of the tooth stumps 1 is taken in the dental office according to the usual procedure.

Over the tooth-stump impression, with copper rings 2 filled with thermoplastic impression material 3 in place on the tooth stumps, a plaster-impression is taken, which is the complex impression 4. Into the tooth-stump impression 1 provided with copper rings 2 filled with thermoplastic impression material 3 included inside the complex impression of plaster 4, hard plasters 5 is poured to cover the alveolar crest area between the tooth stumps 1, too. After the hard plaster 5 begins to set, but not before its setting is completed, the alveolar crest area of hard plaster 5 is fashioned to a parallel pipedlike shape 6, without removing the complex impression 4.

After final setting of the hard plaster 5 the complex impression is isolated (provided with a parting film or surface) with plaster 7 and soap, and common plaster 8 is poured over it in order to obtain an extended model of the hemisection and antagonistic teeth. After removing the impression, a complex model of plaster 7 is obtained, which receives a little removable model 8 of hard plaster, with tooth-stump models or cores 1 surrounded with copper rings 2 and thermoplastic impression material 3.

Next the copper rings 2 containing thermoplastic impression material 3 are removed from the tooth-stump models 1 of the little removable model of hard plaster 8. The tooth-stump models 1 of the little removable model made of hard plaster 5 are then contoured to a reduced anatomical shape, using a modelling compound made up by combining 1 part of gutta percha and 3.3 parts of modelling pink wax, but without carving a 1–1.5 mm. strip on the cervical area 10 of the tooth-stumps models 1 and without creating contact points between the tooth-stump models 1 and adjoining tooth models 11, thus creating a free space (s) of about 0.4 mm. against adjoining teeth 11 and antagonist teeth (which are not shown in the drawing).

The little removable model of hard plaster 8, with the tooth-stump models 1 contoured to a reduced anatomical shape 9, is removed from the complex model of common plaster 7 and sealed with wax to the inner face of a former 13 at its lid 12, which is provided with one or several holes (10 mm. wide); the little removable model 8 made of hard plaster 5, is located on the lid such that at least half of the area a of each hole is covered by the little removable model 8.

The former 13 and its lid 12, together with the little removable model of hard plaster 5 attached, are immersed for 10–15 minutes into a fresh-water jar. A reversible hydrocolloid negative impression 14 of the little removable model 8 is then taken by pouring into the former 12 reversible hydrocolloid 14 melted at a temperature of 90°C. and tempered to 45°-50° C.

The former 13, with the reversible hydrocolloid 14, is then immersed in fresh water. After cooling, the former lid 12 is removed and the little removable model 8 of hard plaster 5 is separated from the reversible hydrocolloid 14.

Investment, prepared in proportions of 130 g. powder to 15 ml. water, mixed for one minute, is now poured into the negative block 15 made of reversible hydrocolloid 14. The investment 16 sets in 20 minutes, hydroscopic expansion occurring at the same time. The little removable model 17 made of investment 16 is then cautiously separated from the negative block 15 and placed in a furnace for 5 minutes at a temperature of 200°C.
The investment model is removed from the furnace and it is immersed for 2 seconds into a bath of heated wax at 150° C. After the little removable investment model 17 is cooled, a wax pattern shaped to a adequate thickness is constructed by applying a wax strip 18 of 0.4 mm. thickness around the tooth-stumps and a wax disc of the same thickness on each occlusal surface.

The wax pattern is completed with blue wax to reproduce the occlusal surface, the proximal contacts 19 and the anatomical crown contour as a whole. The wax pattern of the pontic 20 is then fashioned with blue wax, according to the usual procedure.

The wax pattern of the future one-piece cast bridge 21 is sprued. Number and ramification of wax sprue former 22 are dependent on typical shape of the wax pattern to be cast.

The base of the investment duplicate 17 of the little removable model, together with the wax pattern of the future cast bridge 21, is sealed to the lid 23 of a cylindrical former and a crucible former 24 provided with a little wax sprue 25 is sealed to the upper end of the main wax sprue 22.

Next the model wax pattern complex of the future cast bridge 21 is flashed with investment material 16 and a mold 26 is obtained. The mold, containing the invested pattern, is heated at first slowly to 300° C. in order to permit the elimination of the wax from the mold and the drying of the investment material. The heat is then increased to 900°-1,000° C. to allow the thermal expansion of the investment material 16. The melted chromium-cobalt alloy is cast into the mold 26 by using any usual centrifugal machine for casting.

Eventual minor adjustments of the cast crowns, required to closely adapt them to the tooth stump models of the future one-piece cast bridge, may be made by means of mounted or unmounted stones.

EXAMPLE II

The procedure for making one-piece cast metallic full crowns or window crowns to a given thickness, of chromium-cobalt alloys, is similar to that described for bridges, except that all steps are carried out on removable tooth stump models 27.

EXAMPLE III

When corono-radicular retainers are made, a thermoplastic impression 3 is taken by the dental officer with copper rings 2. After removing the copper rings 2, hard plaster 5 is poured into the impression complex in order to obtain a cylindrical model of hard plaster 28 including the impression of the radicular canal 29.

The hard plaster model 28, including the impression of the radicular canal 29, is then isolated with tap water, in order to avoid adhesion of the wax to the walls of the radicular canal 29, after which a metallic taper dowel provided with a threaded end 30, is introduced into the radicular canal and pushes the wax against the radicular canal walls 29, staying securely located in place in a strictly vertical position.

The hard plaster model complex 28 together with the metallic taper dowel 30 is fastened on the lid 32 of a former 33 by means of a threaded screw 31 introduced into the threaded end of the metallic taper dowel 30. For that purpose, the lid is provided with holes f which help to fasten together the metallic taper dowel 30, the screw 31 and the lid 32. The former base 33, too, is provided with a hole that permits one to pour reversible hydrocolloid 14 into the former 33.

After fastening of the hard plaster model complex 28 to the lid 32, the former is immersed in a tap-water jar for 10-15 minutes.

The cylindrical model made of hard plaster 28, including the impression of the radicular canal 29, is duplicated with reversible hydrocolloid 14 to create a model of investment material 34 including the impression of investment material of the radicular canal 16, according to the procedure for fabricating one-piece cast bridges described in the example I, namely by making a negative mold 15 of reversible hydrocolloid 14 into which investment material 16 providing hygroscopic expansion is poured. The investment material is allowed to set for 20 minutes, after which it is cautiously separated from the reversible hydrocolloid-negative mold, the final result being a model of investment material 34.

For this purpose, the screw 31 one the lid 32 of the former 33 is taken off, the reversible hydrocolloid-block 14 is removed from the former, cut into slices and the investment model is cautiously separated.

The metallic taper dowel 30 is drawn out of the radicular canal 29 by heating the investment model 34. The investment model thus made is further processed according to the procedure described for dental bridges and metallic full crowns, namely a wax pattern 18 of the corono-radicular retainer is shaped without introducing wax into the radicular canal 29; wax sprue formers 22 are attached to it; the wax pattern complex 35 is flashed with investment material 16 and in the resulting mold 26 chromium-cobalt alloy is cast.

The procedure of the present invention offers the following advantage: it allows constructions of one-piece cast dental bridges and dental crowns contoured to a given thickness and one-piece cast corono-radicular retainers made of chromium-cobalt alloys, which are much harder than other dental alloys and of considerably increased strength; also, dental bridges thus constructed do not need any soldering at all; moreover, the present process eliminates from the list of usual fixed prosthesis those made of wipla, which is an injurious material to oral tissues and to the bodily health as whole; finally the present system effects important savings of dental material and makes the processing of these prostheses much easier.

We claim:

1. A method of making a dental bridge, comprising the steps of:

(a) forming a negative cast of the mouth area adapted to receive said prosthesis with a casting material; thereafter forming a hard plaster positive model of said region by introducing plaster into only a limited region of said cast corresponding to the tooth-stump area and the alveolar crest area between the two stumps, producing an extended plaster positive model from said cast from which the tooth-stump model is removable, and removing the tooth-stump model from said extended model;

(b) casting a reversible hydrocolloid material about said model and withdrawing said model from said hydrocolloid material upon setting thereof to form a reversible hydrocolloid negative mold;

(c) casting in said negative impression an investment material to form a positive representation from said investment material;

(d) building up a thin layer of wax on said positive representation and shaping said layer to the configuration of the prosthesis to be fashioned; and

(e) forming a lost-wax casting mold about the positive representation with the wax layer thereon and casting a molten metal in said mold to produce the prosthesis, said reversible hydrocolloid negative impression being formed from said tooth-stump model and said positive impression of investment material constituting a duplicate of said tooth-stump model, said tooth-stump model and the duplicate thereof of investment material forming cores corresponding to the teeth on either side of said alveolar crest area and of a dimension less than that of the teeth to be formed on said prosthesis, said thin layer of wax being built on said cores to the anatomical shape of the teeth by applying a wax band of predetermined thickness around said cores and a wax disk to the ends of said cores.

2. The method defined in claim 1 wherein said wax band has a thickness of about 0.4 mm.

3. The method of making a corono-radicular retainer comprising the steps of:

(a) forming a negative cast of the mouth area adapted to receive said prosthesis with a casting material; thereafter forming a plaster positive model of said region by introducing plaster into said cast;
casting a reversible hydrocolloid material about said model and withdrawing said model from said hydrocolloid material upon setting thereof to form a reversible hydrocolloid negative impression;
casting in said negative impression an investment material to form a positive representation from said investment material;
building up a thin layer of wax on said positive representation and shaping said layer to the configuration of the prosthesis to be fashioned, said layer of wax being applied to said positive representation in the form of a wax band of a predetermined thickness of about 0.4 mm. and fixing a metallic taper dowel in said model, suspending said model in a container and casting said hydrocolloid material about said model in said container.

4. The method defined in claim 3 wherein said taper dowel has a threaded end and is fastened to said container by a screw thread into this end, said model being withdrawn from said dowel and said negative impression and said investment material being cast in said negative impression around said dowel.

5. A method of making a dental prosthesis, such as a dental bridge, dental crown or corono-radicular retainer, comprising the steps of:

forming a negative cast of the mouth area adapted to receive said prosthesis with casting material; thereafter forming a plaster positive model of said region by introducing plaster into said cast;
casting a reversible hydrocolloid material about said model and withdrawing said model from said hydrocolloid material upon setting thereof to form a reversible hydrocolloid negative impression;
casting in said negative impression an investment material to form a positive representation from said investment material;
building up a thin layer of wax on said positive representation and shaping said layer to the configuration of the prosthesis to be fashioned; and forming a lost-wax casting mold about the positive representation with the wax layer thereon and casting a molten metal in said mold to produce the prosthesis, said molten metal being a chromium-cobalt alloy, said investment material being cured at an elevated temperature prior to the build up of said layer of wax thereon.