June 9, 1959 B. H. LUNDQUIST ET AL 2,889,598

DENTAL PATTERN

Filed Jan. 17, 1957

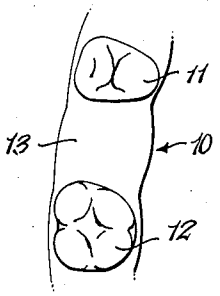


Fig. 1.

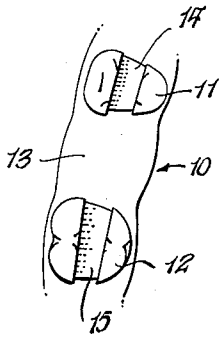


Fig. 2.

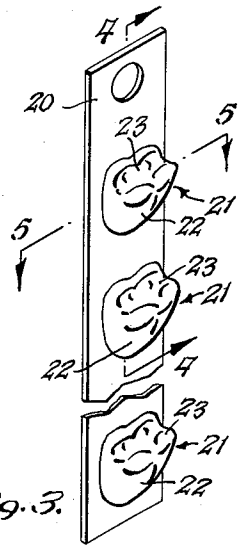


Fig. 3.

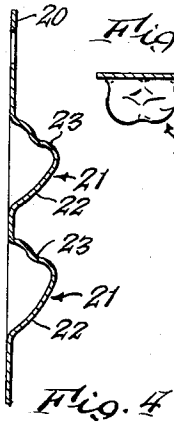


Fig. 4.

Fig. 5.

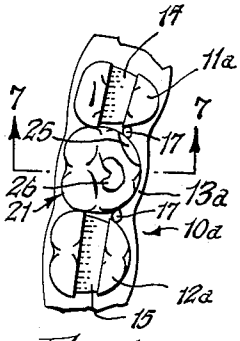


Fig. 6.

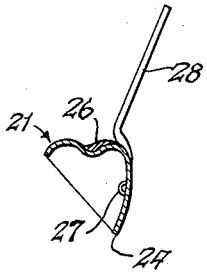


Fig. 7.

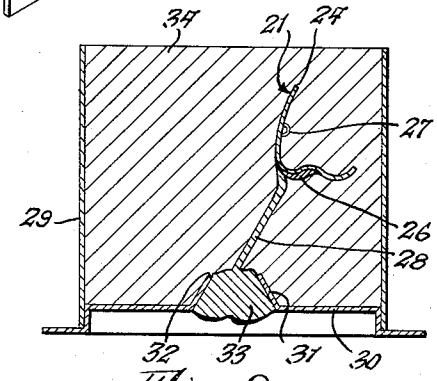


Fig. 8.

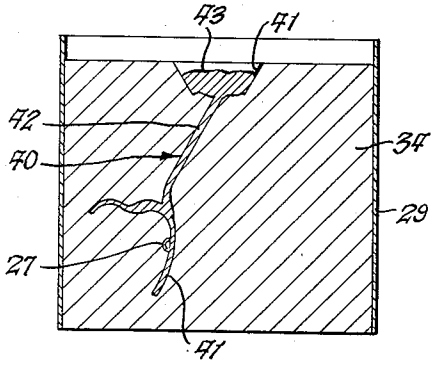


Fig. 9.

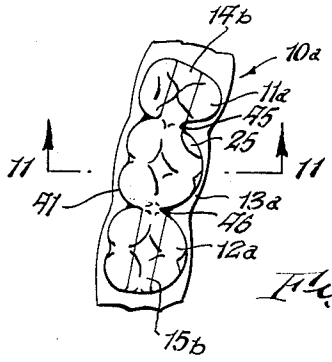


Fig. 10.

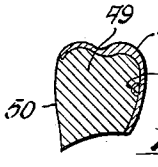


Fig. 11.

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DENTAL PATTERN

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3 Claims. (Cl. 22—164)

This invention relates to a pattern for and method of making dentures and bridgework and more particularly to a pattern used in producing in metal the lingual and occlusal portions only of the artificial teeth of fixed or removable partial dentures and bridges, the remaining portions of the teeth being completed in plastic in the form of a solid dummy, spacer or pontic.

One of the principal objects of the invention is to obtain precision and uniformity as well as a substantial saving in labor and material in modeling the lingual and occlusal portions of the teeth of artificial dentures and bridges, this being accomplished by providing a pattern in the form of a concavo-convex shell made of a plastic which softens under the application of heat and which conforms to the particular tooth to be substituted so that the shell can be placed in position in a model of the jaw of the patient, reshaped with a hot spatula or built up by the application of wax to conform to the patient's bite, jaw and remaining teeth, and then used as a pattern in making a metal casting of this part of the denture.

Another object is to provide such plastic shells in such form that the proper tooth form can readily be selected by the dentist and so that the dentist can readily remove a shell of the desired tooth form from a group of such shells.

Another object is to provide such shells in multiple units of identical shells, the shells of each unit conforming to a particular tooth, this enabling the dentist to restock only those units which require replacement.

Another object is to provide a pattern for the lingual and occlusal portions of teeth which leaves exceptionally smooth and flawless lingual and occlusal surfaces in the metal part of the denture.

Another object is to produce a denture having metal lingual and occlusal portions of the required thickness and strength.

Another object is to produce a pattern which will disintegrate without apparent residue in the investment in which the metal is cast.

Another object is to provide an internal anchorage in the concavo-convex metal casting for the plastic with which this casting is filled.

Other objects and advantages of the invention will be apparent from the following description and drawings in which:

Fig. 1 is a plan view of a portion of a patient's jaw showing two teeth between which an artificial tooth is to be supplied in the form of a fixed denture embodying the present invention.

Fig. 2 is a view similar to Fig. 1 showing the two teeth of the patient ground to anchor inlays for supporting the denture.

Fig. 3 is a fragmentary perspective view of a strip of high impact polystyrene formed with a series of identical concavo-convex shells conforming to the lingual and occlusal surfaces of the tooth normally in the space appearing in Figs. 1 and 2.

Fig. 4 is a fragmentary longitudinal sectional view taken on line 4—4, Fig. 3.

Fig. 5 is a transverse sectional view taken on line 5—5, Fig. 3.

Fig. 6 is a fragmentary plan view of a model made of the portion of the jaw shown in Fig. 2 and showing a concavo-convex shell cut from the strip, Fig. 3, fitted between the model reproduction of the patient's teeth and anchored by bits of wax, this figure also showing the plastic pattern or shell reformed by the application of a hot tool and by the application of a bit of wax to conform it to the bite of the patient.

Fig. 7 is a sectional view of the shell taken on line 7—7, Fig. 6 and showing a wax sprue forming stem attached thereto.

Fig. 8 is a sectional view through a casting flask of a centrifugal casting machine and showing the pattern and sprue forming stem, Fig. 7, embedded in an investment.

Fig. 9 is a view similar to Fig. 8 and showing the pattern and sprue forming stem replaced with metal.

Fig. 10 shows the casting and inlays positioned on the model, Fig. 6, and soldered together.

Fig. 11 is a sectional view taken on line 11—11, Fig. 10 and showing the denture completed by filling the cavity of the metal casting with plastic to form the visible side of the artificial tooth of the denture.

The present invention relates to dentures of the type in which the lingual and occlusal faces of the artificial tooth or teeth, is made of metal, such as stainless steel, or gold alloys, to provide the required structural strength and resistance to grinding wear, this metal portion being recessed toward the outside. This metal portion is provided with metal anchorages which removably or permanently anchor to the natural teeth being bridged. The recess of the metal portion is filled with plastic of a color conforming to the patient's teeth and which is built out to provide the labial or buccal surfaces of the tooth or teeth so that the artificial tooth or teeth will simulate the adjacent natural teeth.

As now practiced, following forming the natural teeth to accept the anchorages, such as a metal cap or inlay, and following making an impression and a model of this area of the patient's jaw, a pattern of the artificial tooth or teeth is carefully sculptured in wax to conform to the bite, jaw and natural teeth of the patient. Following this the labial or buccal side of the sculptured wax tooth or teeth is hollowed out to provide a cavity. A metal casting, which can also be a one-piece casting, is then made of the wax pattern and this casting is smoothed and finished and soldered to the anchoring caps or inlays or clasps which have previously been formed to anchor to the natural teeth. The cavity or cavities are then filled with plastic to provide a natural appearance to the labial or buccal sides of the denture and the denture is ready to be placed.

The sculpturing of the wax pattern is time consuming and requires skill, patience and care to obtain the required structural strength, bite and fit and it is the object of the present invention to greatly reduce the time, skill, patience and care required for this step by providing a pattern which is largely preformed and which requires only incidental reforming or rebuilding up to achieve the required structural strength, fit and bite of the metal casting.

As illustrative of the present invention, in Fig. 1 is illustrated a plan view of that portion of a human jaw 10 which includes a second bicuspid 11 and a second molar 12, the jaw having a space 13 from which the first molar was extracted. The invention is illustrated as providing an artificial first molar in the space 13 and which is anchored by inlays to the adjacent natural teeth 11 and 12 although it will be understood that the anchorage could be in the form of metal caps, for the teeth 11 and 12, or

could be removable clasps to these or other teeth. To accept the anchorage inlays, the teeth **11** and **12** are shown as provided with medial grooves **14** and **15**, respectively, and in which the inlays are cemented. From a wax impression (not shown) a hard setting artificial stone model **10***a* is made, this having protuberances **11***a* and **12***a* conforming to the patient's teeth **11** and **12** and having a space **13***a* conforming to the space **13** of the extracted first molar. In the pattern the protuberances **11***a* and **12***a* have grooves **14***a* and **15***a* conforming to the grooves **14** and **15**.

As a first step the dentist or laboratory technician can form, from metal, the inlays **14***b* and **15***b*, Fig. 10, these being shaped to fit and anchor in the groove **14***a* and **15***a*, respectively, of the model **10***a* and hence in the grooves **14** and **15** of the patient's teeth **11** and **12**. These inlays **14***b* and **15***b* are later soldered to the metal casting of the lingual and occlusal sides of the artificial first molar to be placed in the space **13** all as hereinafter described although these inlays may be in the form of a single casting.

The numeral **20** represents a long narrow strip of a flexible synthetic plastic which softens by the application of heat and which has high tear strength and maintains its form but can be readily cut to any desired form. For this purpose, and to provide a casting of the required structural strength the sheet **20** is in the order of from .015 to .030 inch thick and is made of a thermo-plastic which softens at between about 150° to about 200° F. A plastic suited for this purpose is high impact polystyrene.

In the strip **20** shown in Figs. 3–5, it is provided on one side with a longitudinal series of shell-like, concavo-convex protuberances **21** spaced from each other and each identical in form. Each is in the form of the lingual face **22** and occlusal face **23** of a first molar normally present at the space **13** in the human jaw. The concavity of each protuberance or shell **21** is on the buccal and gingival or saddle sides thereof. The dentist or laboratory technician would have on hand twenty-eight different strips **20**, each having protuberances conforming to a corresponding one of the twenty-eight human teeth, the end or wisdom teeth being excepted since these are never reconstructed into dentures. The dentist would use the tooth forms of the particular teeth the denture is to replace and since in the example illustrated the first molar from the space **13** is to be replaced, the protuberances **21** are in the form of the lingual and occlusal faces only of this particular tooth.

The dentist or laboratory technician then cuts one of the series of protrusions **21** at its base from the strip **20** as to produce a concavo-convex shell having a rim **24** and conforming to the lingual and occlusal faces of the tooth to be replaced. This shell, as a pattern, is then fitted in the space **13***a* of the model **10***a* with its lingual and occlusal faces properly oriented with reference to the tooth form protuberances **11***a* and **12***a* of the model. In so fitting, the rim **24** of the pattern or shell **21** will probably have to be cut and shaped to fit the gum and tooth portions of the model and after being so cut the pattern or shell **21** can be fixed in position by bits of wax **17** applied in molten form to bridge and connect the rim or edges **24** of the pattern **21** with the model **10***a*.

Following this, with a hot spatula having a temperature above the softening point of the pattern or shell **21**, the pattern or shell can be reshaped to conform to the jaw, teeth and bite of the patient. As an example, a flat **25** can be provided in the pattern or shell **21** by applying a hot spatula to this area and exerting the required pressure to produce this flat in the pattern. To conform to the bite of the patient it will generally be found that some areas of the occlusal surface of the pattern or shell **21** must be built up or extended outwardly. This can be done by applying a small blob **26** of molten wax to the portion of the pattern or shell **21** to be built up and this blob sculptured with a hot spatula into the required form. As compared with the former practice of sculpturing an entire tooth from wax and then hollowing out its buccal or labial side, it will be appreciated that the pattern or shell **21** is essentially preformed to the desired shape and also hollowed out so that all that is necessary is to reform it to fit the particular patient. This results in a saving in time, care, patience and skill and greatly facilitates this operation.

To provide a better anchorage for plastic, as hereinafter described, a small semicircular length **27** of wire can be inserted into the interior face of the shell or pattern **21**, using either a bit of molten wax or a hot spatula for this purpose. The bend of this piece of wire projects into the interior of the shell or pattern.

Following this conventional practice can be followed to complete the denture. Thus the pattern or shell **21** can be removed from the model **10***a* and a wax stem or sprue forming member **28** adhered thereto. The flask for centrifugal casting is shown as including a cylindrical ring **29** and an end head **30** which removably fits one end of the ring **29**. This end head is shown as having an indented central portion **31** provided with a central hole **32**. In the indented portion **31** is adhered a mass of wax **33**. The end of the wax sprue forming stem **28** is then adhered to the portion of the mass of wax **33** which is exposed through the hole **32**. The end head **30** is then applied as the base of the ring **29** with the shell or pattern inside the ring. The ring **29** is then filled with a hard setting material to form an investment **34**. The parts are then heated to a high temperature to melt out the wax **28**, **33** and burn out the plastic shell or pattern **21**. Accordingly, a cavity is left in the investment **34** which conforms to the shell or pattern **21**, sprue forming stem **28**, and the indented portion **31**.

The flask or ring **29** is then inverted as shown in Fig. 9 and molten metal **40** forced centrifugally into the cavity formed in the investment **34** by the indented portion **31**. The flask is then put in a centrifugal casting machine and the metal driven into the cavity.

This metal forms a metal shell **41** exactly conforming to the pattern or plastic shell **21**, a sprue **42**, and an excess of metal **43** at the outer end of the sprue. The semicircular piece of wire **27** is cast into the shell **41**. The casting is broken out of the investment and the sprue ground off. It will particularly be noted that since the pattern **21** was essentially a smooth surfaced shell, and since any added wax should also be sculptured to have a smooth surface, the surface of the casting is also exceptionally smooth.

The inlays **14***b* and **15***b* are then fitted, respectively, in the grooves **14***a* and **15***a* of the model **10***a*. The metal shell **41** is then placed in proper position in the space **13***a* in the model and is soldered, as indicated at **45** and **46**, to the inlays **14***b* and **15***b*.

Following this the interior of the metal shell **41** is filled with plastic **49**. This plastic flows around the semicircular piece **27** of wire which forms an anchor for the plastic when the latter hardens. The plastic is selected to color match the patient's teeth **11** and **12** and the vertical face **50** thereof is sculptured to provide a buccal face conforming to that of a first molar.

The denture is then ready to be fitted into the patient's mouth, the inlays **14***b* and **15***b* being fitted and cemented, in the grooves **14** and **15**.

From the foregoing it will be seen that the present invention provides a partially preformed pattern for dentures of the class described which effects a substantial economy in time, and materials, care and patience of the dentist or laboratory technician and provide a high quality, high precision denture.

We claim:

1. A pattern used in producing in metal the lingual and occlusal portions of an artificial tooth in a denture, comprising a solid walled shell consisting substantially

entirely of a convex lingual and occlusal surface on the outside and a conforming concave surface on the inside, the shell being open on the buccal and gingival sides thereof and being composed of a thermoplastic resin which softens under heat and having a substantially uniform wall thickness, measured from said inside to said outside surfaces, of from 15 to 30 thousandths of an inch whereby the pattern can be deformed, without diminution of said wall thickness, to conform to the bite of the patient and whereby when reproduced in metal as a casting the corresponding open buccal and gingival sides of the metal casting can be filled with moldable plastic which hardens to form the buccal and gingival surfaces of said artificial tooth.

2. A pattern as set forth in claim 1 wherein the thermoplastic resin is a high impact polystyrene which softens to a readily deformable condition at a temperature of from about 150° to 200° F.

3. A pattern as set forth in claim 1 and wherein a multiplicity of said shells are provided in the form of protuberances from a common sheet from which said shells are readily cut.

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