

May 2, 1967

A. H. SHOVERS
ARTIFICIAL DENTURES

3,316,639

Filed July 1, 1963

FIG. 1

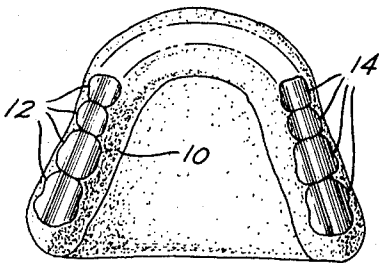


FIG. 2

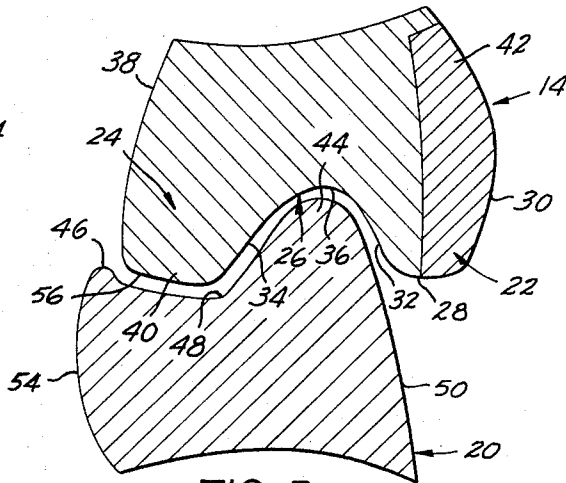
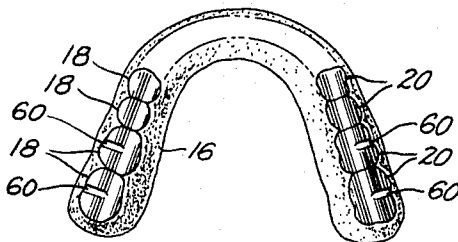


FIG. 5

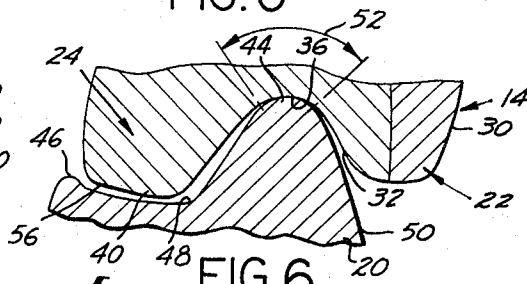


FIG. 6

FIG. 3

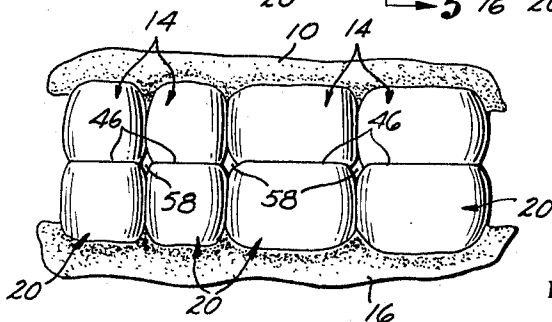
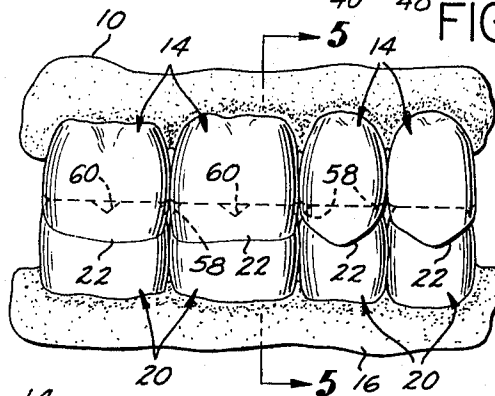


FIG. 4

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3,316,639

ARTIFICIAL DENTURES

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The present invention relates generally to artificial teeth, and more particularly to artificial posterior teeth having an improved orientation and formation of the occlusal contact surfaces based upon a new method of articulation.

The occlusal form of the artificial posterior teeth of the present invention primarily provides a single stroke grinding action with no lateral excursion in centric position. This is based upon the concept that human mastication is primarily a substantially direct closing movement of the mandible, occlusal contact first occurring between the mandibular buccal cusp tips and the buccal or lingual edges of the maxillary fossa on the working side of the mouth. Thereafter, the mandibular buccal cusps are guided by the buccal and lingual slopes of the maxillary fossa, such guidance continuing until the mandible has moved completely vertically into centric, in a combined cutting and grinding action.

Heretofore, prior types of artificial posterior teeth have been formed to permit relatively large mandibular excursions by designing them to match the condylar inclination or by completely eliminating cuspal interference by eliminating cusps. For example, in one prior art type, all portions of the cusp formation which might possibly interfere with relatively free lateral mandible excursions are removed, and in another prior art design the occlusal surfaces are substantially devoid of any cusps, the occlusal surface angles being comparatively low and shallow to enable the mandibular teeth to protrusively and laterally slide, both in and out of centric. As a consequence, the wearer was effectively denied any clue as to the location of his true centric, and experienced discomfort in mastication and difficulty in maintaining his dentures in proper position, with concurrent mandibular "class three" type protrusion.

Other prior types of teeth were designed with occlusion of both buccal and lingual cusps to allow completely free lateral and protrusive mandibular movements in and from centric occlusion by means of a complex system of balancing the cusp angles to the condyles of the human jaw.

Accordingly, it is an object of the present invention to provide artificial posterior teeth having a type of cusp interdigitation and no lateral or protrusive excursion in centric, and in which only the mandibular buccal cusps are guided into centric by the sloping surfaces of the maxillary fossa. It is an important aspect of the invention that the engagement between the maxillary and mandibular teeth in centric position is limited to the apices of the mandibular buccal cusps, the maxillary fossa within which they are received being of the same radius at the apex and then flaring out to a greater radius than the radius of curvature of the cusps received to permit some protrusion and lateral excursion when the mandibular teeth are just out of engagement with the maxillary teeth. In this regard, the radius of curvature of each such fossa is preferably larger for an "ovoid" mouth, compared to a "tapered" mouth, and preferably still larger for the "square" mouth, recognizing that a "square" and "ovoid" type person will require more lateral and protrusive movement.

Another object of the present invention is to provide a pair of cooperating dentures in which all the posterior maxillary teeth are constructed as a single unit for each side of the mouth including fossae in the form of troughs

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arranged in a V-configuration, substantially in alignment with the bony ridges, so that the fossae of the posterior teeth on either side of the mouth define forwardly convergent troughs. Similarly, the mandibular teeth on each side of the mouth have buccal cusps substantially parallel to the bony ridges for receipt within the maxillary fossae whereby protrusive or forward mandibular movement is substantially prevented by interengagement of the cooperating occlusal formations of the maxillary and mandibular teeth when the dentures are in centric.

A further object of the invention is to provide artificial posterior maxillary and mandibular teeth characterized by minimum contact, there being no mandibular lingual cusps, whereby total mastication pressures are comparatively low and the amount of bony resorption is correspondingly reduced. However, the limited contact area is also productive of high cutting pressures with relatively small closing forces.

A further object of the present invention is to provide artificial posterior teeth of the aforementioned character which provide comparatively close cusp interdigitation to substantially prevent lateral and protrusive relationships in centric position, permitting such relationships only upon slight separation of the maxillary and mandibular teeth. Thus, actual engagement between the teeth during a cutting operation occurs only in the centric position.

Yet another object of the present invention is to provide artificial posterior teeth of the aforementioned character which are adapted to interengage only in centric to thereby properly seat the mandibular denture upon the bony ridge and maintain it in place.

Another object of the invention is to provide artificial posterior teeth characterized by an occlusal formation having surfaces which define a mandibular lingual food table and which are closely positioned in centric to provide some grinding, masticating action, but which never actually engage. Thus the tongue and cheeks may guide food into place upon this lingual food table just prior to the closure of the teeth. Labial and lingual protection during mastication is afforded by generous or heavy contours adjacent the food table, which guide the cheek and tongue out of interfering relationship during movement of the teeth into centric to prevent their being bitten. These same contours are designed to stimulate the proprioceptive nerves involved in human mastication to assure proper function.

Other objects and features of the invention will become apparent from consideration of the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a plan view of a portion of a denture, illustrating the occlusal surfaces of artificial posterior maxillary teeth embodying the present invention;

FIG. 2 is a plan view of a portion of a denture, illustrating the occlusal surfaces of artificial posterior mandibular teeth embodying the present invention;

FIG. 3 is an enlarged, elevational view of the buccal sides of the posterior maxillary and mandibular teeth of FIGS. 1 and 2 in cooperating relationship, the teeth being those on the right side of the mouth;

FIG. 4 is an enlarged, elevational view of the lingual sides of the teeth of FIG. 3;

FIG. 5 is an enlarged, detail view taken along the line 5-5 of FIG. 3; and

FIG. 6 is a view identical to FIG. 5, but illustrating the teeth in engagement in centric relationship.

Referring now to the drawings, and particularly to FIG. 1 thereof, a portion of an upper or maxillary plate or denture 10 is illustrated which mounts four artificial posterior teeth 12, as a single unit, on one side thereof, and four artificial posterior teeth 14, as a single unit, on

the other side, each set of the four teeth 12 and 14 including a pair of molars and a pair of bicusps. Similarly, in FIG. 2 there is illustrated a portion of a lower or mandibular plate or denture 16 which mounts four artificial posterior teeth 18 on one side thereof and four posterior teeth 20 on the other side, each set of the teeth 18 and 20 including a pair of molars and a pair of bicusps.

Although the drawings illustrate the case in which full upper and lower replacement of the posterior teeth is made, it is to be understood that the scope of the present invention encompasses utilization of as few as a pair of cooperating maxillary and mandibular teeth, whereby the invention is adapted for use in stationary partial dentures or bridges as well as in completely removable dentures.

The right-hand posterior teeth 14 and 20 are illustrated in FIGS. 3 and 4 with their occlusal surfaces in cooperating or complementary relationship in centric position, the comparatively close cusp interdigitation in this centric position preventing appreciable mandibular lateral excursion, as will be more particularly described hereinafter.

As best illustrated in FIGS. 5 and 6, each maxillary posterior tooth 14, whether it be molar or bicuspid, has its occlusal surfaces formed into an elongated buccal cusp 22, an elongated lingual cusp 24, and an intermediately located elongated fossa 26. The cusps 22 and 24 and fossa 26 are elongated in a posterior-anterior direction, substantially parallel to the bony ridges of the mouth.

The buccal cusp 22 is characterized by a rounded apex 28, and a buccal contour 30 having a relatively large or generous radius of curvature to locate the cheek of the wearer well out of interfering engagement with the occlusal surfaces of the teeth 14 and 20.

The fossa 26 is characterized by a gradually and smoothly sloping buccal surface 32 and a smoothly sloping lingual surface 34, the base or deepest portion 36 between the surfaces 32 and 34 having a radius of curvature which is sufficiently small to limit its arc of contact with the mandibular tooth 20 to approximately 2-3 millimeters, as will be more particularly described hereinafter.

The lingual cusp 24 is characterized by a lingual contour having an upper portion 38 which is slightly convex, and a lower portion 40 which is almost flat, sloping gradually inwardly and downwardly until it intersects the lingual surface 34 of the fossa 26. As will be seen, the lingual surface 40 is never in engagement with the opposing or complementary surface of the mandibular tooth 20, always being spaced therefrom approximately one-half millimeter. This desirably reduces the area of engagement between the teeth 14 and 20 thereby reduce the forces necessary to produce satisfactorily high cutting pressures, while yet maintaining overall mastication pressures at a comparatively low level.

Although the artificial teeth of the present invention may be made of any suitable material, the maxillary teeth 12 and 14 are preferably constructed in gold and provided with a porcelain overlay 42 for cosmetic purposes, as best illustrated in FIG. 5.

The mandibular tooth 20 is provided with occlusal surfaces which are complementary to the occlusal surfaces just described in connection with the maxillary tooth 14, such mandibular surfaces being constituted by an elongated buccal cusp 44, an elongated lingual lip 46, and an intermediately located food table 56.

The buccal cusp 44 is provided with a buccal contour 50 which slopes slightly inwardly from the vertical, while the apex of the buccal cusp 44 is characterized when viewed or projected upon a buccal-lingual plane, by a circularly curved or rounded surface having a radius of curvature identical to the radius of curvature of the maxillary fossa 26 and then sloping down to a slightly smaller radius of curvature. In centric position, these apical radii of curvature provide a buccal-lingual arc of contact 52 which is preferably approximately 2 millimeters for a tapered type of mouth, 2½ millimeters for

an ovoid type of mouth, and 3 millimeters for a square type of mouth, thus permitting slightly more generous lateral accommodation for mandibular seating for the square type of mouth, for example. However, it is important to note that when the teeth 14 and 20 are in centric position, there is no lateral excursion and the fossa 26 cannot rock to any extent about the round apex of the buccal cusp 44 since there is centric balancing on the other side of the mouth.

The lingual lip 46 is characterized by a lingual contour 54 having a generous convex contour to suitably space the tongue away from interfering engagement with the occlusal surfaces of the teeth 14 and 20. In this regard, the lingual and buccal contours 54 and 30 serve a like purpose in properly orienting the tongue and cheek of the wearer of the dentures 10 and 16.

The inner or buccal slope of the lingual ridge or lip 46 is characterized by an inwardly and downwardly sloping, slightly concave surface which gradually approaches the horizontal plane to define a food table 56 for receiving food placed thereon by the tongue. The lip 46 tends to retain the food upon the table 56 during mastication thereof between the confronting or opposing surfaces 40 and 56, it being again noted that the surfaces 40 and 56 are at all times spaced apart so that actual contact does not take place, even during mastication. This is best shown in FIG. 6 wherein such surfaces are illustrated as being spaced apart, occlusal contact being limited to the maxillary fossa base 36 and the apex of the buccal cusp 44.

In the construction of the teeth 14 and 20, the maxillary fossa base 36 is preferably located along the longitudinal center line of the tooth 14, and the apex of the mandibular buccal cusp 44 located as close to the center line of the tooth 20 as possible. This develops balanced forces upon the bony ridges of the mouth, particularly of the mandible, since the forces developed upon mastication will then act substantially vertically. This reduces any tendency of the mandibular denture to wobble or tip when the teeth on one side of the denture are engaging or crushing food without corresponding crushing of food on the opposite side of the denture.

As best viewed in FIGS. 2 and 3, the posterior and anterior occlusal surfaces of the teeth 20 are preferably rounded to provide escape passages or sluiceways 58 therebetween to permit masticated food to escape from between the teeth during mastication. In addition central sluiceways 60 are provided on the buccal sides of the molars. This prevents the development of excessive pressures between the opposed teeth and otherwise facilitates efficient mastication of food, as is well known.

Referring again to FIGS. 1 and 2, the V-shaped or anteriorly convergent orientation of the maxillary fossa 26 of all of the posterior teeth, and of the mandibular buccal cusps 44 received therein, provide an interlocking and wedging which prevents any lateral or protrusive excursion of the mandible when the teeth are in centric. The sloping surfaces of the maxillary fossa 26 guide the mandibular cusps 44 into the centric position and afford the wearer with a positive indication of the location of his centric position. This promotes a more natural mastication action, and eliminates any need for the prior art practice of balancing artificial teeth to function in extreme lateral and protrusive relationship. This greatly simplifies the manufacture and fitting of artificial teeth, as will be apparent to those skilled in the art.

It is important to note that the combined wedging action and occlusal contact between the maxillary and mandibular teeth occurs only in the centric position upon mandible closure. This substantially prevents the dentures from becoming dislodged during mastication since the mastication pressures occur only in the centric position and in that position are precisely directed so as to firmly and accurately seat the dentures upon their adjacent bony ridges.

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Thus, artificial posterior teeth have been provided according to the present invention which are adapted to effect occlusal contact between the maxillary and mandibular teeth in centric position only, and in which such contact is limited to the apices of the mandibular buccal cusps. It is another salient feature of the invention that the maxillary fossae within which such buccal cusps are received have the same apical radii of curvature and then flare out to a greater radius of curvature than the cusps to thereby permit slight mandibular protrusive and lateral excursion only when the mandibular teeth are just out of engagement. In addition, the mandibular buccal cusps and the maxillary fossa are longitudinally oriented in substantially parallel relationship with the bony ridges of the mouth, somewhat in a V configuration which is protrusively or anteriorly convergent whereby protrusive mandibular movement in centric position is substantially prevented.

Various modifications and changes may be made with regard to the foregoing detailed description without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. In a denture, artificial maxillary and mandibular posterior teeth, each maxillary tooth having a fossa defining a buccal cusp and a lingual cusp, and each mandibular tooth having a food table and a buccal cusp, said mandibular food table being arranged to move into confronting relationship with said lingual cusp and said buccal cusp being arranged to cooperate with said maxillary fossa, the occlusal contact between said maxillary and said mandibular teeth being limited to the apex of said buccal cusp and the base of said maxillary fossa.

2. In a denture, artificial maxillary and mandibular posterior teeth, each maxillary tooth having an elongated anterior-posterior fossa defining an elongated buccal cusp and an elongated lingual cusp, and each mandibular tooth having a substantially flat food table and an elongated buccal cusp, said mandibular food table being arranged to move into confronting relationship with said lingual cusp and said buccal cusp being arranged to cooperate with said maxillary fossa, the occlusal contact between said maxillary and said mandibular teeth being limited to the apex of said buccal cusp and the base of said maxillary fossa.

3. In a denture, artificial maxillary and mandibular posterior teeth, each maxillary tooth having an elongated, substantially centrally located anterior-posterior fossa defining elongated lingual and buccal cusps, and each mandibular tooth having a substantially flat food table defining an elongated lingual lip and an elongated buccal cusp, said mandibular food table being arranged to move into confronting relationship with said maxillary lingual cusp, and said mandibular buccal cusp being arranged to engage said maxillary fossa and prevent occlusal contact between said maxillary lingual cusp and said food table, occlusal contact being limited to the apex portion of said mandibular buccal cusp and the base of said maxillary fossa.

4. In a denture artificial maxillary and mandibular posterior teeth, each maxillary tooth having an elongated, substantially centrally located anterior-posterior fossa defining elongated lingual and buccal cusps, and each mandibular tooth having a substantially flat food table defining an elongated lingual lip and an elongated buccal cusp, said mandibular food table being arranged to move into confronting relationship with said maxillary lingual cusp, and said mandibular buccal cusp being arranged to engage said maxillary fossa and prevent occlusal contact between said maxillary lingual cusp and said food table, occlusal contact being limited to the apex portion of said mandibular buccal cusp and the base of said maxillary fossa, said apex portion being arcuate in buccal-lingual cross section and adapted for said occlusal contact over approximately 2-3 millimeters thereof.

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5. In a denture, artificial maxillary and mandibular posterior teeth, each maxillary tooth having an elongated, substantially centrally located anterior-posterior fossa defining elongated lingual and buccal cusps, and each mandibular tooth having a substantially flat food table defining an elongated lingual lip and an elongated buccal cusp, said mandibular food table being arranged to move into confronting relationship with said maxillary lingual cusp, and said mandibular buccal cusp being arranged to engage said maxillary fossa and prevent occlusal contact between said maxillary lingual cusp and said food table, occlusal contact being limited to the apex portion of said mandibular buccal cusp and the base of said maxillary fossa, said apex portion being arcuate in buccal-lingual cross section and characterized by a radius of curvature the same as that of the mating said base of said maxillary fossa.

6. A pair of cooperating dentures including, respectively, maxillary posterior teeth and mandibular posterior teeth, said maxillary teeth each having an elongated, substantially posteriorly-anteriorly aligned fossa defining a buccal cusp and a lingual cusp, said fossae on opposite sides of the maxillary denture extending in anteriorly convergent relationship, and said mandibular teeth having elongated buccal cusps adapted to be received within said fossae in centric position to substantially prevent protrusive mandibular excursion, said maxillary and mandibular teeth also including complementary occlusal surfaces defining a food table area wherein food is crushed during mandibular closure, said teeth being constructed and arranged to always orient said surfaces of said food table area out of occlusal contact.

7. A pair of cooperating dentures including, respectively, maxillary posterior teeth and mandibular posterior teeth, said maxillary teeth each having an elongated, substantially posteriorly-anteriorly aligned fossa defining a buccal cusp and a lingual cusp, said fossae on opposite sides of the maxillary denture extending in anteriorly convergent relationship, and said mandibular teeth having elongated buccal cusps adapted to be received within said fossae in centric position to substantially prevent protrusive mandibular excursion, said maxillary and mandibular teeth being constructed and arranged to limit occlusal contact therebetween to the bases of said fossae and the apices of said buccal cusps.

8. A pair of cooperating dentures including, respectively, maxillary posterior teeth and mandibular posterior teeth, said maxillary teeth having elongated, substantially posteriorly-anteriorly aligned fossae, said fossae on opposite sides of the maxillary denture extending in anteriorly convergent relationship, and said mandibular teeth having elongated buccal cusps adapted to be received within said fossae in centric position to substantially prevent protrusive mandibular excursion, said fossae and said buccal cusps being complementally curved, the apical radius of curvature of each fossa being substantially identical to that of the mating buccal cusp, the occlusal contact between said maxillary and said mandibular teeth being limited to the apices of said buccal cusps and the bases of said maxillary fossae.

9. A pair of cooperating dentures including, respectively, maxillary posterior teeth and mandibular posterior teeth, said maxillary teeth each having an elongated, substantially posteriorly-anteriorly aligned fossa defining a buccal cusp and a lingual cusp, said fossae on opposite sides of the maxillary denture extending in anteriorly convergent relationship, and said mandibular teeth having elongated buccal cusps adapted to be received within said fossae in centric position to substantially prevent protrusive mandibular excursion, said maxillary and mandibular teeth also including complementary occlusal surfaces defining a food table area wherein food is crushed during mandibular closure, said teeth being constructed and arranged to always orient said surfaces of said food table area out of occlusal contact, the anterior and posterior

corners of said mandibular teeth, and the centers of the molar buccal cusps, being rounded to provide escape passages from said food table area in said centric position.

10. A pair of cooperating dentures including, respectively, maxillary posterior teeth and mandibular posterior teeth, said maxillary teeth each having an elongated substantially posteriorly-anteriorly aligned fossa defining a buccal cusp and a lingual cusp, said fossae on opposite sides of maxillary denture extending in anteriorly convergent relationship, and said mandibular teeth having elongated buccal cusps adapted to be received within said fossae in centric position to substantially prevent protrusive mandibular excursion, said maxillary and mandibular teeth also including complementary occlusal surfaces defining a food table area wherein food is crushed during mandibular closure, said teeth being constructed and ar-

ranged to always orient said surfaces of said food table area out of occlusal contact, said maxillary teeth and lingual surfaces, respectively, which are characterized by generous contours for spacing the cheek and tongue from said food table area.

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