

Sept. 24, 1963

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3,104,465

ARTIFICIAL DENTURE WITH ADJUSTABLE SEGMENTS

Filed Aug. 4, 1961

3 Sheets-Sheet 1

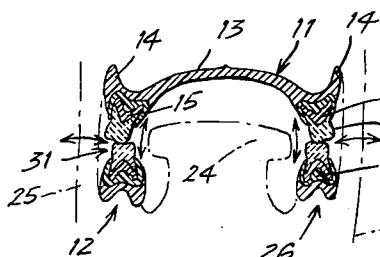


Fig. 2

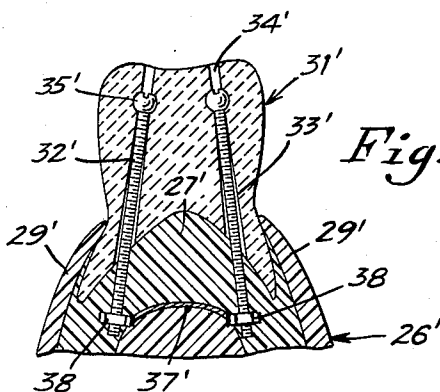


Fig. 5

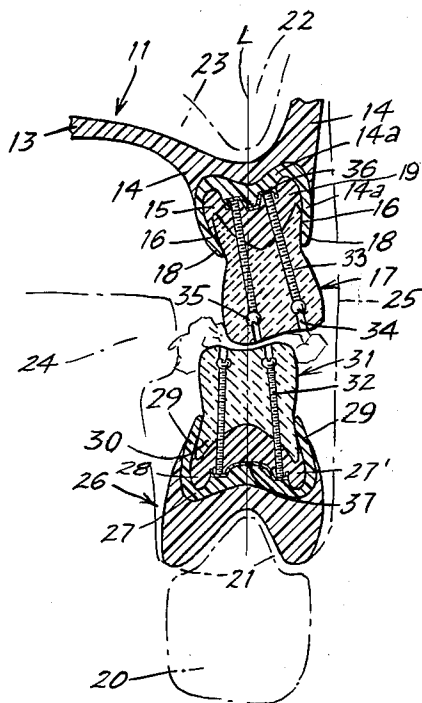


Fig. 3

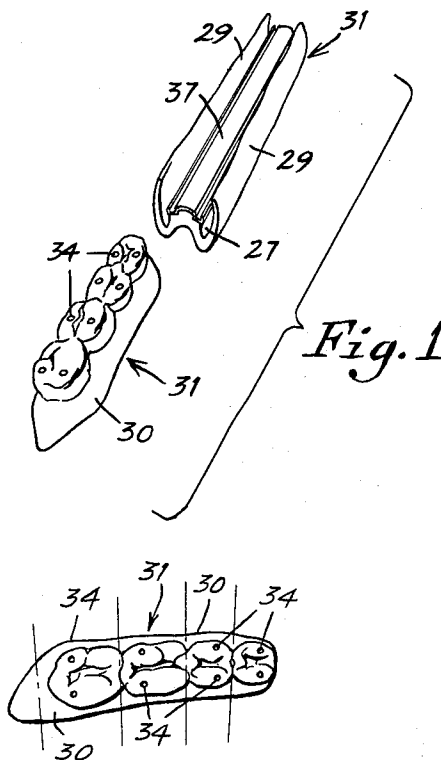


Fig. 1

Fig. 4

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3 Sheets-Sheet 2

Fig. 6

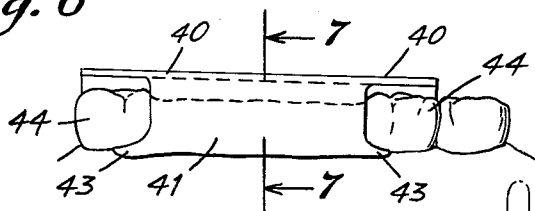


Fig. 7

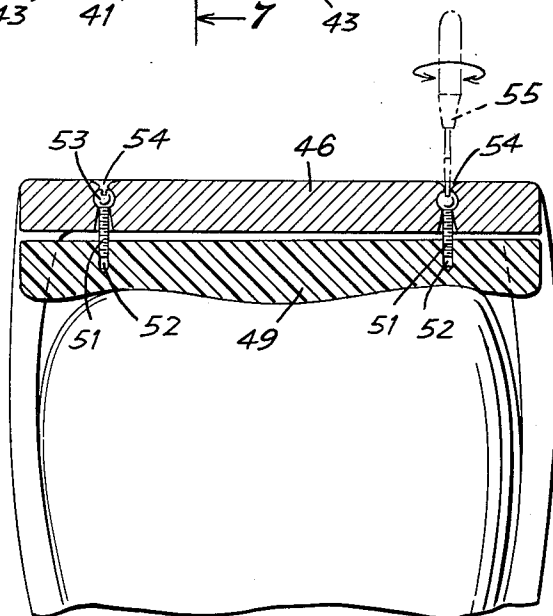
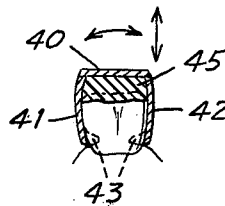


Fig. 9

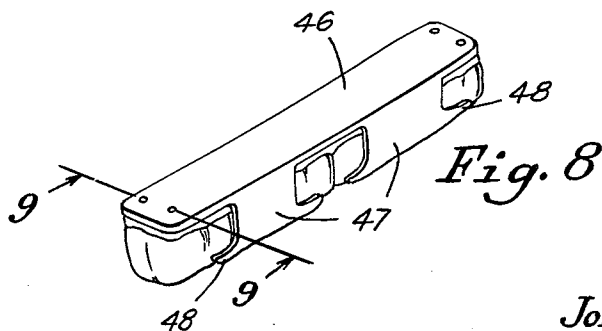


Fig. 8

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ARTIFICIAL DENTURE WITH ADJUSTABLE SEGMENTS

Filed Aug. 4, 1961

3 Sheets-Sheet 3

Fig. 10

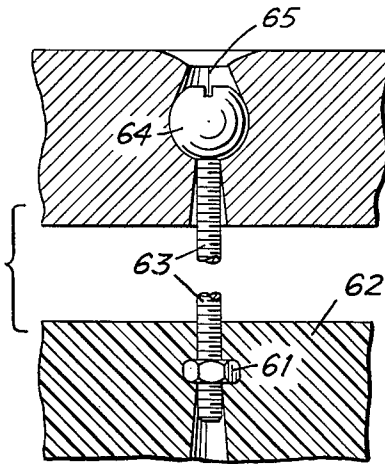


Fig. 11

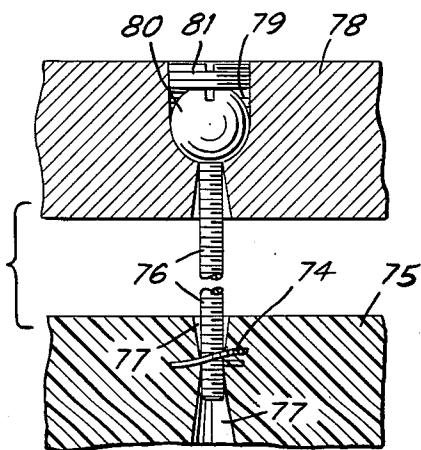
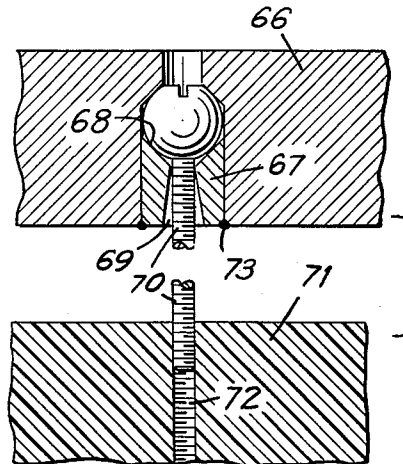


Fig. 12

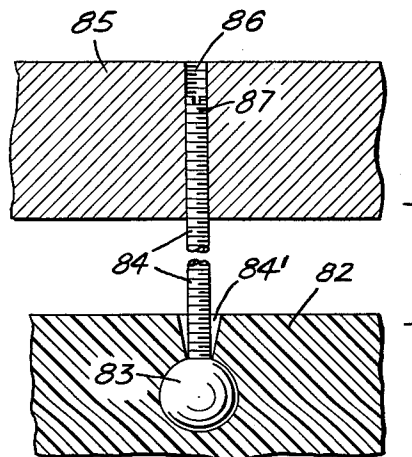


Fig. 14



Fig. 13

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1

2

3,104,465 ARTIFICIAL DENTURE WITH ADJUSTABLE SEGMENTS

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18 Claims. (Cl. 32-2)

This invention relates to adjustable segment artificial dentures and the method of assembling the same.

Generally there is provided a base for each of the upper and lower dentures, molded in known manner of a tough plastic material, to fit the gums of the patient. Each base has molded therein, or attached thereto, a branched channel or channel element of U-shaped cross section, which is filled with soft wax to exclude fluids and food particles from the channel. The artificial teeth are molded of relatively hard materials (which can also be conventional substances, such as porcelain or plastics) in three or four tooth segments which can be cut away in parts if partial dentures are being made. The segments are adjustably connected to the denture bases by screws that provide both vertical and angular adjustments of the segments relative to their denture bases.

The teeth described herein are mechanically mounted in sections to permit adjustments to the "work bite" or jaw relationship when the teeth are crushing food, with a minimum of mechanical "grinding in" of these relationships and destruction of the important functional masticating anatomy of the teeth. These adjustments are to be made by means of screws set in the sections to which the teeth are mounted. These adjustments are to be made over a period of many months before the parts are sealed into position. The seal is to be of such design as to permit quick removal of seal, readjustments of parts to compensate for physiological changes in the patient's posture and oral tissues; and eventual reseal.

The functional anatomy of the teeth is to consist of large lingual cusps on the upper posterior teeth which are dome-shaped elliptically anteroposteriorly and proportionally larger in relation to the more diminutive buccal cusps than occurs in natural teeth. The occlusal surfaces of the lower posterior teeth will occlude with the dome-shaped lingual cusps of the upper posterior teeth. The occlusal surfaces of the lower posterior teeth will be almost flat, with a slight saucer-shaped concavity between the diminutive buccal and lingual cusps to only partially receive the more acutely curved dome shaped lingual cusps of the upper posterior teeth. The lingual cusps of the upper posteriors are to move, with almost as much freedom as a pestle in a mortar, in the occlusion surfaces of the lower molar teeth. This will permit a wider range of lateral excursive gestures than do the prosthetic teeth now on the market, except flat cusp teeth; yet the saucer-shaped concavity of the occlusal surfaces of the lower posterior teeth will give the patient more comfort than any other now available prosthetic teeth because they will aid in slightly limiting excessive excursive motions which flat cusp teeth will not restrain. Flat cusp teeth tend to permit uncomfortable sliding of the mandible at any vertical position of the "work bite." The teeth described herein are more efficient during mastication than flat cusp teeth.

The teeth are to be mounted in sections with two bicuspids and two molars in each posterior quadrant to comprise one section for each four teeth. These sections may be cut shorter for partial dentures where some natural teeth remain. The three upper anterior teeth on each side of the mid-line comprise one unit for each group of three teeth. The six lower anterior teeth comprise two sections also. The upper and lower arches of these teeth are assembled on a special mounting plane

on a special articulator to permit the original design of the occlusal surfaces of the individual upper posterior teeth to contact the original design of the lower posterior teeth at the vertical distance between the jaws to which the dentist sets the articulator with the lingual cusps of the upper teeth in a straight line to the center of the lower occlusal surfaces when said straight line runs from the crest of the upper ridge to crest of the lower dental ridge (FIG. 3). Should the patient have muscles of mastication which are too debilitated to function with teeth, temporary smooth plastic bite planes may be inserted into the dentures for several months. These can be replaced with the mounted sections of teeth when the patient is ready physiologically for more vigorous mastication.

The teeth will be preset in sections in a slightly spiral plane of occlusion, which will permit the buccal cusps of the upper posterior teeth to tilt outward and upward in a slight, gradual spiral plane to enhance the function of the teeth of the mandibular arch against only the lingual cusps of the upper posterior teeth. This spiral plane, which can be observed in well occluded natural teeth, and this cusp position will permit the mandible to move outward and slightly upward in lateral excursive motions which are proficient in the mastication of food and comfortable to the patient. The teeth preset in this manner will achieve proficiency of function beyond the skill and knowledge of dentists and dental technicians using the manufactured teeth in distribution and now available to patients.

The vertical distance between the jaws is to be adjusted by the dentist over a period of several months by means of screws set in the units of mounted posterior teeth. These adjustments, planned by clinical examination of the existing relationship of the mandible to the skull, study casts of occlusion if some natural teeth remain, extra-oral radiographs of T.M. joints, profile radiographs of the mandible, skull and cervical vertebrae with the patient standing so the X-ray machine can be adjusted to the patient, and a case history of symptoms of mandibular malfunction, to reset the "work bite" to help the patient re-coordinate the muscles of the head and neck for comfortable, proficient mastication. The mandible is repositioned according to the condition of the musculature attached to it and its relation to the skull. The overly contracted muscles are stretched and the overly stretched muscles are permitted to contract until a range of function as near optimal as the mechanical parts of the body permit is established for all the musculature used in mastication. This comfortable coordination will enhance the neuro-muscular balance through the entire body. These mechanically adjustable dentures can be used to relieve indigenous malfunction of the very important head and neck region.

It is accordingly an object of this invention to provide artificial dentures in which the teeth are adjustably mounted in sections to permit quick and easy relative adjustments over a long period of time.

It is another object of the invention to provide such dentures in which the tooth sections are adjustable both vertically and angularly.

It is a further object of the invention to provide artificial dentures having multiple tooth sections capable of being cut away medially or at their ends for easy fabrication of partial dentures.

It is another object of the invention to provide artificial dentures having tooth sections adjustably assembled therewith by screws accessible through countersunk bores in the teeth and/or denture bases, which bores permit temporary sealing thereof during the adjustment period and relatively permanent sealing when a satisfactory adjustment has been effected.

3

Other and further objects of the invention will become apparent from a reading of the following specification taken in conjunction with the drawings, in which:

FIGURE 1 is an exploded fragmentary perspective view of a preferred embodiment of the invention,

FIGURE 2 is a front elevational view of a set of dentures embodying the invention, in vertical transverse posterior section,

FIGURE 3 is an enlarged detailed view of the right third of FIGURE 2,

FIGURE 4 is a plan view of the four tooth section of FIGURE 1, indicating severance lines,

FIGURE 5 is a sectional elevational view (corresponding to the central fifth of FIGURE 3) of a modified form of the invention,

FIGURE 6 is a side elevational view of a bite-opening denture embodying the invention,

FIGURE 7 is an end elevational view of the disclosure of FIGURE 6 in section taken on the line 7—7 of FIGURE 6,

FIGURE 8 is a perspective view of a screw adjustable modification of the bite-opening denture,

FIGURE 9 is an enlarged detailed end elevational view in section taken on line 9—9 of FIGURE 8,

FIGURE 10 is an enlarged fragmentary elevational view of a modified form of the adjusting means,

FIGURE 11 is a view similar to FIGURE 10 but showing another species of the adjusting means,

FIGURE 12 is a view similar to FIGURE 10, of a further species of the adjusting mechanism,

FIGURE 13 is a plan view of the split-washer-type of nut of FIGURE 12, and

FIGURE 14 is a view similar to FIGURE 10, showing a further modification of the adjusting means.

With reference now to FIGURES 1—4 of the drawings, the numerals 11 and 12, respectively, designate the upper and lower dentures. The upper denture 11 is molded in known manner to provide an arch-shaped central part 13 and a U-shaped marginal part 14 which respectively conform to the contours of the roof of the patient's mouth and the upper gum. The bottom portion of the marginal part 14 is molded around the upper surface of a prefabricated U-shaped channel part 14a which has a downwardly opening double-lobed groove 15 molded therein and shaped to receive the upwardly and outwardly flaring ribs 16 of each multiple-tooth section 17.

Lips 18 of the groove 15 constrict about the tooth section 17 in the approximate position thereof shown in FIGURES 2 and 3. The material of which the denture bases is formed is, however, sufficiently resilient to permit sufficient expansion of the groove opening for insertion and removal, and for vertical and tilting movements of the tooth section 17 relative to the groove 15. The space in the groove 15 not occupied by the ribs 16 of section 17 is filled with a soft wax 19 which excludes liquids and food particles from the groove 15 while permitting adjustment movements of the tooth section 17 in the sealed socket, provided by said groove and its lip portions 18, by mechanism hereinafter described.

The lower denture 12 is similarly molded of plastic material in U-shape and of channel cross section to fit snugly over the lower gum of the patient defined by the mandible 20 and its covering tissues 21. The upper denture 11 similarly embraces the gum defined by the upper jaw bone 22 and its covering tissues 23. The numerals 24 and 25 designate the tongue and cheek of the patient.

The lower denture base comprises the U-shaped base element 26 molded around the bottom surface of a prefabricated channel element 27 having a double-lobed groove 27' formed therein and filled with soft wax 28. The resilient lip portions 29 of element 27 yieldably grip the diverging rib portions 30 of the lower posterior tooth section 31.

The means for adjustably mounting the tooth sections

4

17 and 30 on the dentures 11 and 12 comprise, in addition to the lips 18 and 29, at least four ball-headed screws 32 for each tooth section. Screws 32 are located in pairs, preferably one pair being located in each end tooth of each of the tooth sections in laterally located vertically disposed bores 33. Bores 33 are left open at 34 on the occlusal surfaces of the teeth to permit adjusting engaging of the ball heads 35 of screws 32 by a small screw driver. The bores 33 are threaded along their constricted thread-engaging major extent.

The adjustable screws 32 bear at their free ends against the bottoms of channels or sockets formed along or in the edges of the arch-shaped metallic strips 36 and 37, which strips are fixed to the preformed branched channel elements 14a and 27 of the denture bases by and during the molding thereof, or by other suitable methods or means. Thus, as the screws 32 are tightened, their ends push against the bottoms of said channels or sockets in strips 36 or 37 to move or tilt the adjacent portions of tooth sections 17 or 31 away from its denture base, toward which it is yieldably urged by the lip portions 18 or 29. For the molar and bicuspid tooth sections 17 and 31, it has been found desirable to construct the same with relatively large dome-shaped lingual cusps, forming approximately two-thirds of the occlusal surfaces of each tooth and with relatively small buccal cusps (as compared with natural teeth) so that the lingual cusps can be more easily centered in the occlusal surfaces of the lower molars during the adjusting period with the end result of providing dentures capable of relative masticatory movements approaching or even superior to those of natural teeth. The point of tangency of the crests of the lingual cusps of the upper molars to the occlusal surfaces of the lower molars is determined by arranging the teeth so that a straight vertical line L will extend from the crest of the upper dental ridge, through each crest of the lingual cusps of said upper molars, centrally through the trough between the cusps of each lower molar, and finally to the crest of the lower dental ridge. This arrangement provides a tilting of the upper molars so that a plane tangent to their cusp crests will be tilted at an angle of approximately 25 to 30 degrees to the bite plane of the dentures.

In FIGURE 4, the four broken lines show vertical cleavage planes recommended for cutting away or out one or more end or medial teeth, when partial dentures are to be made. In the species of FIG. 5, the arched strip 27' has nuts 38 welded, soldered or otherwise fixed to or formed in the margins thereof for positive two-way adjustment of the tooth section 31' relative to the denture base 26'. The outer ends 34' of bores 33' are constricted about the ball heads 35' of the screws 32' to prevent axial movement of said screws in the bores.

The bores 33' are conically tapered to permit tilting of the tooth section 31' about the screws 32' since the lower ends thereof cannot move relative to strip 37', as the screws 32 could do in the previously described species.

FIGURES 6 and 7 illustrate a bite-opening denture comprising a plate portion 40 and a pair of downturned integrally joined clamp portions 41 and 42. The lower ends of the clamp portions 41 and 42 have integral finger extensions 43 which engage under and/or around the bases of teeth 44 to anchor the denture to the teeth covered thereby. A spacer 45, the lower face of which is molded of plastic or other suitable material, to conform to the contour of the underlying teeth, spaces plate 40 from said teeth by an amount that can be varied by cutting away the top surface, or by replacing the same by another molded spacer. Alternatively, the bite can be opened further by adhering a flat strip to the top surface of spacer to build up its thickness.

FIGURES 8 and 9 disclose a bite opener in which the adjusting means employed for the dentures of FIGURES

1-5 has been substituted for the spacer 45 of FIGURES 6 and 7.

In the species of FIGURES 8 and 9, the occlusal plate 46 has one or more pairs of integrally joined lateral clamping elements 47, each having clamping fingers 43 corresponding to the fingers 43 above described. A spacer plate 49, molded to conform on its lower surface to the shape of teeth 50, is adjustably connected to plate 46 by screws 51 entering threaded bores 52 in the plate 49. The ball heads 53 of screws 51 are retained in ball sockets 54 in plate 46 and are accessible through the constricted opening in said sockets for adjustment of screws 51, as by a screw driver 55, to vary the spacing and/or the angle between the plates 46 and 49.

FIGURE 10 illustrates a modified form of adjustment means in which a nut 61 is embedded in the molded plate 62 for cooperation with screw 63. The ball head 64 and the ball socket 65 correspond to like parts in FIGURE 9.

In the species of FIGURE 11, the ball socket is formed in plate 66 by a cylindrical insert 67 having an upper conical bearing seat 68, and a conically tapered axial bore 69 permitting angular movement of a screw 70 therein. A plate 71 has threaded bores 72 for adjustably receiving the screws 70. The insert 67 is fixed in the plate 66 as by welds 73, or the like.

In FIGURES 12 and 13 a nut 74, formed by splitting and helically twisting a washer, is embedded in the molded plate 75 for engagement with screws 76 in double tapered bores 77. A bite plate 78 has countersunk bores 79 therein to form sockets for ball heads 80 of the screws 76. However, in this species, the ball heads are held in sockets 79 by screw caps 81 instead of by peened-over socket rims as in the previously described forms of the invention.

In the modification of FIGURE 14, the socket in molded plate 82 is formed by placing the ball portion 83 of a screw 84 in the mold before the plate 82 is cast. The tapered bore portion 84' is formed by a removable mold insert (not shown) or by cutting away part of the plate 82 after molding of the same around the screw 84. A bite plate 85 has a threaded bore 86 to receive the screw 84 and to permit adjusting access to its kerfed upper end 87.

While but several forms of the invention have been shown and described herein, it will be readily apparent to those skilled in the art that many minor modifications may be made without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. An artificial denture comprising a base member molded to cover and conform to the shape of a portion of a gum of a patient, at least one molded tooth section comprising a plurality of integrally joined tooth portions, and cooperating means vertically and tiltably adjustable and rigidly connecting said tooth section to said base member.

2. Structure according to claim 1, said base member having a longitudinally extending channel having a restricted throat and said tooth section having outwardly flaring base portions extending into said channel and embraced by said restricted throat of said channel, said channel being filled with a viscous material serving to exclude liquids and food particles from said channel.

3. Structure according to claim 1, said tooth section comprising two molars and two bicuspsids.

4. Structure according to claim 3, said molars and bicuspsids having their occlusal surfaces defined by lingual and buccal cusps differing greatly in both area and convexity whereby the lesser cusps may be more easily and quickly ground or worn away during the adjustment period of said denture.

5. Structure according to claim 1, said cooperating

means comprising a plurality of screws extending vertically through longitudinally and laterally widely separated bores in said tooth section and engaging similarly separated portions of said base member.

6. Structure according to claim 5, said screws having kerfed ends accessible through openings in the occlusal surfaces of said tooth section.

7. Structure according to claim 6, said screws having enlarged heads constituting ball-type joint elements cooperating with bore enlargements in one of said base member and tooth section.

8. Structure according to claim 7, additionally comprising a metallic member embedded in one of said base member and tooth section and having marginal portions engaging the free ends of said screws.

9. Structure according to claim 8, said marginal portions having threaded bores therein adjustably engageable by said screws.

10. Structure according to claim 7, additionally comprising a metallic member embedded in one of said base member and said tooth section, said metallic member having a U-shaped branched channel the marginal portions of which engage the ends of said screws.

11. Structure according to claim 1, said tooth section being formed of plastic material easily severable to remove one or more tooth portions at its ends or medially thereof.

12. Structure according to claim 1, said tooth section comprising a canine and two incisor artificial teeth integrally molded as an adjustable unit.

13. Structure according to claim 1, said cooperating means comprising screws extending through bores in one of said base member and tooth section, said bores being tapered to permit tilting of said tooth section relative to said base member.

14. Structure according to claim 13, the occlusal ends of said bores containing a filling of easily removable sealing material.

15. Structure according to claim 13, the occlusal ends of said bores containing a filling of relatively permanent sealing material.

16. Structure according to claim 1, at least one of said base member and said tooth section being formed of plastic material to facilitate the fitting and adjusting of said denture, whereby after the adjusting period the same can be fully sealed to produce a long-lasting shape retaining denture.

17. Structure according to claim 1, said tooth section comprising upper molars and bicuspsids having their occlusal surfaces defined by lingual and buccal cusps differing greatly in both area and convexity in such manner that the lingual cusps may be more easily and quickly placed into occlusion with the wide almost flat area between the smaller buccal and lingual cusps of mating lower teeth by means of a special mounting plane on a special articulator.

18. Structure according to claim 1, said base member having embedded therein a longitudinally extending pre-fabricated channel element having a restricted throat and said tooth section having outwardly flaring base portions extending into said channel element and embraced by said restricted throat of said channel element, said channel element being filled with a viscous material serving to exclude liquids and food particles therefrom.

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