

[54] **ARTIFICIAL POSTERIOR TEETH**
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[52] U.S. Cl. **32/8**
[51] Int. Cl. **A61c 13/00**
[58] Field of Search **32/8, 2**

[56] **References Cited**

UNITED STATES PATENTS

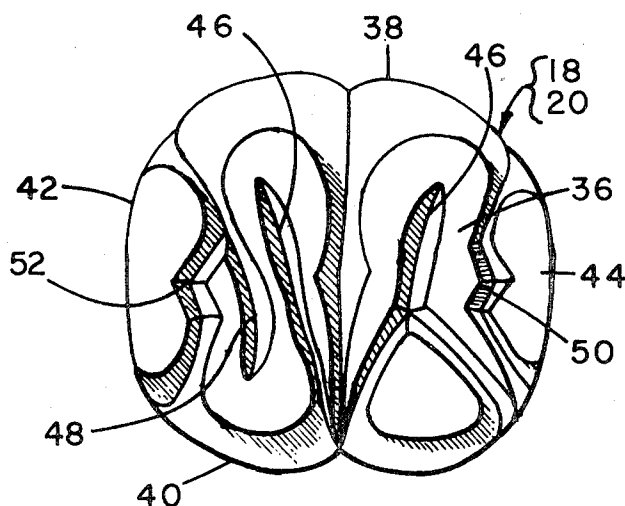
2,548,956	4/1957	Dickson	32/8
3,305,926	2/1967	Gerber	32/8

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Assistant Examiner—J. Q. Lever
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[57] **ABSTRACT**

A pair of artificial posterior teeth having co-engageable occlusal surfaces, the upper tooth having an incising ridge on its occlusal surface extending in mesial-distal direction and the lower tooth being concaved in a buccal-lingual direction on its occlusal surface and having sulci which are closed at one end and open at the other, whereby said incising ridge, when moving in lateral excursion in one direction effects shearing engagement with the closed ends of said sulci and when moving in the opposite direction, sluices sheared food from the open ends of said sulci.

4 Claims, 9 Drawing Figures



2 Sheets-Sheet 1

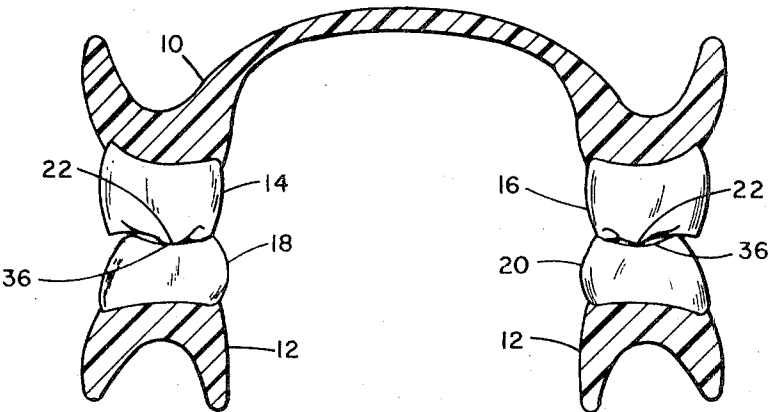


FIG. 1

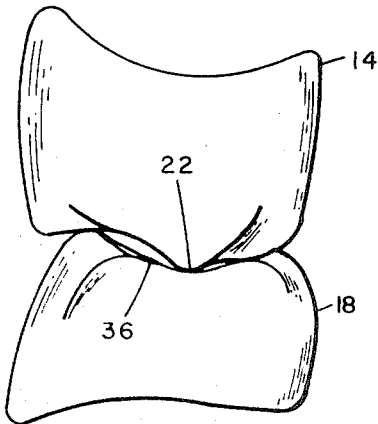


FIG. 2

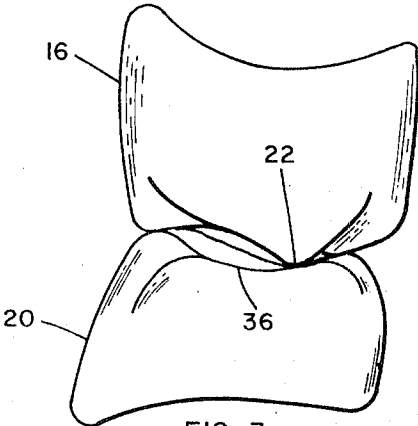


FIG. 3

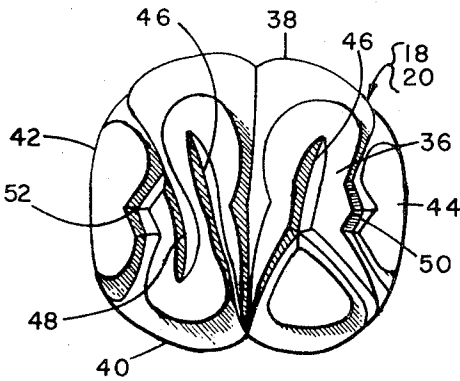


FIG. 4

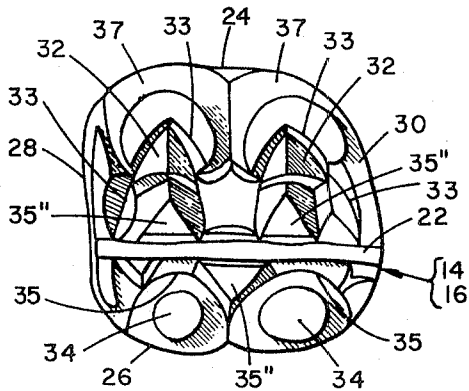


FIG. 5

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2 Sheets-Sheet 2

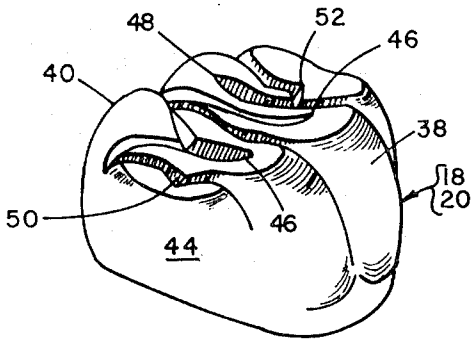


FIG. 6

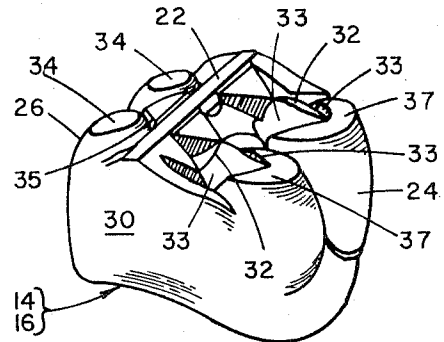


FIG. 7

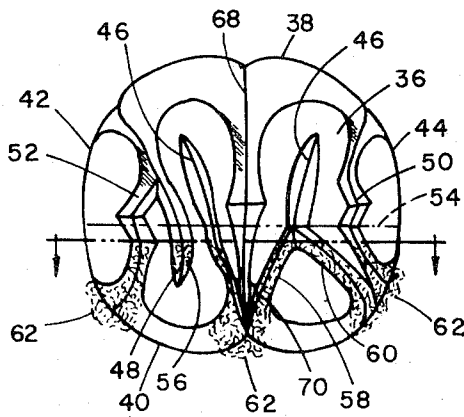


FIG. 8

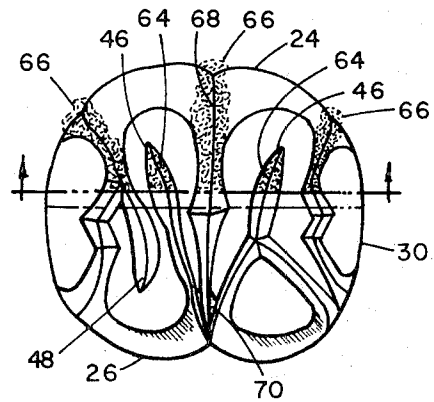


FIG. 9

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ARTIFICIAL POSTERIOR TEETH

BACKGROUND OF THE INVENTION

In a natural dentition, each tooth has its own shock-absorbing membrane which surrounds the root of the tooth and by which it is retained in operative position within the human gums. In view of this, when greater pressure is exerted against one or more individual teeth, or a limited group of successive tooth, such pressure is not transmitted to the other teeth within the oral cavity which are not subjected to such pressure.

In contrast to this situation, when an individual who, for example, is using full upper and lower dentures, exerts abnormal pressure at a restricted locality against one or more teeth of the denture incident to biting or chewing food or the like, such pressure is transmitted to the entire denture or at least to an extensive section of a denture, and, consequently, to the gingival tissue which underlies the same. To this extent, therefore, it is not feasible at present for the manufacturers of artificial teeth, nor for dentists and dental technicians, who fabricate dentures, to reproduce by artificial means the individual shock-absorbing membrane which surrounds the root portions of natural teeth, and thereby, eliminate the transmission of shock resulting from forces imposed against a single or limited number of teeth to the other teeth in a natural dentition.

It is therefore, the phenomenon described above of each tooth in a natural dentition having its own shock-absorbing membrane to support it which renders the natural mastication of food more comfortable than corresponding mastication of food by dentures and especially full upper and lower dentures. Thus, in an effort to minimize the imparting of shock to at least similar opposing entire sides or sections of artificial upper and lower dentures, incident to masticating food which requires the exertion of normal forces or forces greater than normal, and correspondingly, to minimize the transmission of such shock to the gingival tissue engaged by the dentures, a number of attempts have been made heretofore in the dental profession to minimize such exertion of abnormal forces required to masticate food by devising various mechanical innovations in posterior artificial teeth for dentures. These have been essentially in the form of various types of incising means, whereby the posterior teeth have similar incising characteristics to the anterior teeth of a natural dentition. Thus, whereas natural posterior teeth do not particularly have incising means, it has been proposed to include incising means on artificial posterior teeth, in order to sever and decimate food when engaged between upper and lower posterior teeth embodied in dentures. Typical examples of such innovation are as follows:

U.S. Pat. No. 2,717,45, to Ford, issued Sept. 13, 1955, illustrates inter-related upper and lower posterior teeth having closed sulci in both the upper and lower posterior teeth, which effect certain types of shearing action upon food, but the food is trapped in the closed sulci in view of the fact that no sluice type discharge openings are provided.

U.S. Pat. No. 3,305,926, to Gerber, issued Feb. 28, 1967, includes a ridge on either the lower or upper posterior teeth and a cooperating concave surface on the opposite teeth, but no food retaining and shear-including sulci are provided so as to produce desirable shearing action.

U.S. Pat. No. 3,252,220, to Goddard, issued May 24, 1966, includes similar incising ridges on both the upper and lower teeth which cooperate with transversely extending grooves that are closed at the opposite ends, whereby sheared food cannot be readily removed therefrom due to no discharge openings or slots being provided.

It will be seen from the foregoing discussion of certain examples of the prior art that even though ridges which are somewhat of an incising nature have been provided in previous attempts to effect incising of food by posterior teeth, such incising has been inefficient due to inability to effect a desirable shearing action, such as is possible by employing the same in conjunction with sulci arranged in the opposite tooth from that which has the incisal ridge thereon so as to cooperate with said ridge in shearing of food when the ridge is moving in transverse excursions across the sulci to shear in one direction and sluice the sheared food in discharging manner when the incising ridge is moving in the opposite direction.

SUMMARY OF THE INVENTION

It is the principal object of the present invention to minimize the pressure required in a masticatory stroke to incise and masticate food by artificial posterior teeth by providing an incising bar on upper posterior teeth which operate against a concave food table on the opposing lower posterior teeth which is oriented to the natural movements of the mouth in lateral excursion, said food tables having elongated sulci extending substantially in buccal-lingual directions to provide sluiceways to effect shearing action in one excursion direction of said incising bar and discharge the sheared food when moving in the opposite excursion direction during reciprocal lateral movement of the lower denture relative to the cooperating upper denture, whereby three cooperative functions are provided; incising, shearing and discharging after temporarily holding the food against lateral movement of any appreciable extent while the first two functions are being performed.

It is a further object of the invention to arrange the patterns and shapes of the aforementioned sulci in the lower posterior teeth in such a manner as to provide a food holding function to enhance the food shearing functions set forth above, without impeding the discharge of sheared food from the sulci after shearing has occurred.

It is a further object of the invention to utilize the aforementioned incisal ridge upon the upper posterior teeth and position the same between the buccal and lingual sides thereof in such a manner that any tendency for the incising function of the upper teeth to tilt with respect to the lower teeth is minimized, thereby providing stability of the dentures in the masticating functions, and consequent comfort to the wearer.

It is still another object of the invention to provide a design of sulci in the occlusal surfaces of both the upper and lower posterior teeth which have a somewhat natural appearance similar to occlusal surfaces on natural or artificial teeth which actually inter-digitate, yet the teeth comprising the present invention offer no interference in any excursion between the cooperating dentures in masticatory operation, whereby the teeth offer similar advantages to those afforded by so-called flat plane teeth with respect to easier fabrication of the

same into finished dentures than is possible with artificial teeth having inter-digitating occlusal surfaces.

It is still another object of the invention to provide pairs of cooperating posterior artificial teeth in which, as a result of simple axial movement toward each other, the incising ridge on the upper tooth coacts with the concave food table on the lower tooth to incise food, while during lateral excursions between the upper and lower teeth when in engagement with each other, actual mastication of the food occurs due to lateral shearing thereof, while trapped momentarily in the closed ends of the sulci in the lower tooth by the transverse wiping of the incising bar past the closed end of such sulci, thereby effecting functions closely resembling those achieved by natural posterior teeth while the open ends of the same sulci permit ready discharge of sheared food when the incising bar moves in the opposite lateral direction.

Details of the foregoing objects and of the invention, as well as other objects thereof, are set forth in the following specification and illustrated in the accompanying drawings comprising a part thereof.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical sectional view through an exemplary set of upper and lower dentures in which pairs of opposing posterior teeth embodying principles of the present invention are mounted operatively and are shown in centric position.

FIG. 2 is an enlarged end view of a cooperating pair of upper and lower posterior teeth embodying the invention illustrated in centric position.

FIG. 3 is a view similar to FIG. 2 but showing the upper tooth has moved to the right with respect to the lower tooth as viewed in said position.

FIG. 4 is a top plan view of the lower tooth of each pair shown in FIGS. 1-3 to illustrate the various exemplary sulci embodied in the concave food table surface of said tooth, which comprises the occlusal surface thereof.

FIG. 5 is a plan view of the occlusal surface of the upper tooth of each pair of teeth illustrated in FIGS. 1-3 and showing the incising bar which extends transversely of said surface between the opposite mesial and distal sides of the tooth, and also showing additional food-holding sulci which are formed on said occlusal surface at opposite sides of said incising bar.

FIG. 6 is a perspective view of one of the lower teeth shown in FIGS. 1-3 and illustrating the concave food table or occlusal surface thereof and the buccal side surface to illustrate the life-like appearance of the tooth for esthetic purposes.

FIG. 7 is a perspective view of the upper teeth of each pair shown in FIGS. 1-3 showing the occlusal surface which has the incising bar thereon, and the buccal surface of the tooth to illustrate the esthetic, life-like characteristics of the tooth.

FIG. 8 is a top plan view of the occlusal surface of the lower teeth shown in FIGS. 1-4 and including an imaginary line extending transversely between the mesial and distal sides of a tooth which represents the position of the incising bar of the upper tooth when moving in a lateral excursion in one direction from another imaginary line representing the centric position of said bar to sluice sheared food from the open ends of the sulci and sheared food trapped in the closed ends or diagonally extending portions of other sulci.

FIG. 9 is a view similar to FIG. 8 but showing the imaginary line representing the incising bar extending transversely between opposite sides of the lower tooth when moving in the opposite excursion direction from an imaginary centric position line to illustrate the sluicing of sheared food from the open ends of certain of the sulci, while shearing food which is trapped in the closed ends of other sulci.

DETAILED DESCRIPTION

For purposes of illustrating the function and details of the posterior teeth which embody the present invention, FIG. 1 shows an exemplary transverse sectional view of mating dentures comprising an upper denture 10 and a lower denture 12. It will be understood that the lower denture 12 is unitary since the illustrated section is taken near the inner end of the denture as used in the mouth, such denture in plan view being substantially U-shaped. The upper denture is provided with a pair of posterior teeth respectively comprising a left upper tooth 14 and a right upper tooth 16. The lower denture has a pair of exemplary lower posterior teeth mounted thereon respectively comprising a left lower tooth 18 and a right lower tooth 20. As viewed in FIG. 1, the sides of the teeth which are foremost the mesial sides thereof. It is also to be understood the the present invention pertains to all posterior teeth, including bicuspids and molars. For simplicity, however, only pairs of upper and lower molar teeth are shown in the drawings and described in detail hereinafter.

The upper posterior teeth 14 and 16 are provided with incising ridges 22 which extend in a mesial-distal direction intermediately between the opposite buccal and lingual sides of the occlusal surfaces of the teeth. Referring particularly to FIG. 5, such sides of said teeth are indicated in exemplary manner by appropriate numerals. Thus, in FIG. 5, the buccal side 24 is opposite the lingual side 26 and the mesial side 28 is opposite the distal side 30. The occlusal surface of the upper teeth 14 and 16 is provided with a plurality of irregularly shaped cusps 32 and 34 respectively which are partially surrounded by irregularly shaped sulci 33 and 35 which are respectively positioned at opposite sides of the incising bar 22.

Sulci 33 and 35 have a mechanical function of holding the food from appreciable lateral movement with respect to the incising bar 22 incident to generally axial movement thereof toward the arcuate food table 36 comprising the occlusal surface of the lower posterior teeth 18 and 20. In addition, the sulci 33 and 35 provide cuspal effects therebetween with respect to the lowermost projecting areas thereof which aid in the food retention function described above. In addition, they provide anatomical esthetic effects. Still further, sulci 35' which are somewhat crescent shape are arranged outwardly from cusps 32. Also, distributed on opposite sides of the incising ridge 22, are a plurality of flat crushing surfaces 35'' which slope downwardly from ridge 22 to brace the bar comprising the ridge 22 and also act as a plow through the food being incised by the ridge.

The lower posterior teeth 18 and 20, as indicated above, have occlusal surfaces comprising the arcuate food table 36 which is oriented relative to the natural movements of the lower jaw in lateral excursion, said curvature extending buccal-lingually between the buccal side 38 and the lingual side 40 of said teeth. The

axis of the arc which defines the food table 36 extends between the mesial side 42 and the distal side 44 of the lower posterior teeth 18 and 20.

The arcuate food tables or occlusal surfaces 36 of the lower posterior teeth 18 and 20 are provided with elongated sulci 46 which are closed at ends that are nearest the buccal side 38, but are open adjacent the lingual side 40. Said occlusal surface 36 also is provided with at least one additional elongated sulci 48 which is closed at the end that is nearest the lingual side 40 of the tooth but is open at its opposite end which is nearest the buccal side 38 of the tooth.

There is a further irregular sulci 50 which is somewhat zig-zag in shape and is open at its opposite ends respectively adjacent the buccal 38 and the lingual side 40. In addition, there is a still further irregular sulci 52 in the arcuate food table surface 36 of each of the lower posterior teeth 18 and 20 which has a somewhat zig-zag irregular portion intermediately of the ends thereof, the opposite ends of said sulci respectively opening in opposite directions into the elongated sulci 48 and the lingual side 40 of the tooth.

The function of the particular shapes of the various elongated sulci 46, 48, 50 and 52 is twofold, one of these functions being to trap and hold the food during relative lateral movement of the lower tooth relative to the upper tooth upon which the incising ridge or bar 22 is positioned and the other function is to coact with incising bar 22 to effect shearing of food. For example, in FIG. 8, one such relative lateral movement between the teeth causes the bar to move from the imaginary centric position indicated by the line 54 to a position where the bar or ridge 22 is nearer the lingual side 40 of the lower tooth 18 or 20. It will be seen that a bolus of food 56 is held or trapped within the closed end portion of the sulci 48. Also, a certain amount of food is held or trapped within the angularly extending sulci 58 and 60 which jointly comprise the discharge ends of the elongated sulci 46. In such relative movement, it will be assumed that the direction is substantially in a transverse direction to the incising ridge or bar 22 and the holding of the food by the closed end of sulci 48 and the angularly extending sulci 58 and 60 permits the incising ridge or bar 22 to slidably move along the curved portions of the arcuate food table 36 which intervene the various sulci and, in so doing, effects a shearing operation of the food which is held in sulci 48, 58 and 60.

A second function of the sulci is that, during such aforementioned movement between the upper and lower teeth, as the lingual side 40 of the lower tooth is moved toward the ridge or bar 22, additional boluses of previously sheared food 62 are discharged in a sluicing manner from the open ends of the various sulci as clearly illustrated in FIG. 8. Therefore, it will be seen that such relative movement effects both a shearing function with respect to food retained either in angularly extending sections of the sulci or the closed ends thereof, while food that has been previously sheared by a similar function in previous excursions in the oppositely opening sulci is sluiced from the open ends thereof.

The illustration in FIG. 8 is intended to depict relative movement between the upper and lower teeth in one direction. In FIG. 9, however, similar relative movement in the opposite direction is illustrated and, in said figure, it will be seen that boluses of food 64 are held or trapped within the closed end portions of sulci

46. Therefore, the boluses are being sheared by engagement thereof with the incising ridge or bar 22, while additional boluses of food 66 which have previously been sheared in the opposite excursions, are being discharged in a sluicing manner from the open ends of sulci 48, 50 and 52. Discharge is also occurring from intermediate sulci 68 which opens freely adjacent the buccal side 24 of the tooth, but has a corresponding constricted opening 70 at the end adjacent the lingual side 40 of the tooth. The latter also cooperates with ridge 22 to effect shearing when the ridge moves toward lingual side 26 of teeth 18 and 20.

It will be understood that the various excursions which respectively effect either shearing or sluicing discharge of boluses of food will not always result in complete discharge of food from the sulci, especially when moving in sluicing discharge direction relative to the incising ridge or bar 22. Small amounts of the food may remain in the sulci until perhaps the next excursion or the one after that will ultimately remove the food after reasonably adequate shearing has occurred.

From the foregoing, therefore, it will be seen that the present invention provides posterior teeth having cooperating occlusal surfaces which greatly enhance the comfort factor to a patient who, in particular, wears full dentures. This is accomplished by providing an incising ridge or bar which when moving in direct axial direction toward an arcuate food table in the opposite tooth effects actual incising of food to initiate the mastication thereof, the food also being prevented from migrating materially from opposite sides of the incising ridge or bar by providing restraining sulci 32 and 34 which are formed in the occlusal surface of the tooth which carries the incising ridge or bar 22. By providing such ridge or bar 22, pressure necessary to effect incising of the food is minimized in contrast to other artificial teeth which employ no such incising ridge or bar.

Following the incising function, the subsequent lateral excursion movements which are effected in the course of natural mastication of food by natural movements of the mouth in lateral excursions causes both shearing of boluses of food which are restrained by certain sulci against lateral movement while the incising bar or ridge moves thereover and shears the food, followed by sluicing type discharge of the sheared food when opposite lateral movements between the teeth are effected. Accordingly, it is apparent that three principal beneficial functions are effected by the present invention, namely, incising of the food by an actual incising ridge or bar, shearing of the food in a transverse direction while the food is prevented from moving laterally appreciably when engaged by the incising bar or ridge during lateral excursion movement in one direction, followed by sluicing type discharge of the food when the lateral excursion movement is effected in the opposite direction.

All of the foregoing contributes greatly to comfort in the use of dentures and minimizes the amount of pressure which normally is required in denture use to masticate food satisfactorily. In addition to the functional aspect of the preferred arrangements of the sulci in both the upper and lower teeth, they and the other exterior surfaces of the teeth are so designed that they resemble the characteristic appearance of natural posterior teeth, while functioning similarly to flat plane teeth. Thus, they greatly facilitate the fabrication of dentures without requiring complicated articulation of the teeth,

such as is required in the fabrication of dentures employing cusp-type teeth which function mechanically similarly to natural teeth.

Not only is the fabrication of dentures with teeth embodying the present invention facilitated, but from the esthetic standpoint, the arrangement of sulci as described above in the teeth of the present invention produces a natural and life-like appearance in the teeth, in addition to greatly improving the mechanical functioning thereof, whereby there is not only increased physical comfort to a person wearing dentures, but psychologically, there is also the peace of mind resulting from minimum possibility of detection that a person is wearing dentures, due to the life-like appearance of the teeth embodying the present invention.

While the invention has been described and illustrated in its several preferred embodiments, it should be understood that the invention is not to be limited to the precise details herein illustrated and described since the same may be carried out in other ways falling within the scope of the invention as illustrated and described.

I claim:

1. A pair of cooperating posterior artificial teeth for application to artificial dentures and adapted respectively to be mounted in the upper and lower denture and said teeth each having ridge lap surfaces adapted to be affixed to denture base material, the tooth for the upper denture having an incising ridge intermediately of its buccal and lingual sides extending in a substantially mesial-distal direction on the occlusal surface and the lingual and buccal side edges of said surface being smoothly rounded outwardly and toward the ridge lap

end of the tooth to produce a natural posterior tooth appearance, and the other tooth of said pair having an occlusal surface which is generally concaved in a buccal-lingual direction, said concaved surface also having a plurality of sulci extending substantially transversely of said tooth for a distance greater than half the width of the tooth in a buccal-lingual direction and closed at one end to effect a shearing action with said incising ridge, the opposite ends of said sulci opening outwardly of one edge of said occlusal surface of said tooth to provide means for sluicing discharge of a bolus of food which has been incised and sheared during relative occlusal movement of said teeth in buccal-lingual directions.

2. The teeth according to claim 1 in which said sulci in said other tooth alternately open to the opposite side edges of said occlusal surface, whereby both shearing and sluicing of food therefrom occurs in each direction of relative movements between said upper and lower teeth in buccal-lingual directions.

3. The teeth according to claim 1 in which the concavity of the occlusal surface of said other tooth is substantially on an arc described by the lateral excursion movements of said incising ridge of said one tooth during relative buccal-lingual movements between said teeth.

4. The teeth according to claim 1 in which said tooth for the upper denture also is provided with sulci in opposite sides of said incisal ridge to maintain integral balance of the ridge relative to the sulci on said other tooth to implement the shearing.

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