Feb. 28, 1967 A. GERBER 3,305,926

ARTIFICIAL DENTURES

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FIG. 1

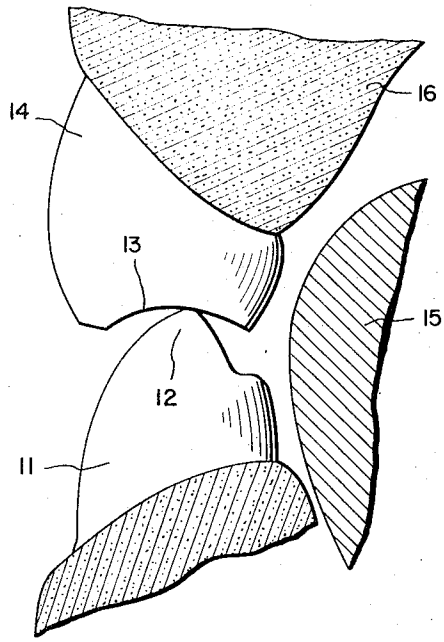


FIG. 2

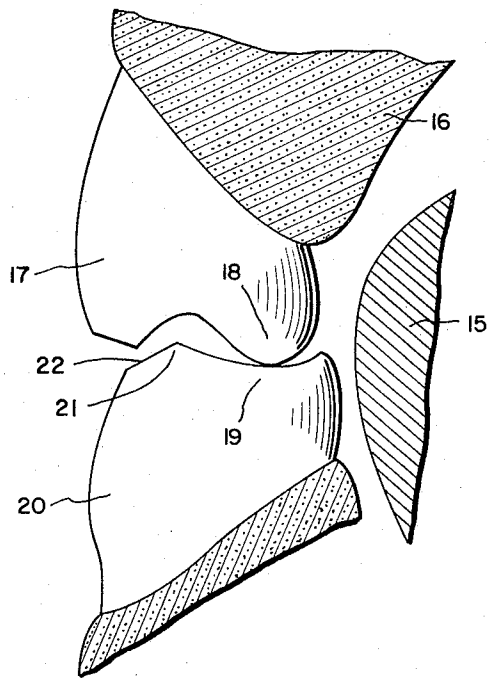
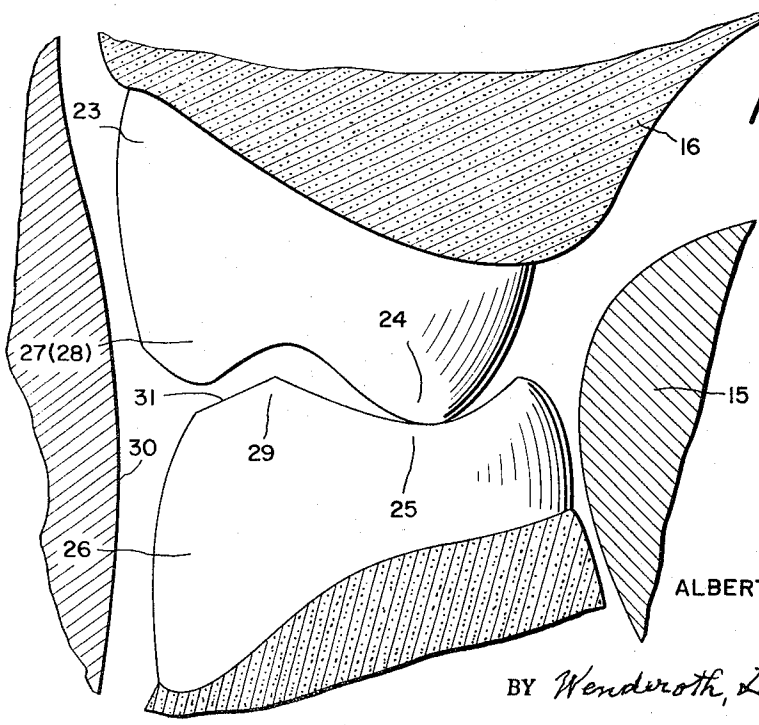


FIG. 3



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ARTIFICIAL DENTURES

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FIG. 4

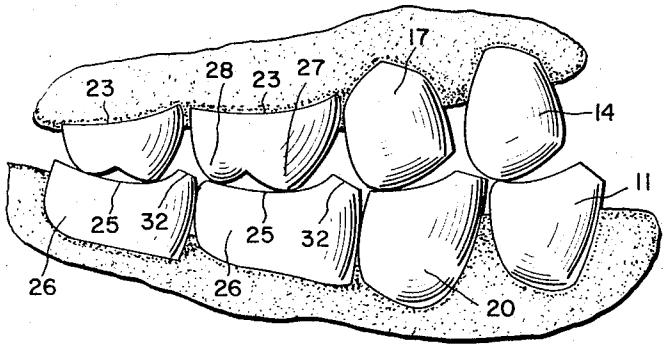


FIG. 5a

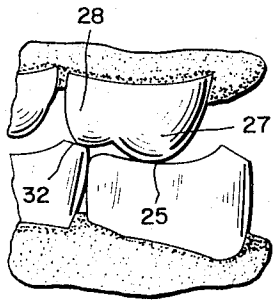


FIG. 5b

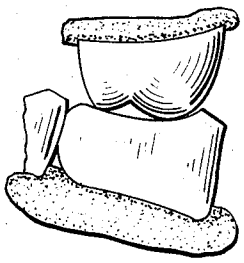


FIG. 5c

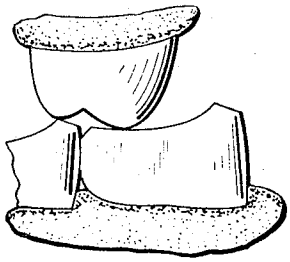
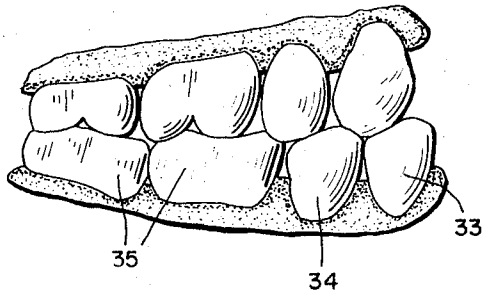


FIG. 6



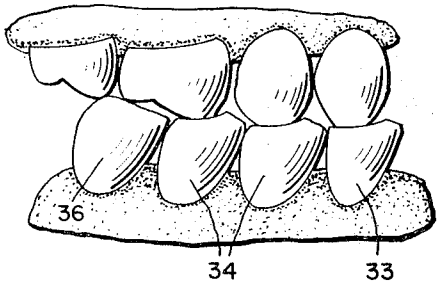


FIG. 7

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ARTIFICIAL DENTURES

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Claims priority, application Switzerland, Nov. 9, 1962, 13,155/62
2 Claims. (Cl. 32—2)

The present invention broadly has reference to improvements in artificial posterior teeth for dentures.

A large number of forms have been developed for the manufacture of artificial posterior teeth for dentures which partially deviate only to a small extent and partially deviate to a large extent from the form or shape of natural posterior teeth (premolars and molars). Such deviations have been undertaken in order to accommodate the particular static and mechanical laws to which all full dentures are subjected. Furthermore, these deviations from the natural shape are undertaken in order to reduce the contact surfaces of the artificial posteriors in all gliding movements of the lower jaw. From the entire number of possible patterns and paths of movement of the lower jaw only those are of interest which result in an antagonistic friction of the artificial posteriors.

Since there are still considerable differences between the various theories on the geometry of these movements of the lower jaw, the artificial teeth also differ appreciably in regard of the relevant movement characteristics of the mastication surfaces of the artificial teeth, according as the teeth are based upon this or that theory. Since the manufacturing laboratories or plants which produce artificial teeth are, as a rule, generally advised by persons specialised in the theories of occlusion and articulation movements, the different artificial teeth can generally be easily distinguished from one another by the skilled person in view of the characteristic features, and insofar as such manufactures do not merely copy the purely anatomical shape of natural teeth. Generally it can be considered that in the formation of artificial chewing and gliding surfaces of posterior teeth three form-influencing factors are placed in the foreground by specialists in prosthetic dentistry.

(1) The intention to accommodate the artificial teeth shapes and chewing surface shapes to the particular static and dynamic laws to which all full dentures are subjected requires deviations from the anatomical shape of natural teeth.

(2) The intention to accommodate the artificial teeth shapes and chewing surface shapes to the theories advanced respecting the geometry of the movement of the lower jaw likewise requires appropriate deviations from the anatomical shape of newly erupted natural teeth.

(3) The intention to provide the chewing surfaces of the lower and upper arches of teeth with effective elements for mechanical chewing, such as edges, ridges and so forth, likewise oftentimes requires deviations from the anatomical shape of natural premolars and molars. Such deviations are also undertaken to protect the living tissues, such as bone and mucous membrane supporting the dentures. For the protection of the living tissues there is required, in accordance with generally accepted principles, high chewing efficiency even with small muscle forces, as well as antagonistic gliding movements free of

cusp-interference to protect the denture supporting tissue from excessive thrust and shear components.

The combination of the intentions enumerated in items 1 to 3, has in actual practice very often led to artificial premolar and molar teeth which in minor and major points deviated from the shape of natural teeth chewing surfaces and the shapes of which were based upon purely technical considerations.

It has been suggested to combine factors 1 to 3 above with the following factor:

(4) The intention to preserve as nearly as possible the anatomical appearance and shape of natural teeth without neglecting the biomechanical particularities of full dentures.

Not infrequently with the construction of arches of artificial teeth it is also necessary to provide a very considerable deviation from the width of natural premolars and molars. Practical experience has namely shown that not infrequently, in the construction of artificial teeth for the lower jaw, there must be taken into consideration that the tongue may have increased in size as a result of partially edentulous ridges. If such is the case, when the lower denture is fitted there is only available a very narrow space between tongue and cheek. In order to cover such not too seldom occurring requirement with particularly space-saving posterior teeth, there are available on the market, in addition to standard shapes, also special sets of teeth with narrow premolars and molars.

In order to also accommodate for such a situation without broadening the fabricated assortment of teeth shapes or forms the invention contemplates the following:

(5) New shapes of artificial posterior teeth are developed for the upper jaw as well as the lower jaw which correspond to the features mentioned under items 1 to 4 and, at the same time, are constructed in proportions and chewing surface forms in such a manner that the usual assembly of eight teeth for the lower denture can be composed for special cases from only eight premolars. Since premolars are much smaller than molars, rows of cheek teeth constructed from only such premolars can be inserted between tongue and cheek for effective function even with a shortage of space.

This aim can then be considered as accomplished when in a dental laboratory a set of eight lower premolars can be put into perfect antagonistic contact and occlusion with an upper normal set of artificial posterior teeth, consisting of two premolars and two molars for each side.

While keeping the foregoing in mind, it will be generally recognized that the present invention relates to an assembly of artificial posterior teeth characterized by the features that, for each pair of superimposed arranged teeth, one such tooth possesses a chewing groove which is concave in transverse or cross-section as well as also in longitudinal section and the other tooth is provided with a corresponding cusp which cooperates with the chewing groove of the said one tooth and which is convex in transverse or cross-section as well as also in longitudinal section. Furthermore, the convex curvatures of the aforesaid protuberance have sharper curves than the concave curvatures of the chewing groove cooperating with the protuberance. Moreover, the deepest point of the chewing groove as viewed in transverse section is displaced towards the lingual side. Thus, the functional area of the

chewing surface can be more easily located on the inner (lingual) field of the alveolar ridges.

The invention also takes into consideration the fact that the closing movement of the lower jaw is not always done with geometric precision. Therefore, the occlusion or intercuspidation of the artificial teeth must include a degree of tolerance.

In conjunction with the object of the invention there is provided a range of tolerance for slightly differing centric positions of the lower jaw. Such tolerance is achieved in that the radii of curvature of the surfaces which encounter one another are selected to be considerably smaller for the convex surface than for the concave surface, to provide a mortar and pestle effect.

Further objects and advantages and the entire scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

In the drawings:

FIGURE 1 schematically illustrates a side view of the first upper and lower premolars designed according to the invention;

FIGURE 2 is a side view of the second upper and lower premolars;

FIGURE 3 is a side view of the first upper and lower molar;

FIGURE 4 illustrates a front view of an upper and lower row of teeth constructed in the manner of the teeth depicted in FIGURES 1–3;

FIGURES *5a* to *5c* are front views of a first upper molar and first and second lower molars designed according to the invention and their cooperative relation for different positions of the jaw in gliding movements;

FIGURE 6 illustrates the right-side of a normal denture construction with two molars and two premolars arranged at the top and bottom; and

FIGURE 7 illustrates a view similar to FIGURE 6 but with a lower row of teeth incorporating four premolars.

Describing now the drawings, in FIGURE 1 there are illustrated a side view of the upper and lower first premolars. The lower tooth **11** possesses a cutting edge-like cusp **12** which is in antagonism or counteraction with a concave chewing surface zone or groove **13** of the upper tooth **14** and possessing large radius. Reference numeral **15** generally depicts the tongue, whereas numeral **16** represents a portion of the false teeth plate.

In FIGURE 2 there is illustrated a side view of the second premolars. The cusp **18** of the upper tooth **17** situated towards the tongue **15** possesses a surface with a small radius of curvature and engages with a central chewing groove or furrow **19** of the lower second premolar **20**. Moreover, the central chewing groove **19** exhibits a considerably larger radius of curvature than the cusp **18**. The protuberance **21** of the lower tooth **20** possesses towards the side of the cheek a small flat or plane surface **22**.

In FIGURE 3 there are illustrated the first upper and lower molars. In the same manner as in FIGURE 2 the upper tooth **23** in this case also possesses a cusp **24** which engages with a chewing groove or furrow **25** of the lower tooth **26**, wherein the radius of curvature of the chewing groove **25** is larger than that of the cusp **24**. However, the protuberance **24** of the upper tooth **23** in deviation from the natural model is here larger than the buccal cusps **27**, **28** arranged behind one another, of which only the cusp **27** is visible in this figure. At the lower tooth **26** the cusp **29** towards the side of the cheek **30** in deviation from the anatomical shape is constructed in reduced size and is provided with a pronounced inclined plane surface **31** which drops-off buccally. Analogous deviations from natural models or patterns are applied also to

the chewing surfaces of the second premolars and the second molars in the interest of improving the static and dynamics of the denture constructions.

In FIGURE 4 there is illustrated a side view (next to the cheek) of an upper and lower row of teeth provided with the teeth previously described in FIGURES 1–3. The construction is maintained in accordance with a multiple mortar-pestle principle in that, in the lower row of teeth the chewing groove **25** of a forward tooth continues to a subsequently arranged inclined surface **32** of a rearward tooth.

In FIGURES *5a* to *5c* there is depicted the first upper molar and the first and second lower molars in side view for different positions of the jaw. Thus, in FIGURE *5a* the teeth are located in the central position. The cusp **27** is disposed in the chewing groove **25** and the cusp **28** upon the inclined surface **32** of the neighboring tooth. When the lower jaw slides back then the cusp **28** glides from the inclined surface **32** of the rearward tooth into the chewing groove **25** of the forward tooth, as best seen by referring to FIGURE *5b*. On the other hand, if the lower jaw is moved forwardly or projected then the position indicated in FIGURE *5c* is obtained.

In FIGURE 6 there is illustrated in side view the right-side denticulation for a normal construction with two premolars **33**, **34** and two molars **35** arranged at the top and bottom. In FIGURE 7 the same right-side upper tooth row is illustrated in engagement with a lower row of teeth incorporating four premolars. Thus, the first lower molar is replaced by a second right-side premolar **34** and a second left-side premolar **36**. In this combination there is not inserted a lower second molar.

As illustrated in the figures, the portion of the cusp surfaces cooperating with the chewing surface or groove is more sharply curved than the chewing surface or groove, producing a mortar and pestle effect. In addition, the deepest part of the concave chewing surface or groove is shifted towards the lingual side of the molar or premolar. Finally, a downwardly inclined planar surface **22** or **31** is located buccally. The advantage of the former is, as already remarked, that the functional area of the chewing surface is more easily located on the lingual field of the alveolar ridges. The latter permits the food to slide down and off the surface and reduces the loading in the area of the occlusion complex. The chewing grooves or surfaces are concave in both longitudinal and transverse cross section.

While there is shown and described present preferred embodiments of the invention it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practised within the scope of the following claims.

Having thus described the present invention, what is desired to be secured by United States Letters Patent, is:

1. A set of dentures, including: first upper and lower premolar teeth, said upper premolar tooth having a chewing groove concave in transverse and longitudinal section, said lower premolar tooth having a cooperating cusp convex in transverse and longitudinal section, said cusp being more sharply curved over its surface that cooperates with the groove than said groove, and the deepest point of said groove in transverse section being displaced towards the lingual side of the tooth; second upper and lower premolar teeth, said lower premolar tooth having a chewing groove concave in transverse and longitudinal section, said upper premolar tooth having a cooperating cusp convex in transverse and longitudinal section, said cusp being more sharply curved over its surface that cooperates with the groove than said groove, and the deepest point of said groove in transverse section being displaced towards the lingual side of the tooth; first and second upper and lower molars, said upper molars each having at least two cusps, which cusps are spaced transversely of the respective tooth and are convex in transverse and longitudinal section, said lower molars each

having a chewing groove cooperating with the said two cusps of the upper tooth which is concave in transverse and longitudinal section, said cusps being more sharply curved over their surfaces that cooperate with the respective grooves than the groove, and the deepest point of said grooves in transverse section being displaced towards the lingual side of the teeth.

2. The set of posterior teeth as defined in claim 1, including on said second lower premolar tooth and on each of said first and second lower molar teeth a downwardly inclined substantially planar surface located next to the check.

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ROBERT E. MORGAN, *Acting Primary Examiner.*