

Aug. 8, 1967

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3,334,417

ORTHODONTIC APPLIANCE AND METHOD OF MAKING AND USING SAME

Filed March 8, 1965

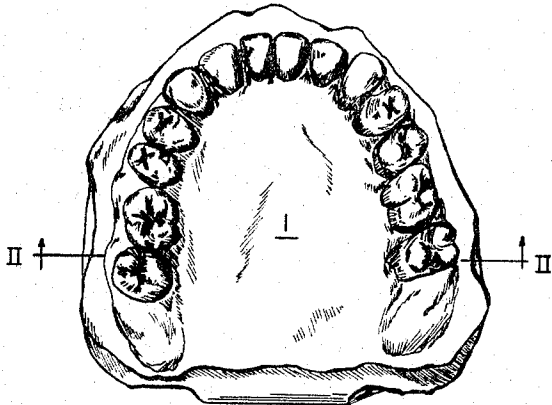


FIG. 1

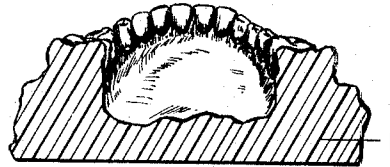


FIG. 2

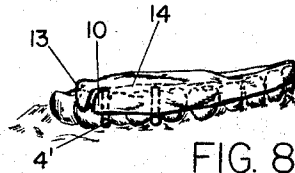


FIG. 8

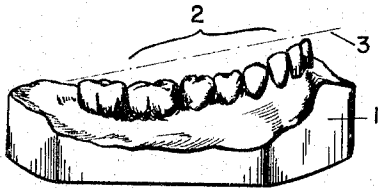


FIG. 3

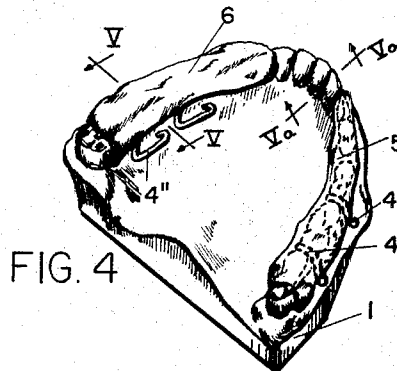


FIG. 4

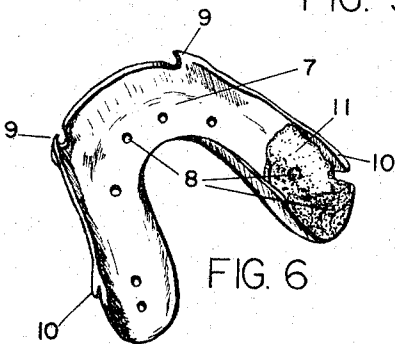


FIG. 6

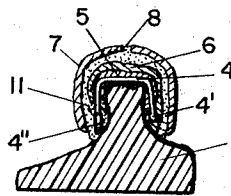


FIG. 5

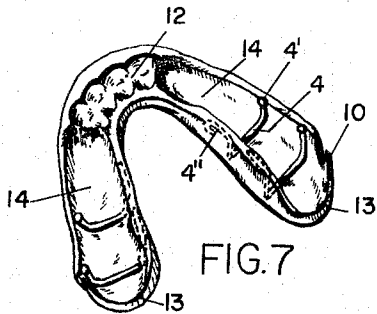


FIG. 7

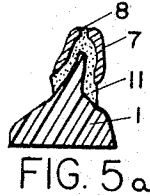


FIG. 5a

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3,334,417
**ORTHODONTIC APPLIANCE AND METHOD OF
 MAKING AND USING SAME**

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Filed Mar. 8, 1965, Ser. No. 437,697
 11 Claims. (Cl. 32-14)

This invention relates to an orthodontic appliance and the methods of making and using same, the appliance being designed particularly for use in leveling the "curve of Spee."

The appliance can serve also to relieve cuspal interference and, in conjunction with selected clasps, may provide a rigid mandibular appliance which may be worn during the day in conjunction with suitable mechanics, providing a distal backward action to the maxillary upper teeth during hours when an extraoral appliance would not normally be used. It may be used with any orthodontic technique to supply mandibular "anchorage" for reciprocal movement of maxillary teeth.

It is a further object to provide improvements in the appliance and method of making same whereby the above described results, and others, may conveniently, reliably and effectively be attained.

About 1941 Dr. John Thompson of Northwestern University concluded that, if the bite is opened beyond the "freeway space," a physiological reaction of the muscles of mastication will soon cause a collapse of the bite raising, this conclusion having been accepted by prosthodontists and full mouth reconstructionists ever since. An over-pronounced curve of Spee is frequently a problem in the course of extraoral therapy, and use of an upper bite plate with a face bow headgear has been suggested but this reduced the efficiency of the appliance.

As a further development from the principles just explained, in accordance with the present invention, the "freeway space" is purposely encroached on in those areas of the mandibular arch where depression of the teeth is desired, while teeth which need extrusion are permitted to achieve it without occlusal interference.

The appliance itself comprises a thin plastic shell, arch-shaped in plan view and channel shaped in cross-section, designed to cover all the lower teeth back to the first or second molars and down to or near the gum line, the shell being filled with material of a similar nature (e.g., acrylic plastic) so that at least the front teeth are closely engaged by the appliance, while the molars may be engaged labially by ball-end clasps or the like, anchored in the appliance. In some cases, the molar teeth may be "banded" with projections on the outside of these bands. Wires may be included on the inside of this appliance to engage on the projections, thus affording even greater retention of this appliance than obtained with ball (or other) clasps. Reference herein to "clasps" is intended, unless otherwise indicated, to include wires or other retention elements. Hooks for engagement with elastic bands may be provided initially in the labial surface of the appliance at desired points, facing in either direction, subject to removal if not needed.

The method of making the appliance comprises, in a typical case, making a stone cast of the set of teeth to which the appliance is to be attached; applying clasps and wax over the front half of the molars and over teeth which are to erupt further; applying a second layer of wax over the ball ends of the clasps and down the sides of the teeth previously covered on top but leaving the anchor ends of the clasps exposed. Then a shell of the proper size and approximately correct configuration is selected which may be heated and adapted (molded) closely to the prepared cast. The shell is then filled with a

mass of soft dental acrylic; the filled shell is pressed firmly over the waxed-up cast; excess material is trimmed from sides and ends; the appliance is allowed to set long enough for the material to solidify; followed by further trimming, shaping and removal of unnecessary hooks before inserting in the mouth, with final polishing and adjustment in the mouth.

The steps of the method just described, and the product resulting therefrom are illustrated in the accompanying drawings, in which:

FIG. 1 represents a plan view of a stone cast corresponding to the mandibular teeth of a child;

FIG. 2 represents a vertical cross-section on the line II-II of FIG. 1;

FIG. 3 represents a side elevation of the cast from the right side of FIG. 1;

FIG. 4 represents a perspective view of the cast with clasps and a first layer of wax on the right side and a second layer of wax on the left side;

FIG. 5 represents a vertical cross-section on the line V-V of FIG. 4 with the addition of a representation of the shell filled with soft dental acrylic and pressed onto the cast, enveloping the anchor ends of the clasps while leaving the ball ends protected by wax;

FIG. 5a represents a vertical cross-section on the line Va-Va of FIG. 4 with the addition of a representation of the shell filled with soft dental acrylic and pressed down around a wax-free anterior tooth;

FIG. 6 represents a view in perspective of the plastic shell of the appliance, inverted and partially filled with soft dental acrylic;

FIG. 7 represents a view in perspective of the completed appliance, inverted, and

FIG. 8 represents a side elevation of the appliance in use.

Referring to the drawings, and particularly FIG. 3, it will be apparent that the set of teeth, represented by the cast 1, exhibit a pronounced "curve of Spee," reflected in the departure of teeth in the zone 2 from the plane of the line 3. To prepare an appliance for correcting this condition (as an example, subject to variations noted below or arising from special circumstances) pairs of ball clasps 4, 4 are applied in positions where the ball ends 4', 4' can aid in holding the appliance in place by snapping into the anatomic undercuts, the clasps being embedded (with ends exposed) in a first layer of wax 5 which covers the upper surfaces of all teeth in the zone 2 which are to erupt further as well as the front half of the second molars (FIG. 4, right side). A second layer of wax 6 is then applied over the ball ends 4', 4' of the clasps, over the layer 5 and down the sides of the teeth previously covered on top but leaving the anchor ends 4'', 4'' exposed (FIG. 4, left side).

Acrylic plastic shells having the general basic form shown in FIG. 5 are provided in a varying range of sizes, each shell 7 being made with small vent holes 8, with forwardly facing integral hooks 9 near the front and with rearwardly facing integral hooks 10 near the back. After the waxing of the cast 1, as explained above, a shell of appropriate size and shape is selected and heat adapted, a consideration being the provision of no more than slight clearance over the waxed portions. The selected shell is filled with a mass of soft but hardenable dental acrylic 11 and the filled shell is then pressed firmly onto the waxed cast and the excess material (squeezed out along sides and ends and through the holes 8) is trimmed off, preferably while still soft. The appliance is then held in place long enough for the soft material to set after which it is removed from the cast, cleaned, trimmed further as needed and dewaxed. Either pair of hooks 9, 10 is trimmed off, depending on which may thereafter be

needed; if there is to be no forward or rearward pulling, both pairs are removed.

In the typical finished product (FIG. 7) the clasps 4, 4 have their anchor ends 4', 4'' firmly embedded in the lingual side walls of the appliance and their ball ends 4', 4' in proper position within the appliance on its labial side to engage the adjacent teeth. If bands are to be cemented to the molar teeth to provide even greater retention, the appropriate wires are incorporated into the labial aspect of the appliance rather than the lingual side walls. The four front teeth are engaged closely and firmly within the accurately molded impressions 12 at the front of the appliance, and some molar surfaces may also be engaged in the vicinity of the rear edges 13, 13. In the areas 14, 14, where the wax has covered the cast, the appliance leaves chambers within which teeth needing extrusion may achieve it without occlusal interference, as indicated in broken lines in FIG. 8. The biting forces applied to any part of the upper surface of the appliance will be communicated to the teeth in the area above the impressions 12 and/or to the molars, thus tending to depress the front teeth with respect to those in the zone 2 and effecting marked straightening of the curve of Spee.

It will be apparent that the upper surface of the appliance encroaches, in a controllable manner, on the "freeway space" to ensure the application of depressing forces to any desired areas of the mandibular arch, wherever may be the specific points of origin of those forces. The upper surface may be built up or cut away in different areas to encroach more or less on the freeway space thus determining, within wide limits, both the distribution and the value of the depressive forces.

It is anticipated that the actual shape, size and thickness of these shells will be produced to conform closely with the objectives and requirements of the case to be treated. In the accompanying drawings certain dimensions are exaggerated for purposes of illustration.

While this appliance is felt to have special usefulness in the form shown and described, a simplified form made on a wax-free cast and thus having no extrusion chambers might, in some situations, be desirable; e.g., as an extended anchor from which corrective forces could be applied to other teeth, or as a multi-tooth appliance through which depressive or edgewise forces could be applied to a plurality of adjacent teeth.

It will be understood that various changes may be made in the form, construction, arrangement and materials of the appliance and in the methods of making and using same, and hence I do not intend to be limited to the details shown or described herein except as the same are included in the claims or may be required by disclosures of the prior art.

What I claim is:

1. An orthodontic appliance comprising, a filled shell of solid slightly resilient synthetic plastic material shaped to overlie and cover the sides of a plurality of adjacent teeth, the under surface of said filled shell having impressions matching closely the configurations of certain teeth and being adapted to engage said teeth to hold the appliance removably in place, said under surface being formed to provide at least one chamber a wall of

which is so located as to be spaced from the facing surface of at least one tooth when the appliance is worn.

2. An orthodontic appliance according to claim 1 in which the shell is shaped to overlie and cover the sides of substantially an entire set of teeth, in which the impressions match closely the configurations of the front teeth and in which chambers are located between the front teeth and the molars on each side.

3. An orthodontic appliance according to claim 1 which includes metallic clasps anchored in and projecting from the shell.

4. An orthodontic appliance according to claim 1 which includes at least one elastic hook integrally formed on the shell.

5. An orthodontic appliance according to claim 1 which includes a pair of forwardly facing elastic hooks and a pair of rearwardly facing elastic hooks, all integrally formed on the shell.

6. An orthodontic appliance comprising, a filled shell of slightly resilient synthetic plastic material shaped to overlie and cover the sides of substantially an entire set of teeth, the under surface of said filled shell having impressions matching closely the configurations of the front teeth and having a chamber between the front teeth and the molars on at least one side, the wall of said chamber being spaced from the occlusal surfaces of adjacent teeth, when the appliance is worn, to permit extrusion thereof, and means integral with said filled shell for securing the appliance in position.

7. The method of making an orthodontic appliance which includes, providing a stone cast of a set of teeth, applying a layer of wax over teeth in the cast which are to be untouched by the appliance, providing a shell of solid plastic material, filling said shell with a quantity of flowable and settable plastic material, pressing said filled shell onto the waxed cast to form in said shell an impression of said cast, solidifying the settable material and trimming, shaping and finishing the appliance as required.

8. The method according to claim 7 which includes applying clasps to the stone cast before waxing, and covering parts of said clasps with said wax.

9. The method according to claim 7 which includes applying a second layer of wax over the first named layer and over additional areas not covered by said first layer.

10. The method according to claim 9 which includes applying clasps to the stone cast before waxing, and covering parts of said clasps with said wax.

11. The method according to claim 7 in which the shell is formed initially with integral elastic hooks and in which the trimming includes removal of such hooks as are not needed.

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