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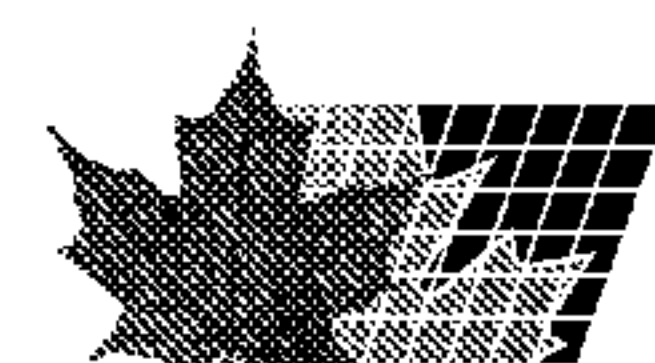
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(54) Title: ORTHODONTIC APPLIANCE AND METHOD

(57) **Abrégé/Abstract:**

An orthodontic appliance including labial and lingual, bodies having teeth-contacting surfaces for acting against targeted anterior teeth of a patient and associated labial and lingual components incorporating spring-loaded biasing means for causing the labial and lingual bodies to act in generally opposed directions and in unison against the surfaces of the targeted anterior teeth. Bands for attaching the appliance to molars and a lingual support component also are provided. The foregoing is applied to a fixed spring aligner, a habit appliance and a bonded crossbite appliance, as well as appliances having new and improved labial and lingual components. The habit appliance includes a labial component to pull anterior teeth into an ideal position, and the aligner and crossbite appliances include labial and lingual components for applying corrective forces to the respective labial and lingual surfaces of the anterior teeth.



Abstract

An orthodontic appliance including labial and lingual bodies having teeth-contacting surfaces for acting against targeted anterior teeth of a patient and associated labial and lingual components incorporating spring-loaded biasing means for causing the labial and lingual bodies to act in generally opposed directions and in unison against the surfaces of the targeted anterior teeth. Bands for attaching the appliance to molars and a lingual support component also are provided. The foregoing is applied to a fixed spring aligner, a habit appliance and a bonded crossbite appliance, as well as appliances having new and improved labial and lingual components. The habit appliance includes a labial component to pull anterior teeth into an ideal position, and the aligner and crossbite appliances include labial and lingual components for applying corrective forces to the respective labial and lingual surfaces of the anterior teeth.

ORTHODONTIC APPLIANCE AND METHOD

BACKGROUND OF THE INVENTIONCross Reference To A Related Application

Applicant claims priority based on United States
5 provisional patent application no. 60/494,161 filed
August 11, 2003 and entitled "Orthodontic Appliance and
Method" which is incorporated herein by reference.

Field of the Invention

The present invention relates generally to
10 orthodontic appliances and treatments, and more
particularly to appliances and treatments for correction
of problems specific to the anterior teeth.

Description of the Prior Art

Orthodontists and dental researchers are constantly
15 searching for new and improved appliances and associated
treatments for correcting problems related to the
anterior teeth, including, for example, crossbites,
overcrowding, rotated teeth, and splayed or flared
teeth. Some prior art orthodontic appliances for
20 treating such problems include both labial and lingual
components for applying corrective forces to the
respective labial and lingual surfaces of the anterior
teeth identified for treatment. Although many such
prior art devices are effective for accomplishing the
25 desired correction, they leave much room for
improvement.

- 2 -

In particular, prior art appliances which incorporate fixed, generally immovable labial and lingual components have significant disadvantages and limitations. A principal drawback is that the desired
5 force of the labial and lingual components against the teeth steadily decreases as teeth are repositioned in response to the force. Consequently, adjustments of such prior art appliances by orthodontists or technicians are required at relatively short time
10 intervals, requiring frequent patient visits. Furthermore, the overall treatment time is increased due to the inability to maintain a constant desired force against the teeth between adjustments.

The foregoing disadvantages, limitations and
15 drawbacks of such prior art appliances having fixed, generally immovable labial and lingual components are avoided by the orthodontic appliance shown and described in United States Patent No. 6,435,871 issued August 20, 2002 the disclosure of which is hereby incorporated by
20 reference. The appliance of that patent incorporates labial and lingual components acting in generally opposed directions, and in unison, against the respective labial and lingual surfaces of a set of targeted anterior teeth, thereby enabling the
25 application of a relatively continuous force against the targeted teeth between scheduled treatments, with minimal reduction in applied force. This is accomplished by the labial and lingual components incorporating spring-loaded biasing means having
30 improved flexibility. Such flexibility, in turn, enables adjustments to the appliance to be made without

- 3 -

requiring bending or manipulation of the labial and lingual wires.

Summary of the Invention

It would be highly desirable to extend the advantages of the appliance of the foregoing patent to orthodontic appliances of additional types and configurations. These would include, for example, a fixed spring aligner, a habit appliance and a bonded crossbite appliance, as well as appliances having new and improved labial and lingual components. The habit appliance includes a labial component to pull anterior teeth into an ideal position, and the aligner and crossbite appliances include labial and lingual components for applying corrective forces to the respective labial and lingual surfaces of the anterior teeth.

The following detailed description, when read in conjunction with the accompanying drawing, is in such full, clear, concise and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention.

Brief Description of the Drawings

Figs. 1-4 are perspective views of a fixed spring aligner orthodontic appliance according to this invention;

Figs. 5-27 are perspective views illustrating a method of fabricating the appliance of Figs. 1-4;

- 4 -

Fig. 28 is a perspective view of a habit orthodontic appliance according to this invention;

Figs. 29-43 are perspective views illustrating a method of fabricating the appliance of Fig. 28;

5 Fig. 44 is a perspective view of a habit orthodontic appliance according to another embodiment of the invention;

10 Figs. 45-48 are perspective views of a bonded crossbite orthodontic appliance according to this invention;

Figs. 49-62 are perspective views illustrating a method of fabricating the appliance of Figs. 45-48;

Figs. 63-65 are perspective views of a new lingual component for use in the appliance of this invention;

15 Figs. 66 and 67 are perspective views of a new labial bow for use in the appliance of this invention;

Fig. 68 is a perspective view of an alternative form of the appliance of Figs. 63-65; and

20 Fig. 69 is a perspective view of an alternative form of the appliance of Fig. 68.

Detailed Description of the Invention

25 The orthodontic appliance disclosed in the aforementioned Patent 6,435,871 includes labial and lingual bodies having teeth-contacting surfaces for acting against targeted anterior teeth of a patient and associated labial and lingual components incorporating

- 5 -

spring-loaded biasing means for causing the labial and lingual bodies to act in generally opposed directions and in unison against the surfaces of the targeted anterior teeth.

5 Figs. 1-4 show a fixed spring aligner orthodontic appliance 10 according to this invention which includes the foregoing components of the appliance of Patent 6,435,871 plus bands 12 for attaching to the molars to band or fix the appliance 10 in place and a lingual
10 support component or wire 14. The appliance 10 is used to correct anterior rotations and crowding associated with Adult Response. This appliance functions the same as the appliance of Patent 6,435,871 but is banded or fixed in place so that it cannot be removed by the
15 patient. Support wire 14 enhances the strength of the appliance framework.

A method of fabricating appliance 10 of Figs. 1-4 is illustrated in Figs. 5-27. Fig. 5 represents model preparation, both original and duplicate, and Fig. 6
20 shows resetting maxillary/mandibular teeth on the original model. The bands 12 are shown in Figs. 7 and 8 installed on the model teeth, in the present illustration on the first molars. A pair of 0.040 inch diameter stainless steel tubes 16 are provided, each cut
25 to a length extending from the middle of the corresponding molar band 12 to the middle of the first bicuspid. A 4-5 mm. length of 0.028 inch diameter stainless steel wire 18 is spotwelded to the distal side of each tube 16 to set the tube lingually. Then each
30 tube 16 and wire 18 combination is tackwelded to the occlusal-middle third of the corresponding band 12, and

- 6 -

oriented so that each tube 16 is angled toward the gingival margin. Thus, each tube 16 is open at the molar band 12 and has a slight gingival angulation toward the anterior part of the tube.

5 The lingual support wire 14 is shown in Figs. 9-13. It preferably is in the form of a 7 inch length of 0.051 inch diameter stainless steel wire, and is bent under the lingual tubes 16 as shown in Figs. 9 and 10. The wire 14 is spaced so as to be about 1.5-2 mm. away from
10 tissue and is sloped downward to a 3-4 mm. area below the gingival margin along the anterior teeth. Fig. 11 shows the support wire 14 cut at the midpoint of each band 12, stabilized by a body 20 of Mortite and tackwelded to the bands 12. Heat Shield is applied into
15 the distal ends of the lingual tubes 16 as shown in Fig. 12, and the lingual metal parts, i.e. support wire 14 and tubes 16, are soldered to the bands 12 as shown in Fig. 13.

 Figs. 14-16 show alternative arrangements for
20 providing labial wire support tubes on the outer surfaces of bands 12. A standard design is shown in Fig. 14 wherein a 0.040 inch diameter stainless steel tube 22 is tackwelded and soldered on the mesial-buccal, mid-height of a molar band 12. In the optional design
25 of Fig. 15, a 0.036 inch diameter stainless steel cantilever arm 24 is tackwelded and soldered on the mesial-buccal, mid-height of a molar band 12. Wire arm 24 is cut near the first bicuspid. Then a 0.040 diameter stainless steel tube 26 is tackwelded and
30 soldered to the gingival side of the anterior end of the cantilever arm 24. As shown in Fig. 16, the lingual

- 7 -

tubes 16 and the labial wire support tubes 22 and 26 are disposed so as to be aligned with the dental arch form and as parallel with each other as possible.

Fig. 17 illustrates installation of the labial frame or bow wire 30. It is in the form of a 0.028 diameter yellow Duraloy wire bent to extend through both buccal tubes 22 and 26, and labial bow wire 30 is soldered on the facial surface of the first permanent molar bands 12. An offset-stop bend is placed in the wire mesial to the tube. Acrylic on labial wire 30 covers 2 x 2 or 3 x 3, based on teeth reset. A 5 x 7 mm. long adjustment loop is placed at the mesial third of cuspids if there is only 2 x 2 or less teeth reset. An adjustment loop is placed at the distal third of cuspids if they are reset.

An optional form of labial bow wire 34' is shown in Fig. 18. It is fabricated using 0.030 inch diameter yellow Duraloy wire. A 5-7 mm. long adjustment loop 36 is placed at the mesial third of cuspids if there is only 2 x 2 or less tooth reset. The adjustment loop is placed at distal third of cuspids if they are reset. The bow 34' is placed at middle height of teeth, extends to the middle third of bands 12 and is tackwelded and soldered to the bands.

A lingual frame component 38 is shown in Fig. 19 and comprises a 0.028 inch diameter yellow Duraloy wire that is bent so as to be rounded along the lingual surface of anterior teeth and extends straight through the distal open ends of the lingual support tubes 16. The wire 38 should engage each tube 16 as straight as

- 8 -

possible and extend through the distal ends. A "V" shaped midline bend 40 is incorporated prior to rounding the wire along the cervical/middle third height of the anterior teeth. The wire distal extension is looped to lock lingual component 38 in the tubes 16. A relief between cuspids and lingual wire 38 allows for open coil springs to be added later. Anterior acrylic 42 forming a lingual body with tooth-contacting surfaces is placed 2 x 2, or 3 x 3 if cuspids are repositioned. A tieback hole can be provided in the lingual acrylic for passive insertion.

Fig. 20 illustrates the steps in fabrication wherein the model is separated and acrylic 42 is applied to lingual component 38 along the incisors (2 x 2), the acrylic being extended to the cuspids if reset, and the cured acrylic then is trimmed to a 4-5 mm. height with lingual wire 38 in the center, the acrylic being allowed to extend to the distal edge of the lateral incisors (or cuspids, if reset). Finally, a small tieback hole is drilled through the middle of the acrylic pad near the dental midline. As shown in Figs. 21 and 22, for the two forms of labial bow 30 and 34, respectively, the model is separated and acrylic 43 forming a labial body having tooth-contacting surfaces is applied to the labial bow within the adjustment loops. The curved acrylic is trimmed to a height of 3-4 mm. with the bow wire in the center.

By way of example, one method of forming the lingual and labial bodies 42 and 43, respectively, can include placing a sheet of thermoplastic material over the dental model of the anterior teeth in desired

- 9 -

position and then placing the model with plastic sheet thereover in the receptacle of a dental appliance forming machine (not shown) such as the one commercially designated Biostar[®] and available from Great Lakes
5 Orthodontics Ltd., Tonawanda, New York. After thermal shaping by the machine and upon cooling the material is trimmed to the desired configuration. For a more detailed description of the Biostar[®] machine and its method of operation, reference may be made to United
10 States Patent 3,768,164 issued October 30, 1973 and entitled "Method Of Making A Dental Appliance", the disclosure of which is incorporated herein by reference.

Next, the bands 12 and framework are removed from the model as shown in Fig. 23 and the removable lingual
15 and labial components are disassembled. The soldered parts are cleaned ultrasonically. The metal parts are smoothed with heatless stone and rubber wheel. The distal ends of the lingual tubes 16 are tapered to provide better patient comfort.

20 Finally, the spring-loaded biasing means are provided on the lingual and labial frames or components. In particular, the lingual component 38 is loaded with a pair of 0.010 x 0.030 inch NiTi open coil springs 44. For each spring, there is added about 3-4 mm. more coil
25 length than the measured distance between the anterior end of the lingual tube and the acrylic pad of the lingual component. The appliance is placed on the duplicate of the original model to verify coil compression, and any needed adjustment is made. The
30 appliance is returned to the setup model as shown in Fig. 24 and the distal end of the lingual wire 38 is

- 10 -

looped 2-3 mm. behind each tube 16 toward the gingival margin.

Fig. 25 shows the addition of 0.010 x 0.030 inch NiTi open coil springs 46, each 10-12 mm. in length, to the labial bar behind each buccal tube. A small helix stop is incorporated to the wire behind each open coil, slightly compressing it 1-2 mm. The labial component is checked to make sure it has an even pull and snaps back properly on the setup model, any necessary adjustments being made.

Fig. 26 shows the completed appliance installed on a maloccluded model. The labial and lingual components are checked to make sure they can travel to engage maloccluded anterior teeth. Fig. 27 shows the provision of a Gurin lock 48 or crimpable stop which may be used to recompress the open coil if needed.

A habit orthodontic appliance 50 according to this invention is shown in Fig. 28. It is used to close anterior spacing as a finger or tongue habit is broken. The labial or outside wire is loaded with coil spring means in a manner similar to that of the appliance of Patent 6,5435,871 to gently pull the teeth into ideal position. The appliance can incorporate a habit-discouraging structure or component in the form of rakes, cribs or rollers, to mention a few, and is banded or fixed. In the illustrative appliance 50 of Fig. 28, a habit-discouraging structure in the form of tongue crib 52 extends between molar bands 54 and labial wire 56 is provided with coil spring biasing means, one of which is shown at 58 in Fig. 28. A labial body of

- 11 -

acrylic material or the equivalent and provided with tooth-contacting surfaces (not shown in Fig. 28) is associated with labial frame or wire 56 in a manner similar to that of the appliance of Fig. 28.

5 A method of fabricating appliance 50 of Fig. 28 is shown in Figs. 29-43. Figs. 29-31 illustrate bending of a 0.036 inch diameter Duraloy wire tongue crib 52 which is joined at each end of a molar band 54. If an optional Nance button is employed, as will be shown
10 subsequently, the base of the crib framework extends to the middle of the rugae to support the acrylic Nance button. The crib screen can be fabricated using standard GLO Habit Crib procedures, where the crib screen is soldered to the lingual body wire.

15 A high percentage of cases requiring the habit appliance 50 will have the bands 54 placed on the first permanent molars (6's), without the eruption of second permanent molars (7's). Thus, use of cantilever tube extensions is standard, unless second molars are
20 exposed. As shown in Figs. 32 and 33, 0.036 inch diameter Duraloy wire cantilever tube extensions 62 are tackwelded and soldered on the mesial-buccal, mid-height of the molar bands 54. Each wire 62 is cut near the first bicuspid/primary first molar.

25 A 0.040 stainless steel tube 64 is tackwelded and soldered to the gingival side of the anterior end of each cantilever extension 62 as shown in Figs. 34 and 35. When the second molars (7's) are exposed, facial tubes 66 are soldered directly to the mesial half of
30 each band 54 as shown in Fig. 36. In either case, the

- 12 -

tubes should be aligned with the dental arch form and extend as parallel with each other as possible.

Figs. 37-39 illustrate installation of the labial bow wire 56. In particular, a 0.028 inch diameter yellow Duraloy wire is bent to extend through each of the buccal tubes 64 or 66. A 5-7 mm. long adjustment loop 70 is placed at the mesial third of cuspids. The distal band from each adjustment loop 70 to the corresponding buccal tube should be more than 5 mm. in length. A V-shaped bend 74 is incorporated in the labial wire 56 at the dental midline to prevent asymmetrical retraction of the bow by the spring biasing means.

The framework is smoothed and polished as illustrated in Fig. 40. The bands and framework are removed and the removable labial component is disassembled. The soldered parts are cleaned ultrasonically. The metal parts are cleaned with heatless stone and rubber wheel.

Figs. 41 and 42 show the addition of a coil spring 80 to the labial bow 28 behind each buccal tube. Each spring is 0.010 x 0.030 inch NiTi open coil and 10-12 mm. in length. A small hexix stop is incorporated in the labial bow wire 28 behind each open coil 80, compressing it approximately 75%. The labial component is checked, to make certain it has an even pull and snaps back into proper position on the setup model, and any necessary adjustments are made.

The finished appliance is shown in Fig. 43. The standard fixed habit crib, rake or roller serves as a

- 13 -

palatal body. Normally, no teeth reset is provided. The labial coil springs close anterior spacing as the patient's habit is broken. This replaces the use of elastics and the problems associated with them riding up
5 toward the gingival. A habit appliance with Nance Button 84 fixed to the lower portion or base of the crib screen is shown in Fig. 44.

Figs. 45-48 illustrate a bonded crossbite orthodontic appliance 90 according to this invention.
10 The appliance is used to gently push teeth out of anterior crossbite. The appliance is bonded in and incorporates occlusal pads to open the bite and allow the anteriors to jump or advance out of crossbite. In appliance 90 the lingual component is loaded with coil
15 spring means in a manner similar to that of the appliance of Patent 6,435,871.

A method of fabricating appliance 90 of Figs. 45-48 is illustrated in Figs. 49-62. Figs 49 and 50 show a lingual frame or component 94 positioned in a dental
20 model. No reset is needed, unless requested by the clinician. A 0.028 inch diameter hard spring wire (Duraloy-yellow) is bent into a mushroom-shaped spring. This is done in a manner keeping the distal extensions in parallel relation. Space is allowed between the base
25 of the spring and the model for rubber sleeves. Next, as shown in Figs. 51 and 52, tubing is attached to lingual component 94. In particular, two lengths of 0.040 inch diameter stainless steel tubing 98 are each cut to a length from the distal of the first permanent
30 molars to the midpoint of the first bicuspid. Plastic tubing 100 is placed on the open end of each stainless

- 14 -

steel tube, and each tubing combination 98,100 is placed on a corresponding distal extension of lingual component 94. Each plastic tubing 100 is of a length such that it extends half-way to the wire loop of lingual component 94 as shown in Fig. 52. Each distal end of tubes 98 is crimped.

The lingual component 94 is secured in the manner illustrated in Figs. 53 and 54. Lingual wire 94 is referenced at the interdental papilla height along the anterior teeth. Also, the steel tubes 98 are placed 1-3 mm. below the gingival margin, about 1 mm. from palatal tissue and parallel to the posterior occlusal surface. The framework is held in place with wax 102 at the loop/plastic tube area.

The component designated 104 in Figs. 53 and 54 is termed a coffin wire, which is provided for improved hygiene, and is installed in the manner illustrated in Figs. 55 and 56. A 6-7 inch length of 0.051 inch diameter stainless steel wire is formed to create an approximately 15-20 mm. long omega-shaped loop which is located about 2 mm. above the center of the palate. The anterior legs are referenced at the first and second bicuspid area and are adapted 1-2 mm. beneath the lingual component 94. An offset bend is incorporated in the wire 104, and the wire is cut near the distal of the first permanent molars.

Next, ball clasp hooks are installed in the manner illustrated in Figs. 57 and 58. This involves placing 0.028 inch diameter stainless steel ball clasps 110 distal to the lateral incisors (or cuspids). Each ball

- 15 -

is referenced at the labial interdental papilla and is adapted tightly to follow the interdental contact. The wire of each ball clasp hook 110 is adapted to rest at the corresponding incisal edge of the lingual wire 94.

5 An offset is placed in the end of each ball clasp hook wire to lock into acrylic which will be applied.

Appliance 90 is provided with coil springs on the arms of lingual component 94 which extend into the posterior tubes. The springs are in the form of 0.009 x

10 0.030 inch NiTi open coil springs. Enough coil should be applied to provide near-complete coil compression when placed over malocclusion.

Figs. 59-61 illustrate application of clear acrylic to the lingual component 94 (lingual of anteriors) and

15 to form a pair of posterior bite plates or tooth-engaging portions 120. Color acrylic of choice is used to form a lingual/palatal body. By way of example, one method of forming the bite plates or tooth-engaging portions 120 can include placing a sheet of

20 thermoplastic material over the dental model of the anterior teeth in their desired position and then placing the model with plastic sheet thereover in the receptacle of a dental appliance forming machine (not shown) such as the one commercially designated Biostar®

25 and available from Great Lakes Orthodontics Ltd., Tonawanda, New York. After thermal shaping by the machine and upon cooling the material is trimmed to the desired configuration. For a more detailed description of the Biostar® machine and its method of operation,

30 reference may be made to United States Patent 3,768,164 issued October 30, 1973 and entitled "Method of Making A

- 16 -

Dental Appliance," the disclosure of which is incorporated herein by reference. Each bite plate 120 is trimmed occlusally to articulate against opposing teeth. Buccal overlap is trimmed to interdental papilla height and covers the first bicuspid to the second permanent molar as shown in Fig. 59. Fig 60 shows the acrylic 120 trimmed to a U shape into the base of the palate, approximately 10-12 mm. below the gingival margin. Referring now to Fig. 61 a thin cut is made between the anterior acrylic component 122 and the posterior bite plate 120. The acrylic is trimmed to 3-4 mm. height, centering the lingual wire in the acrylic pad 122. Acrylic is applied so as to contact all lingual teeth surfaces that are to be moved.

The completed appliance 90 is shown in Fig. 62. The afore-mentioned coil springs are designated 126 and shown also in Figs. 60 and 61. They apply force between lingual body 122 and the bite plates 120. The springs together with the posterior bite plates or pads open the patient's bite and allow anteriors to jump. Mixed dentition is corrected, and appliance 90 eliminates the need for finger springs, screws and adjustments. The force is constant, and does not deflect toward the incisal, unlike finger springs.

Figs. 63-65 illustrate an alternative form of lingual component for use in orthodontic appliances of the type described herein. The labial component is similar to that of the appliance of Patent 6,435,871. The lingual component 130 has an anterior portion 132 which meets posterior portions 134 at approximately right angles. Anterior portion 132 is within an acrylic

- 17 -

body 136 and the labial component has coil spring
biasing means 138. A lingual support wire 140 also is
provided as shown in Figs. 64 and 65. An acrylic palatal
body 144 associated with both labial and lingual
5 components is shown in Figs. 64 and 65. It serves to
provide anchorage for the appliance. The shape of
lingual component 130 enhances patient comfort by
providing a structure where there is less space for the
tongue to go between anterior and posterior portions of
10 the appliance. In addition, disposing posterior
portions 134 at approximately right angles to anterior
portion 132 provides a more direct route for transfer of
force to the target anterior teeth.

Figs. 66 and 67 illustrate an alternative form of
15 labial bow 150 for use in orthodontic appliances of the
type described herein. Its primary function is to serve
as a support for the anterior teeth while force is
applied by the lingual components of the appliance.
Labial bow 150 can apply some force to the anterior
20 teeth if desired, by the provision of the loops 152
which can be adjusted to control the force applied by
bow 150. A labial body 154 of acrylic or like material
and having tooth-contacting surfaces is associated with
labial bow 150 in a manner similar to the appliances
25 previously described. A lingual body 156 of acrylic or
like material has tooth-contacting surfaces and is
operatively associated with the lingual frame and
compression springs 158 in a manner similar to the
appliances previously described.

30 The appliance shown in Fig. 68 is similar to the
appliance of Figs. 63-65 except that the lingual frame

- 18 -

or wire has the mushroom shape like that in the
appliance of Patent 6,435,871. It includes a lingual
support component 172 like wire 140 shown in Fig. 63.
Whereas the appliance of Fig. 68 has a palatal support
5 body 174, the appliance of Fig. 69 uses a lingual
support wire 178 having a diameter of about 0.051 inch
to give the appliance strength and function without
palatal acrylic.

While embodiments of the invention have been
10 described in detail, that has been done for the purpose
of illustration, not limitation.

- 19 -

The Claims

1. An orthodontic appliance for treatment of one or more anterior teeth in a jaw of a patient comprising:

- 5 a) a pair of bands adapted to be secured to posterior teeth spaced from the anterior teeth;
- b) a labial body having teeth-contacting surfaces for engaging the labial side of the anterior teeth;
- 10 c) a labial frame operatively connected between the labial body and the pair of bands;
- d) a lingual body having teeth-contacting surfaces for engaging the lingual side of the anterior teeth;
- 15 e) a lingual frame operatively connected between the lingual body and the pair of bands;
- f) spring-loaded biasing means on the labial and lingual frames for causing the labial and lingual bodies to apply corrective forces to
20 the anterior teeth; and
- g) a lingual support component connected to the pair of bands and extending toward the anterior teeth.

25 2. The orthodontic appliance according to claim 1, wherein the lingual support component is in the general shape of a U with the ends attached to the bands and the web located near the anterior teeth.

- 20 -

3. The orthodontic appliance according to claim 1, wherein the lingual support component comprises a generally U-shaped wire having the ends thereof attached to the bands and extending toward the anterior teeth.

5 4. The orthodontic appliance according to claim 2, wherein the web of the lingual support component is located below the gingival margin along the exterior teeth.

10 5. The orthodontic appliance according to claim 3, wherein the lingual support component extends toward a location below the gingival margin along the anterior teeth.

15 6. A method of making an orthodontic appliance for treatment of one or more anterior teeth in a jaw of a patient comprising:

- a) providing a model of a dental arch of a patient wherein the anterior teeth are in desired locations;
- 20 b) installing a pair of bands on oppositely-located model teeth spaced posteriorly from the model anterior teeth;
- c) mounting a tubular component on the lingual side of each band and orienting the open end of each tube toward the anterior teeth;
- 25 d) providing a lingual support component in the form of a generally U-shaped wire and attaching the ends of the component to the lingual sides of the bands;

- 21 -

- e) mounting a tubular component on the buccal side of each band and orienting the open end of each tube toward the anterior portion of the jaw;
- 5 f) providing a labial frame component in the form of a generally U-shaped wire and inserting the ends of the wire through the tubular components on the buccal sides of the bands;
- 10 g) providing a lingual frame component in the form of a generally U-shaped wire and inserting the ends of the wire through the tubular components on the lingual sides of the bands;
- 15 h) providing a labial support body on the labial frame component, the labial support body having teeth-contacting surfaces for engaging the labial side of the anterior teeth;
- 20 i) providing a lingual support body on the lingual frame component, the lingual support body having teeth-contacting surfaces for engaging the lingual side of the anterior teeth;
- 25 j) installing spring-loaded biasing means on the lingual frame component between the lingual support body and the tubular components on the lingual sides of the bands; and
- k) installing spring-loaded biasing means on the labial frame component between the tubular

- 22 -

components on the buccal sides of the bands
and the ends of the labial frame component.

7. The method according to claim 6, further including
positioning the lingual support component to extend
5 toward the anterior teeth.

8. The method according to claim 6, further including
positioning the lingual support component to extend
toward a location below the gingival margin along the
anterior teeth.

9. The method according to claim 6, further including
10 disposing the tubular support components on the buccal
and lingual sides of each band to be substantially
mutually parallel and in substantial alignment with the
dental arch.

10. An orthodontic appliance for treatment of one or
15 more anterior teeth in a jaw of a patient and for
discouraging an orally-related habit of the patient
comprising:

- 20 a) a pair of bands adapted to be secured to
posterior teeth spaced from the anterior
teeth;
- b) a labial body having teeth-contacting surfaces
for engaging the labial side of the anterior
teeth;
- 25 c) a labial frame operatively connected between
the labial body and the pair of bands;

- 23 -

- d) spring-loaded biasing means on the labial frame for causing the labial body to apply corrective force to the anterior teeth; and
- e) a habit-discouraging structure extending
5 between the pair of bands and serving as a palatal body to interfere with an orally-related habit of the patient.

11. The appliance according to claim 10, wherein the
10 habit-discouraging structure is in the form of a tongue crib.

12. A method of making an orthodontic appliance for treatment of one or more anterior teeth in a jaw of a patient and for discouraging an orally-related habit of the patient comprising:

- a) providing a model of a dental arch of a
15 patient wherein the anterior teeth are in desired locations;
- b) installing a pair of bands on oppositely-
20 located model teeth spaced posteriorly from the model anterior teeth.
- c) providing a habit-discouraging structure having opposite ends and securing those ends to the bands so that the structure extends generally laterally relative to the dental
25 arch;
- d) mounting a tubular component on the buccal side of each band and orienting the open end

- 24 -

of each tube toward the anterior portion of the jaw;

- e) providing a labial frame component in the form of a generally U-shaped wire and inserting the ends of the wire through the tubular components on the buccal sides of the bands;
- f) providing a labial support body on the labial frame component, the labial support body having teeth-contacting surfaces for engaging the labial side of the anterior teeth; and
- g) installing spring-loaded biasing means on the labial frame component between the tubular components on the buccal sides of the bands and the ends of the labial frame component.

13. An orthodontic appliance for treatment of crossbite in anterior teeth in a jaw of a patient comprising:

- a) a lingual frame having a pair of arm sections for extending along posterior teeth and joined by a central section extending along the anterior teeth;
- b) a lingual body on the lingual frame central section and having teeth-contacting surfaces for engaging the lingual side of the anterior teeth;
- c) a pair of posterior bite pads incorporating portions of the lingual frame arm sections and adapted to engage posterior teeth; and

- 25 -

5 d) spring-loaded biasing means on the lingual
 frame between the lingual body and the bite
 pads for opening the patient's bite to allow
 the anterior teeth to advance out of a
 crossbite condition.

14. The orthodontic appliance according to claim 13,
further including a pair of hook components extending
from opposite ends of the lingual body for engaging the
incisor teeth.

10 15. The orthodontic appliance according to claim 14,
wherein the hook components are in the form of ball
clasps located distally of the lateral incisor teeth.

15 16. The orthodontic appliance according to claim 15,
wherein the ball of each ball clasp is referenced at the
labial interdental papilla and is adapted tightly to
follow interdental contact.

20 17. The orthodontic appliance according to claim 13,
further including a hygiene-improving component in the
form of a wire loop extending along the palatal region
and having ends thereof extending along the lingual
frame arm sections.

25 18. The orthodontic appliance according to claim 13,
wherein the lingual frame is in the form of a spring
wire and the central section is generally mushroom-
shaped.

19. A method of making an orthodontic appliance for
treatment of crossbite in anterior teeth comprising:

- 26 -

- a) providing a model of a dental arch of a patient wherein the anterior teeth and the posterior teeth located on opposite sides of the arch are in desired locations;
- 5 b) providing a lingual frame in the form of a spring wire having a pair of arm sections joined by a substantially mushroom-shaped central section;
- 10 c) supporting the lingual frame in the model with the arm sections extending lingually along the posterior teeth and the central section extending lingually along the anterior teeth;
- 15 d) providing a pair of posterior bite pads incorporating portions of the lingual frame sections and adapted to engage posterior teeth;
- 20 e) providing a lingual body on the lingual frame central section and having teeth-contacting surfaces for engaging the lingual side of the anterior teeth; and
- f) installing spring-leaded biasing means on the lingual frame between the lingual body and the bite pads.

20. The method according to claim 19 further including
25 providing a hygiene-improving component in the form of a wire loop and supporting the component in the model with the loop extending along the palatal region and ends of the component extending along the arm sections of the lingual frame prior to providing the pair of bite pads.

- 27 -

21. The method according to claim 19 further including providing a pair of ball clasp hooks for placement distal to the lateral incisor teeth and supporting the hooks in the model with ends thereof extending along portions of the lingual frame central section prior to providing the lingual body.

22. An orthodontic appliance for treatment of one or more anterior teeth in a jaw of a patient comprising:

- a) a pair of attachments adapted to be secured to posterior teeth spaced from the anterior teeth;
- b) a labial body having teeth-contacting surfaces for engaging the labial side of the anterior teeth;
- c) a labial frame operatively connected between the labial body and the pair of bands;
- d) a lingual body having teeth-contacting surfaces for engaging the lingual side of the anterior teeth;
- e) a lingual frame operatively connected between the lingual body and the pair of bands, the lingual frame having an anterior portion which meets posterior portions at substantially right angles;
- f) spring-loaded biasing means on the labial and lingual frames for causing the labial and lingual bodies to apply corrective forces to the anterior teeth; and

- 28 -

- g) a lingual support component connected to the pair of attachments and extending toward the anterior teeth.

23. The orthodontic appliance according to claim 22,
5 further including a palatal body associated with the labial and lingual frames for anchoring the appliance.

24. An orthodontic appliance for treatment of one or more anterior teeth in a jaw of a patient comprising:

- 10 a) a pair of attachments adapted to be secured to posterior teeth spaced from the anterior teeth;
- b) a labial body having teeth-contacting surfaces for engaging the labial side of the anterior teeth;
- 15 c) a labial frame operatively connected between the labial body and the pair of bands;
- d) a lingual body having teeth-contacting surfaces for engaging the lingual side of the anterior teeth;
- 20 e) a lingual frame operatively connected between the lingual body and the pair of bands;
- f) spring-loaded biasing means on the lingual frame for causing the lingual body to apply corrective forces to the anterior teeth; and
- 25 g) the labial frame and body serving to support the anterior teeth during application of corrective forces thereto.

- 29 -

25. The orthodontic appliance according to claim 24, further including a lingual support component connected to the pair of attachments and extending toward the anterior teeth.

- 5 26. The orthodontic appliances to claim 24, further including at least one adjustment formation in the labial frame to enable some force to be applied to the anterior teeth by the labial frame and labial body.

Application number/numéro de demande: 2477352

Figures: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18,

Pages: 19, 20 to 24, 25, 26, 27, 28, 29, 30, 31, 32, 33,
34, 35, 36, 37 to 42, 43, 44, 45 to 50,
51 to 54, 55, 56, 57, 58, 59 to 62,
63, 64, 65, 66, 67, 68, 69.

Unscannable items
received with this application
(Request original documents in File Prep. Section on the 10th Floor)

Drawing 1

Documents reçus avec cette demande ne pouvant être balayés
(Commander les documents originaux dans la section de préparation des dossiers au
10ième étage)