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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : A61C 7/10 — A1

(11) International Publication Number: **WO 99/49805**

(43) International Publication Date: 7 October 1999 (07.10.99)

(21) International Application Number: PCT/IT98/00214

(22) International Filing Date: 28 July 1998 (28.07.98)

(30) Priority Data:
MI98A000698 1 April 1998 (01.04.98) IT

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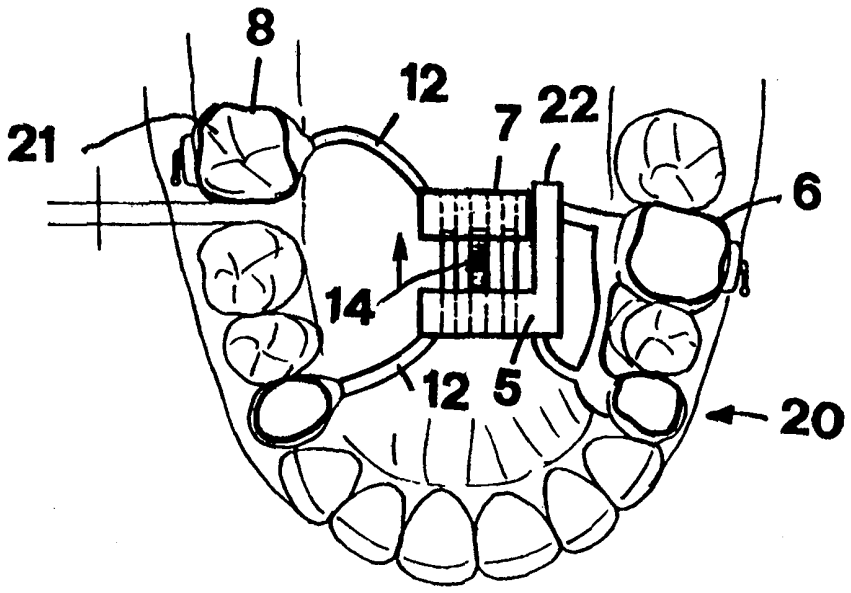
(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: ORTHODONTIC DEVICE FOR SAGITTALLY EXPANDING AND/OR ROTATING THE UPPER JAW

(57) Abstract

The invention relates to an orthodontic device for sagittally expanding and/or rotating the upper jaw, comprising first mechanical means, associated with one or more teeth pertaining to the maxillary arch, and second mechanical means operatively associated with other teeth of the maxillary arch, the first and second mechanical means cooperating for causing, by a mutual translation, rotation, or rototranslation, a sagittal expanding, either monolateral or bilateral, of the teeth pertaining to the maxillary arch, or a rotation of the maxillary arch.



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Description

ORTHODONTIC DEVICE FOR SAGITTALLY EXPANDING AND/OR ROTATING THE UPPER JAW

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an orthodontic device for sagittally expanding and/or rotating the upper jaw.

Expanding devices for transversally expanding the upper jaw, comprising a first and second mutually spaced elements, each of which is provided with bands engaging with some of the teeth pertaining to the maxillary arch, are already known.

The mentioned bands are coupled to the related element by means of coupling arms.

The desired expanding of the jaw, in operation, is obtained by applying a transversal force to the teeth affected by the engagement bands of the device.

Even if devices of the above mentioned type are at present broadly used in clinic operations, they, on the other hand, are affected by great limitations, the most important of which is that they do not allow to obtain a monolateral sagittal expanding.

Actually, the above mentioned devices, do not allow to provide a unilateral spacing, either to the right or to the left, of some tooth element being processed, while holding the positions of the other tooth element unaltered.

A further important limitation of prior

devices is that does not allow to provide a bilateral sagittal spacing of the teeth, in particular they do not allow to simultaneously provide both a rightward or leftward spacing and a leftward or rightward mesialization of the tooth element being processed.

SUMMARY OF THE INVENTION

Accordingly, the aim of the present invention is to provide a device allowing any sort of dental processes to be easily performed, in particular processes involving a unilateral and bilateral sagittal expanding, or a rotation of the jaw while simultaneously providing both a rightward and leftward spacing or mesialization of the teeth, and this in a very simple and efficient manner.

The above aim is achieved by the present invention which specifically relates to an orthodontic device for sagittally expanding and/or rotating the upper jaw, comprising first mechanical means associated with one or more teeth pertaining to the above mentioned maxillary arch, characterized in that said device comprises second mechanical means operatively associated with other teeth of said maxillary arch, said first and second mechanical means cooperating to cause, by mutual translation, rotation or roto-translation, a sagittal expanding, either unilateral or bilateral, of teeth pertaining to the maxillary arch, or a rotation of said maxillary arch.

According to a preferred embodiment of the present invention, the second mechanical means are coupled to a tooth pertaining to the maxillary arch, and they allow said tooth to be unilaterally spaced, by translation along a direction substantially parallel to the sagittal plane of the maxillary arch.

According to another preferred embodiment of the present invention, the second mechanical means are coupled to at least two teeth, pertaining to opposite sides of the maxillary arch, in order to allow the maxillary arch to be bilaterally spaced, by a translation along a direction substantially parallel to the sagittal plane of the maxillary arch.

According to a further preferred embodiment of the present invention, the first mechanical means are coupled to at least a tooth, pertaining to a first side of the maxillary arch, whereas the second mechanical means are coupled to at least a tooth, pertaining to the opposite side of the maxillary arch, in order to allow said maxillary arch to be either rightward or leftward spaced and/or mesialized, by causing said device to rotate or rototranslate, said rotation or rototranslation being caused by a variation of the distance between the first and second mechanical means.

The invention provides a first important advantage with respect to the prior art, i.e. that it allows, during the actuation of the device, to generate a unilateral sagittal force, either rightward or leftward directed, suitable to actuate only the right half or the left half of the sagittal expanding device, thereby achieving either a rightward or leftward unilateral spacing of the desired tooth elements.

Moreover, the device according to the invention, in a preferred embodiment thereof, allows to provide a bilateral sagittal expanding of the upper jaw.

In this case, the device is mainly useful in

obtaining simultaneously a spacing or mesialization, depending on the anchoring point, of two or more dental elements, so as to properly correct the positions of the teeth being treated.

A third use possibility of the orthodontic device of the present invention would allow a rotation, either rightward or leftward, of the upper jaw.

In such a third case, the device can be usefully used for simultaneously providing either a rightward or leftward spacing or a leftward or rightward mesialization of dental or tooth elements, by optimally exploiting the forces generated by said device.

This will allow to also provide an overall displacement of different tooth elements, thereby providing a maxillary rotation.

BRIEF DESCRIPTION OF THE DRAWINGS

Further advantages and characteristics of the present invention will become more apparent from the following detailed disclosure, given by way of an illustrative but not limitative example, with reference to the accompanying drawings, where:

Figure 1 is a top plan view of a first embodiment of the device according to the present invention, specifically designed for providing a unilateral sagittal expanding of the upper jaw, of which are shown its two main portions;

Figure 2 is a partially cross-sectioned view illustrating the device shown in Figure 1;

Figure 3 is a top plan view of the device of the preceding figures, applied to the jaw of a patient;

Figure 4 is a top plan view of the device according to the invention, showing the operating mode thereof;

Figure 5 is a further top plan view of a modified embodiment of the device according to the invention, allowing the upper jaw to be rotated or turned either rightward or leftward;

Figure 6 is a further top plan view of the device of Figure 5, illustrating the operating mode thereof;

Figure 7 is a top plan view of a further modified embodiment of the device according to the invention, allowing the upper jaw to be bilaterally sagittally expanded; and

Figure 8 is a top plan view of the device of Figure 7, illustrating the operation mode thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the following disclosure reference will be made to some preferred embodiments of the present invention, which have been illustrated by way of a not limitative example for indicating possible variations thereof.

Figure 1 illustrates a first embodiment of the device according to the present invention, specifically designed for providing a unilateral sagittal expanding, as generally indicated by the reference number 1.

The device 1 comprises a first and second mechanical means assembly, respectively including a frame 5 and a movable element 7, which can be suitably spaced from one another.

The frame 5 has a substantially L shape, and presents one of its sides, i.e. the side 22, which is

substantially parallel to the sagittal plane of the maxillary arch 20.

The frame 5 is moreover provided with engagement portions for engaging some of the teeth pertaining to the maxillary arch 20, said engagement portions comprising a plurality of bands 6, each of which is coupled to the frame 5 by an arm 12; moreover, the arms 12 pertaining to the frame 5 comprise a mutual connection portion 13.

The movable element 7 comprises an arm 12, ending with a band 8 engaging with the tooth 21 to be spaced.

The frame 5 and movable element 7 are mutually engaged by a screw 2, arranged therebetween and having a direction substantially parallel to the sagittal plane of the maxillary arch 20.

Moreover, the frame 5 and movable element 7 are coupled to one another by a first and second columns, respectively indicated by the reference numbers 3 and 4, arranged on the sides of the screw 2.

The columns 3 and 4 are also substantially parallel to the sagittal plane of the maxillary arch 20.

The screw 2 comprises a first and second threaded portions, respectively indicated by the reference numbers 9 and 10 and having opposite directions, the threaded portion 9 engaging with the frame 5 and the threaded portion 10 engaging with the movable element 7.

Said screw 2 is moreover provided with a nut 14 which can be driven in order to cause the movable element 7 to be displaced towards and/or away from the frame 5.

The subject device for unilaterally sagittally expanding the upper jaw, according to the present invention, operates as follows.

At first, it should be apparent that the element 7 is movable, with respect to the frame 5, along a rectilinear direction substantially parallel to the sagittal plane of the maxillary arch 20.

The above mentioned displacement is achieved by operating the nut 14 so as to cause the movable element 7 to forcibly slide along the sliding guides comprising the first column 3 and second column 4.

This displacement occurs in the direction indicated by the arrow in Figure 4 and allows, by using the band 8 connected by the arm 12 to the movable element 7, to affect the tooth 21 to be spaced.

More specifically, as the device 1 is operated, according to the operating mode thereinabove disclosed, a unilateral sagittal force suitable to actuate exclusively one of the half portions of the sagittal expanding device is generated, thereby providing a unilateral spacing of the desired tooth element or elements.

The device 1, in particular, is arranged so that it can be used to affect only a side of the upper or top maxillary arch 20, for example the right side thereof, whereas a like device, but having a mirror-like symmetry with respect to the device of Figures 1-4, can be used in those cases in which the left side of the upper maxillary arch 20 is to be affected.

Figure 5 is a top plan view illustrating a modified embodiment of the inventive device, specifically designed for causing the upper jaw to be

either rightward or leftward turned.

With respect to the first disclosed unilateral device, the subject device comprises two mechanical elements 25 and 35, opposite to one another with a mirror-like relationship, and which are mutually spaced.

In particular, the mechanical element 25 comprises a first frame 25 having a L-shape, with one of its sides substantially parallel to the sagittal plane of the maxillary arch.

Likewise, the element 35 comprises a second frame 35, of L-shape, and also having one of its sides substantially parallel to the sagittal plane of the maxillary arch.

The L-shape frame 25 is associated with arms ending with engagement bands 16 provided for engaging teeth pertaining to the same side of said maxillary arch, whereas the L-shape frame 35 is associated with arms ending with engagement bands 26 for engaging teeth pertaining to the same side of said maxillary arch.

Moreover, the arms pertaining to the L-shape frames 25 and 35 comprise a mutual connecting portion, said connecting portions being respectively indicated by the reference numbers 23 and 33.

The L-shape frames 25 and 35 are engaged to one another by an engagement screw 2 arranged therebetween and directed according to the sagittal plane of the maxillary arch.

Furthermore, said two L-shape frames 25 and 35 are coupled by a first and second columns, respectively indicated by the reference numbers 3 and 4, arranged at the sides of the screw 2.

The operation of the device shown in Figures 5-6 is analogous to that of the device shown in Figures 1-4, which has been above disclosed.

The variation of the spacing or distance separating the L-shape frames 25 and 35 is achieved by operating the nut 14 so as to forcibly cause the L-shape frames to slide along sliding guides comprising the first column 3 and second column 4.

This displacement will allow the bands 16 and 26 to operate on the teeth to be processed.

In this case, the device according to the present invention will allow to simultaneously provide both a rightward spacing (or a leftward spacing) and a leftward (or a rightward) mesialization of dental elements or teeth, by advantageously exploiting the thus generated forces.

This will also allow to achieve an overall displacement of several dental elements, thereby providing a maxillary rotation.

Figure 7 is top plan view illustrating a further modified embodiment of the device according to the invention, specifically designed to cause the upper jaw to bilaterally sagittally expand.

In this case, the device comprises two mechanical elements 17 and 18 opposite to one another and spaced from one another.

The mechanical elements 17 and 18 are both constituted by a rectilinear portion 17 and 18, substantially perpendicular to the sagittal plane of the maxillary arch.

Each said rectilinear portion 17 and 18 comprises a pair of arms, respectively indicated by 52 and 42, which end with engagement bands 19 and 29

engaging with teeth pertaining to the opposite sides of the maxillary arch.

In this case too, it is possible to change the distance separating the rectilinear portions 17 and 18 by operating the nut 14 so as to forcibly cause the rectilinear portions 17 and 18 to slide along sliding guides comprising the first column 3 and second column 4.

This displacement will allow to affect the teeth to be processed by the bands 19 and 29, in order to cause the upper jaw to be sagittally bilaterally expanded.

In this connection it should be pointed out that the subject device is constituted by a suitable and specifically designed combination of the rectilinear elements or portions 17 and 18 which, in addition to being mutually combined and fitted, as shown in Figure 7, can also be individually combined and coupled to L-shape element 5 or 22, as is shown in Figures 1 and 2.

Likewise, said device can also be made by suitably combining two L-shape elements 25 and 35, as shown in Figures 5 and 6.

In this case, the subject device is mainly useful for simultaneously providing a spacing or mesialization, depending on the anchoring point thereof, of two dental elements or teeth, to properly correct the positions of the teeth affected by the device.

From the above disclosure it should be apparent that the invention fully achieves the intended aim and objects.

CLAIMS

1. An orthodontic device for sagittally expanding and/or rotating an upper jaw, comprising first mechanical means associated with one or more teeth pertaining to said maxillary arch, characterized in that said device comprises second mechanical means operatively associated with other teeth of said maxillary arch, said first and second mechanical means cooperating in order to cause by a mutual translation, rotation or rototranslation, a sagittal expanding, either unilateral or bilateral, of teeth pertaining to the maxillary arch or a rotation of the maxillary arch.

2. An orthodontic device for sagittally expanding and/or rotating an upper jaw, according to Claim 1, characterized in that said second mechanical means are coupled to a tooth pertaining to said maxillary arch, said second means allowing said tooth to be unilaterally spaced, by causing said second means to translate along a direction substantially parallel to the sagittal plane of said maxillary arch.

3. An orthodontic device for sagittally expanding and/or rotating an upper jaw, according to Claim 1, characterized in that said second mechanical means are coupled to at least two teeth, pertaining to opposite sides of said maxillary arch, in order to allow said maxillary arch to be bilaterally spaced, by causing said second means to translate along the direction substantially parallel to the sagittal plane of said maxillary arch.

4. An orthodontic device for sagittally expanding and/or rotating an upper jaw, according to Claim 1, characterized in that said first mechanical

means are coupled to at least a tooth, pertaining to a first side of said maxillary arch, whereas said second mechanical means are coupled to at least a tooth pertaining to the opposite side of said maxillary arch, to allow said maxillary arch to be spaced and/or mesialized, either rightward or leftward, by rotating or rototranslating said device, said rotation or rototranslation being generated by a variation of the distance of said first and second mechanical means.

5. An orthodontic device for sagittally expanding and/or rotating an upper jaw, according to Claim 2, characterized in that said first mechanical means comprise a frame having a L-shape, and having one of the sides thereof substantially parallel to the sagittal plane of said maxillary arch.

6. An orthodontic device for sagittally expanding and/or rotating an upper jaw, according to Claim 5, characterized in that said first mechanical means comprise arm elements ending with engagement bands engaging teeth pertaining to the two sides of said maxillary arch.

7. An orthodontic device for sagittally expanding and/or rotating an upper jaw, according to Claim 6, characterized in that said arms of said first mechanical means comprise a mutual connection portion.

8. An orthodontic device for sagittally expanding and/or rotating an upper jaw, according to one or more of Claims 5 to 7, characterized in that said second mechanical means comprise a rectilinear portion, substantially perpendicular to the sagittal plane of said maxillary arch, and an arm ending with an engagement band for engaging a tooth to be spaced.

9. An orthodontic device for sagittally

expanding and/or rotating an upper jaw, according to Claim 3, characterized in that said first mechanical means comprise a rectilinear portion, substantially perpendicular to the sagittal plane of said maxillary arch as well as a pair of arms respectively ending with respective engagement bands for engaging teeth pertaining to opposite sides of said maxillary arch.

10. An orthodontic device for sagittally expanding and/or rotating an upper jaw, according to Claim 9, characterized in that said second mechanical means comprise a rectilinear portion, substantially perpendicular to the sagittal plane of said maxillary arch and a pair of arms respectively ending with respective engagement bands for engaging teeth to be spaced, pertaining to opposite sides of said maxillary arch.

11. An orthodontic device for sagittally expanding and/or rotating an upper jaw, according to Claim 4, characterized in that said first mechanical means comprise a first L-shaped frame, said frame having one of the sides thereof substantially parallel to the sagittal plane of said maxillary arch.

12. An orthodontic device for sagittally expanding and/or rotating an upper jaw, according to Claim 11, characterized in that said second mechanical means comprise a second L-shaped frame, said second frame having one of the sides thereof substantially parallel to the sagittal plane of said maxillary arch.

13. An orthodontic device for sagittally expanding and/or rotating an upper jaw, according to Claim 11 or 12, characterized in that said said first and second mechanical means comprise arms ending with engagement bands engaging teeth pertaining to the same

side of said maxillary arch.

14. An orthodontic device for sagittally expanding and/or rotating an upper jaw, according to Claim 13, characterized in that said arms respectively pertaining to said first and second mechanical means comprise a mutual connection portion.

15. An orthodontic device for sagittally expanding and/or rotating an upper jaw, according to one or more of the preceding claims, characterized in that said first and second mechanical means are spaced away from one another by a spacing screw, arranged between said first and second mechanical means and extending substantially parallel to the sagittal plane of said maxillary arch.

16. An orthodontic device for sagittally expanding and/or rotating an upper jaw, according to one or more of the preceding claims, characterized in that said first and second mechanical means are coupled by a first and second columns, each said column being arranged on a side of said screw and having a direction substantially parallel to the sagittal plane of said maxillary arch in order to guide a related movement of said first and second mechanical means.

17. An orthodontic device for sagittally expanding and/or rotating an upper jaw, according to one or more of the preceding claims, characterized in that said screw comprises a first and second threaded portions, having opposite directions, each of said portions engaging with one of said mechanical means, and a nut which can be operated for causing said mechanical means to be displaced either toward one another or away from one another.

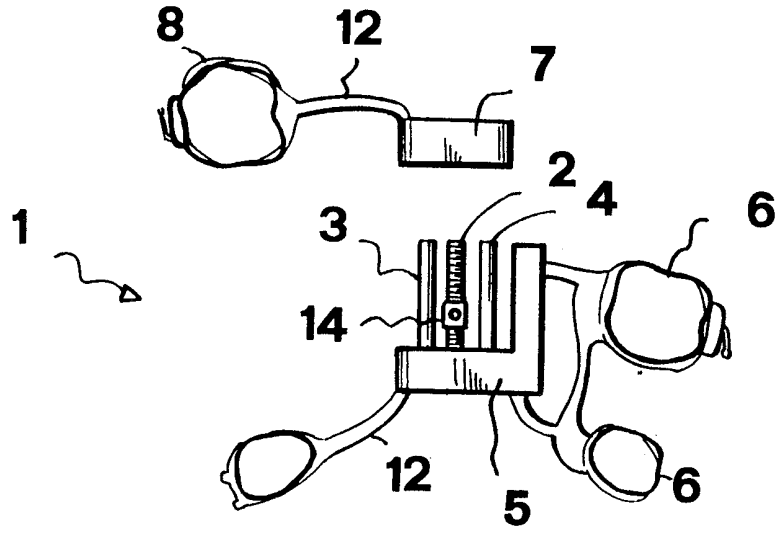

FIG. 1

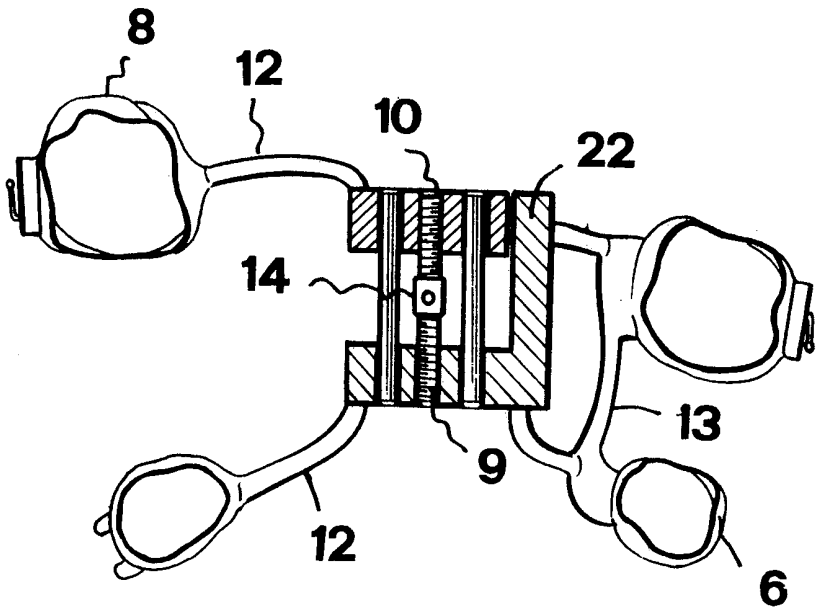

FIG. 2

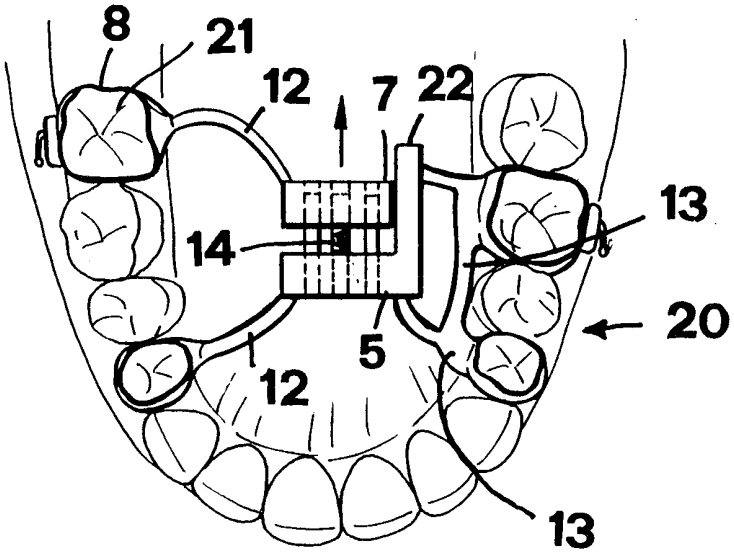

FIG. 3

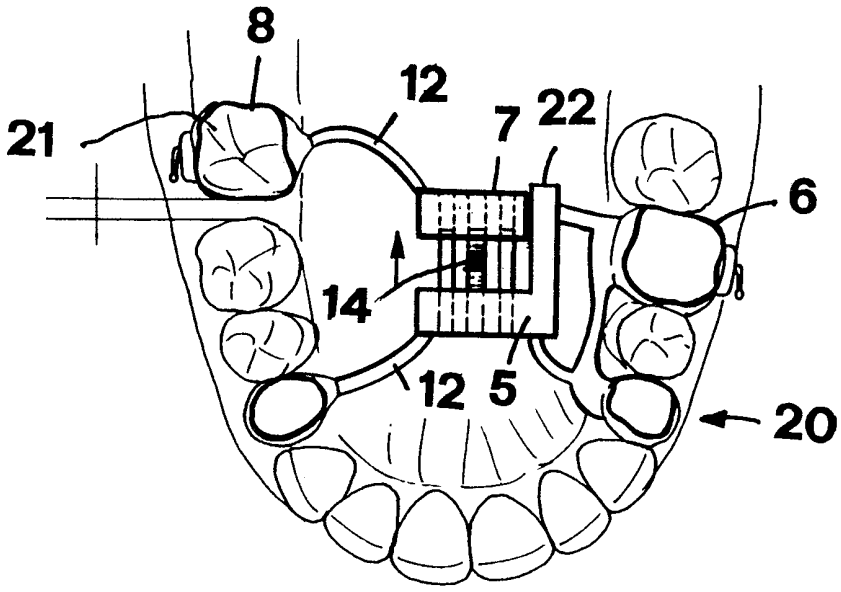

FIG. 4

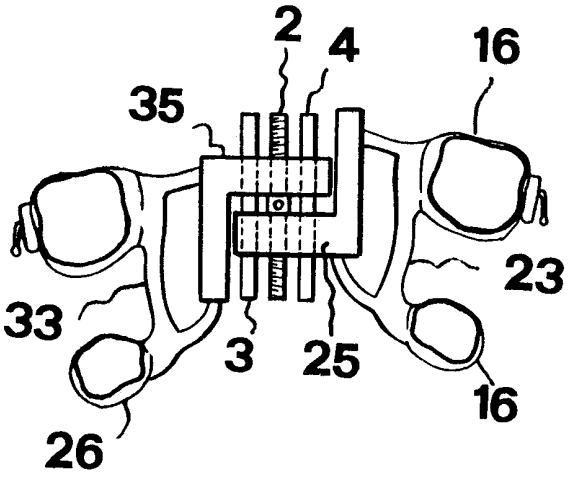

FIG. 5

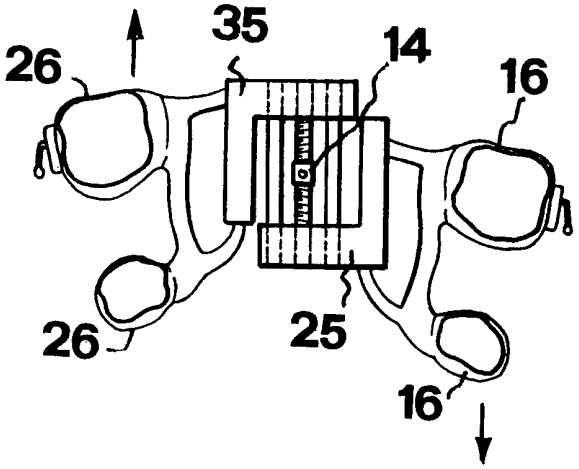

FIG. 6

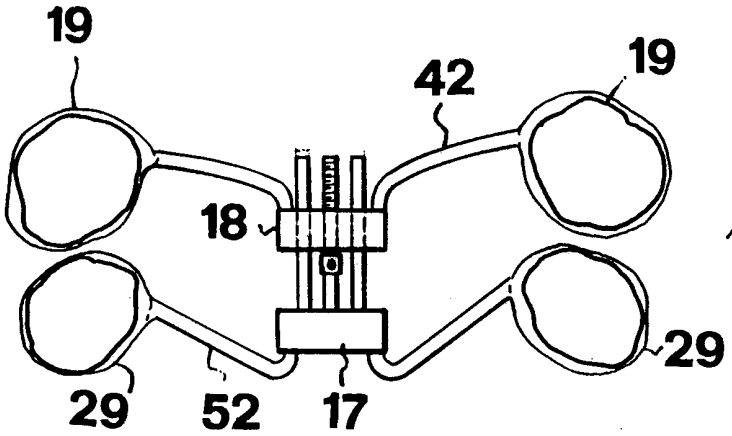

FIG. 7

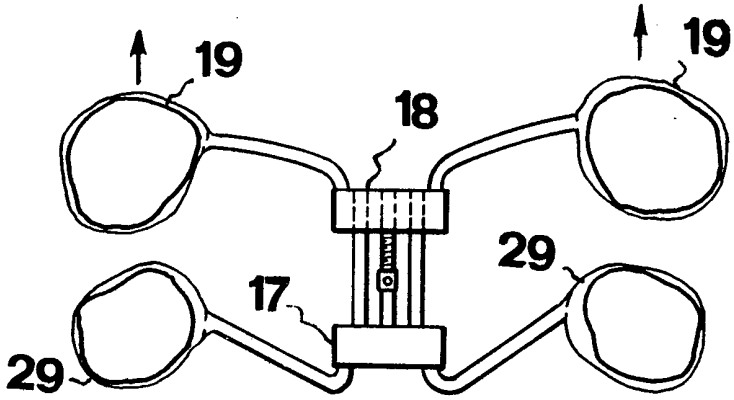

FIG. 8

INTERNATIONAL SEARCH REPORT

Int tional Application No
PCT/IT 98/00214

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61C7/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 439 377 A (MILANOVICH PHILIP J) 8 August 1995 see column 2, line 33-45 see column 3, line 41-55 see column 6, line 18-36 see figures 4-12	1-4,9, 10,15-17
A		5-8, 11-14

X	DE 88 08 906 U (DREVENKA F) 29 December 1988 see page 13, line 23 - page 14, line 10 see figure 2	1,3, 15-17

A	GB 641 139 A (JOHN ROSS PEARS ET AL.) 2 August 1950 see page 1, line 54-76 see figure 2	5,11,12

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Date of the actual completion of the international search	Date of mailing of the international search report
2 December 1998	15/12/1998

Name and mailing address of the ISA	Authorized officer
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US 5439377 A	08-08-1995	NONE	
DE 8808906 U	29-12-1988	NONE	
GB 641139 A		NONE	