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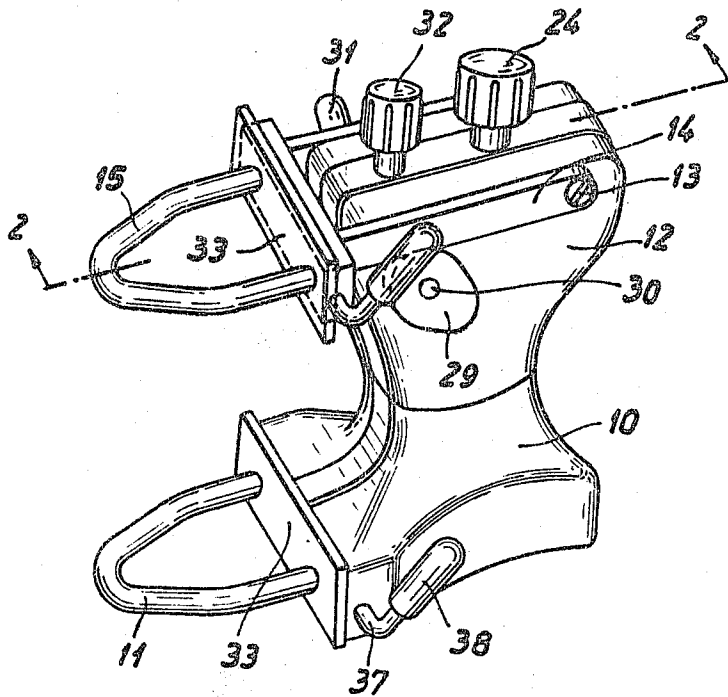
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ARTICULATOR

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Fig. 1



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ARTICULATOR

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This invention relates to an articulator for sagittal and lateral movements.

It is an object of the invention to provide movability for the upper jaw bone and lower jaw bone models in all directions without having to overcome substantial forces.

Another object of the invention is to provide the possibility to simulate with the jaw models fixed on the carriers the natural chewing movements.

A further object of the invention is to provide a simple and economic articulator which allows functioning analysis to be made without the mouth of the patient and which has a great exactitude of reproduction.

Still a further object of the invention is to provide a bearing device between the parts holding the upper jaw bone model and the lower jaw bone model, respectively, which allows the making of translatory movements between the two construction parts in addition to the rotational movements.

Still a further object of the invention is to provide an easily detachable anchorage for the carriers of the models in the construction parts supporting them.

Further objects and characteristics of the invention are given in the following description.

An embodiment of the invention will be described in the following with reference to the drawing. In the drawing:

FIG. 1 is a perspective view of the articulator, according to the invention showing the same in a fixed state,

FIG. 2 is a section taken substantially on the line 2—2 of FIG. 1,

FIG. 3 is a section taken substantially on the line 3—3 of FIG. 2,

FIG. 4 is a detailed enlarged section taken substantially on the line 4—4 of FIG. 3.

The articulator, according to the present invention, is in the form of a stand and comprises a base part or lower section 10 with a first carrier 11 for the positioning of the lower jaw model and a top part or upper section 12. A fork arm 14 which carries on its distal end a second carrier 15 for the upper jaw model is hinged close to its free ends to the upper section, as at 13, for pivoting about a horizontal axis.

The base part or lower section 10, which is made of a plastic material, has a substantially flat and horizontally disposed upper surface and the top part or upper section 12 is formed with a substantially flat under or bottom surface, which is complementary to the upper surface of the base or lower section and the two parts 10 and 12 are in contact with each other at such surfaces, which define an essentially flat and horizontal partition plane 16. The bottom surface of the upper section or part 12 is formed with an upstanding, vertical socket 8, defining a vertical bore, and the base or lower part 10 is formed with a bore 9. The bore 8 and bore 9 are of square cross-sectional configuration and receive a two part guide sleeve 17 of square cross-section, the sleeve being separated in the partition plane 16 with an upper part thereof being in the bore 8 and the lower complementary part thereof being in the bore 9. The sleeve constitutes a guide and is made of metal, such as brass. The sleeve constitutes a guide for a sliding member or block 18 of a corresponding square cross-sectional shape, as shown in FIGURE 3. The block is formed with an axial bore 21a through which a flexible

element 21, such as a wire rope, axially extends. The block 18 is formed or provided on its lower end with a flange or plate 19 that is adapted to abut the lower end 20 of the guide 17, which end 20 constitutes a stop surface. The flexible element 21 is provided on its lower end with an enlargement 21b, which is larger than the bore in the block and which anchors or locates the lower end of the flexible element or wire rope 21 to the sliding block 18. The upper end of the wire rope 21 is attached to a tensioning screw 22, which is rotatably mounted in a threaded screw socket 23 carried by the upper part 12. The tensioning screw 22 has an upstanding, exterior end portion which is provided with a knurled screw head 24. Thus, the screw socket 23, which constitutes a nut that is carried by the enclosure 23a, which is provided in the upper section, threadingly receives the tensioning screw 22, which is actuated by means of the knurled screw head 24. Consequently, as can be best seen from FIGURE 2, the nut 23 threadingly receives the screw 22 and the flexible element 21 is secured to the lower end of the screw that passes through the axial bore 21a in the sliding block or member 18 and has an enlargement 21b on its lower end below the sliding block or member 19 so as to engage, at such point, the block or member 19.

The sliding member or block 18 terminates at its upper end in a spherical head 25, which is adapted to engage within the upper section of the guide sleeve 17, as shown in FIGURE 2. By tightening the screw 22, the two sections 10 and 12 can be fixedly secured together, as shown in FIGURE 2. To achieve better centering, the contacting surfaces of the upper end lower sections 12 and 10 are provided with a centering means, which includes a depression or recess 26 in the upper surface of the base part 10 and a complementary projection 27 on the bottom or undersurface of the top part 12, as shown clearly in FIGURE 2.

With the screw turned, in a tightening manner, the sliding block 18 enters the upper section of the guide sleeve or bush 17. In order to achieve, after loosening of the screw 22, the desired relative movement between the upper and lower sections, the sliding block can be moved to a lowermost position so that the upper end 25 thereof is completely out of and free from the upper section of the guide 17. As shown in the drawings, a spring ring 28 rests between the flange or member 19 and the stop surface 20 and tends to urge the sliding member or block 18 downwardly. When the screw 22 is in a loosened condition, only the extreme spherical tip or end 25 is slightly within the upper section or the guide 17, that is, the upper guide section, within the upper section 12, so that the desired movement can be obtained. According to the extent of loosening of the tensioning screw 22, through actuation of the knurled head 24, the extent of the relative movability may be varied.

Thus, when the screw 22 is tightened in the nut 23 by finger manipulation of the knurled head 24, the sliding member or block 18 is drawn upwardly against the action of the spring 28 and the upper end portion enters the upper section of the guide sleeve 17. This prevents the section 12 from having any rotary motion about a vertical axis, relative to the base or lower section 10, because the sliding block or member 18 and the sleeve are of complementary rectangular or non-circular cross-sectional configuration.

In the initial condition of the device, the screw 22 is turned by the knob 24 to its lower position. In this position, the sliding member or block 18 is located, under the urging of the spring 28, in its lowermost position, in which the upper end thereof does not extend above the separating plane 16 between the cooperating surfaces of the lower and upper parts 10 and 12. Obviously, the

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cable or flexible member 21 is slack. Therefore, the upper part 12 can be tilted, tipped or moved parallel in any desired manner, relative to the base or lower section 10 and chewing motions may be imitated without hindrance. If the screw 22 is turned in such a manner that it is moved so as to draw the block 18 upwardly, through the flexible connection 21 and its enlarged end 21b, the sliding block or member 18 is drawn upwardly against the urging of the spring 28 and the upper end 25 passes beyond the separating plane 16 between the parts 10 and 12. If the screw 22 is further tightened, the parts 10 and 12 will be pressed so tightly together that they will form practically a fixed unit.

Obviously, according to the extent of loosening of the tensioning screw 22, the extent of the relative mobility may be varied, since the spherical end 25 plays an important part in permitting some limited movement of the upper section 12 relative to the lower section 10 if it is disposed within the upper section of the sleeve and if the block 18, in its entirety, is lowered, upon untightening of the screw and under the urging of the spring 28, with the flexible connection 21 being slack, the upper part 12 can be tilted, tipped or moved parallel in any desired manner relative to the lower part. If the screw is tightened, then the upper end portion of the block or member 18 is drawn up into the upper section of the sleeve 17, i.e. the part of the sleeve in the bore in the top part 12 and the parts 10 and 12 are tightly pressed and locked together. Thus, the block constitutes a locking member or means.

The one fork arm of the fork 14 rests on a cam 29 which is fixed on one end of a shaft 30 that is journaled parallel to the axis 13 in the upper section 12 and which is rotatable by means of an actuating lever 31 fixed to the other end. Thus, the height setting of the occlusion plane can be established. By means of a clamping screw 32, the shaft 30 can be locked in any angular position. The carriers 11 and 15, respectively, for the lower jaw model and the upper jaw model are connected with the lower section 10 and the fork 14, respectively, and are easily detachable by a clamping dog. This clamping dog is shown particularly in FIGURES 3 and 4, with respect to the carrier of the lower jaw model. Each carrier is provided with a rest plate 33 which is applied on a flat rest surface of the lower section and the fork respectively. Pins 34 project through the rest plate and engage corresponding holes of metal insert parts of the lower section and of the transverse rail of the fork 14. At a right angle to said bores and insert parts, the transverse rail of the fork 14 is provided with a continuous hole in which a shaft 37 is disposed, the shaft carrying on its projecting end a locking handle 38, as shown in FIGURE 3. The axis of the bores for the pins 34 and the shaft 37 cross each other vertically in different height positions as can be especially noted from FIGURE 4. The shaft 37 is provided with flat cutout portions 39 which are chosen in such a way that in a corresponding rotated position (shown in dotted lines in FIGURE 4), a free entering of the pins 34 into their holes is possible.

After the entering of the pins, the shaft 37 is rotated so that it enters in gaps 40 of the pins and thus blocks the carrier. The gaps 40 are provided on both sides of the pins in order to insert the carrier in two possible positions. The rotational movement of the shaft 37 is appropriately limited by means not shown to get the blocking and deblocking positions.

This articulator is compact and can be handled easily by means of few actuating levers.

The articulator represented in the drawing is only one embodiment. Without leaving the scope of the invention modifications can be made.

What I claim is:

1. An articulator comprising a base part having a carrier for a lower jaw bone model and a complementary

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top part having a carrier for an upper jaw bone model, said parts having complementary surfaces forming a dividing plane between the parts, the top part being completely movable in all directions in relation to the base part so that chewing motions can be imitated without hindrance, said top and base parts having complementary vertically alignable bores, a locking member slidably mounted in the bore in the base part, actuating means carried by the top part and connected to the locking member for moving the locking member upwardly so that the upper end of the locking member extends above the dividing plane and enters the bore in the top part to delimit to various degrees such movements of the top part relative to the base part and so that the upper end portion of the locking member enters the bore in the top part to completely prevent such movements and to secure the top part tightly on the base part with the complementary surfaces of such parts in tight contact so that the parts form practically a fixed unit, said actuating means being operative to locking member in selected positions with respect to the entrance of its upper end and its upper end portion into the bore in the top part, stop means limiting the upward movement of the locking member when the parts are in tightly secured relation, said actuating means being operative to move the locking member downwardly so that its upper end is free from the bore in the top part and lies below the dividing plane and means responsive to movement of the actuating means in lowering the locking member into such last stated position for urging the locking member to such lower position so that the upper end thereof is retained below the dividing plane.

2. The invention of claim 1, wherein said locking member is of non-circular cross-sectional configuration at least at its upper end portion and the bore in the top part is of complementary non-circular configuration for reception of the upper end portion.

3. The invention of claim 1, wherein the bore in the top part is of rectangular cross-sectional configuration and the upper end portion of the locking member is of similar rectangular cross-sectional configuration and is slidable within such bore so as to prevent rotative movements of the top part relative to the base part when the upper end portion of the locking member is disposed within the bore in the top part.

4. The invention of claim 1, wherein the upper terminal end of the locking member is of spherical configuration so that its slight entry into the bore in the upper part permits some delimited movement of the top part relative to the base part.

5. The invention of claim 1, wherein said actuating means comprises a vertically adjustable member carried by the top part and a flexible connection means between said adjustable member and the locking member.

6. The invention of claim 1, wherein said actuating means comprises a screw member threadingly mounted in the top part and having an exterior finger manipulatable end portion and a flexible connector connected between the screw member and the locking member.

7. The invention of claim 6, wherein said flexible member extends through an axial bore in the locking member and terminates in an enlargement that is of greater cross-sectional area than the bore so as to anchor the flexible member to the underside of the lower end of the locking member.

8. The invention of claim 7, wherein said stop means comprises a lateral enlargement on the lower end of the locking member and a stop surface on the lower end of the bore in the lower part.

9. The invention of claim 8, wherein said means for urging the locking member to a lower position includes a spring means interposed between the lateral engagement on the locking member and the stop surface.

10. The invention of claim 9, wherein said screw member is threadingly disposed in a nut carried by the

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upper part and the screw member is orientated in a vertical position overlying the bores in the parts.

11. The invention of claim 1, wherein said bores are provided with liner sleeves that slidably receive the locking member.

12. The invention of claim 1, wherein said complementary surfaces of the top and base parts of the dividing plane between the parts are provided with centering means including a complementary recess and projection.

13. The invention of claim 1, wherein the carrier for the upper jaw bore model is supported by a cam plate, said cam plate being attached to the end of a shaft which is rotatably carried by the top part, an actuating lever for said shaft, said carrier being rotatably mounted on the top part and being moved into various positions by virtue of its supporting engagement with said cam plate.

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