

**Nov. 13, 1945.**

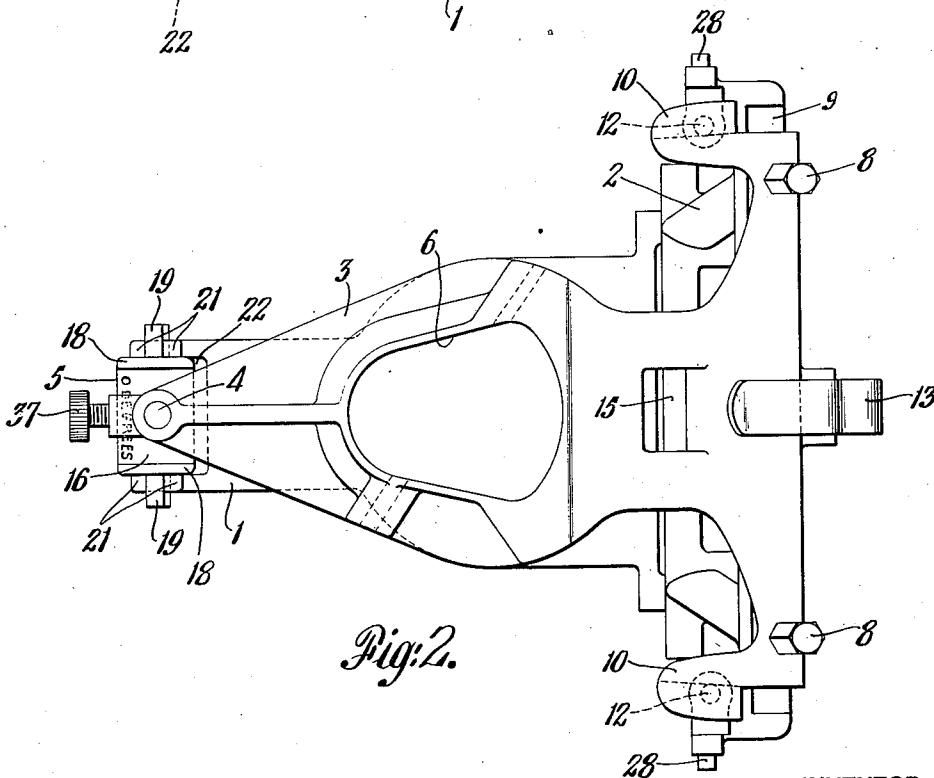
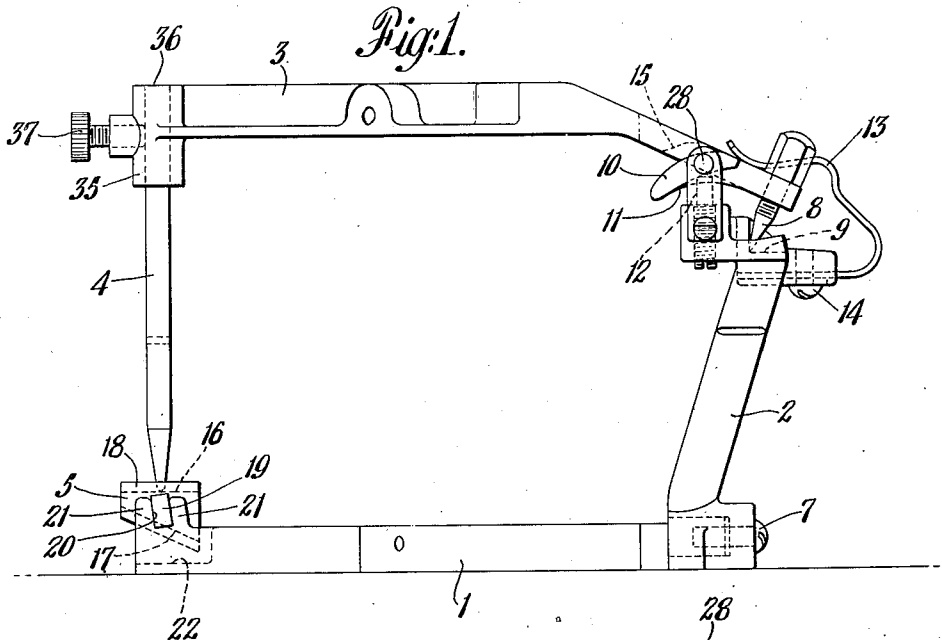
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**2,389,101**

## DENTURE ARTICULATOR

Filed April 7, 1945

3 Sheets-Sheet 1



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DENTURE ARTICULATOR

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3 Sheets-Sheet 2

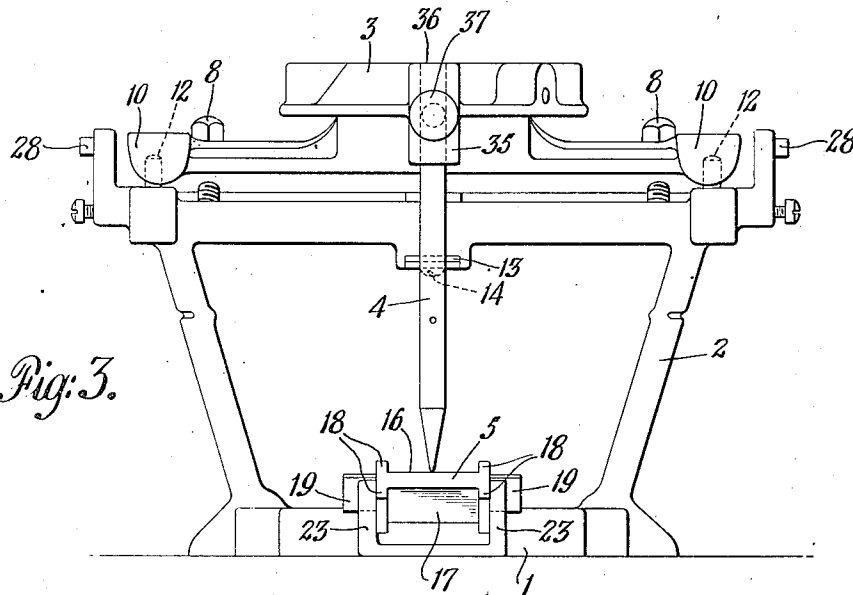


Fig. 3.

Fig. 4.

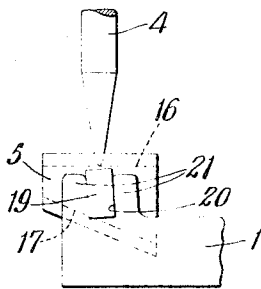


Fig. 5.

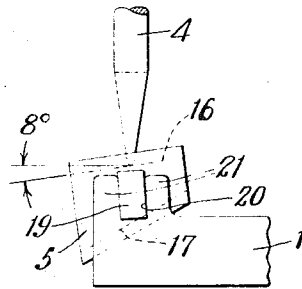


Fig. 6.

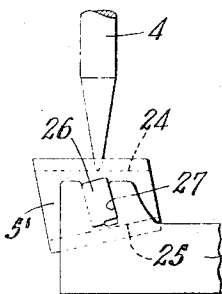
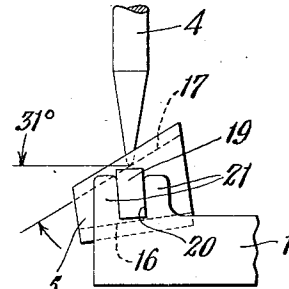


Fig. 7.

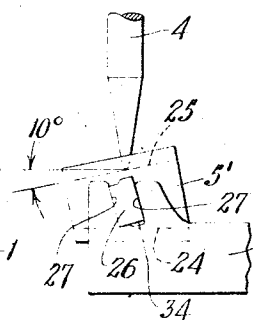


Fig. 8.

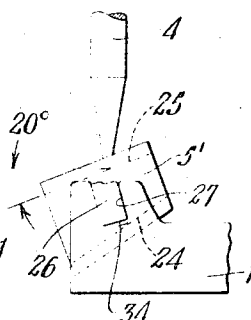


Fig. 9.

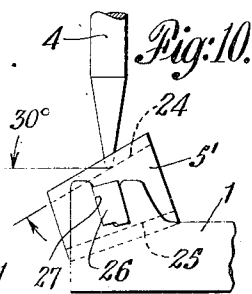


Fig. 10.

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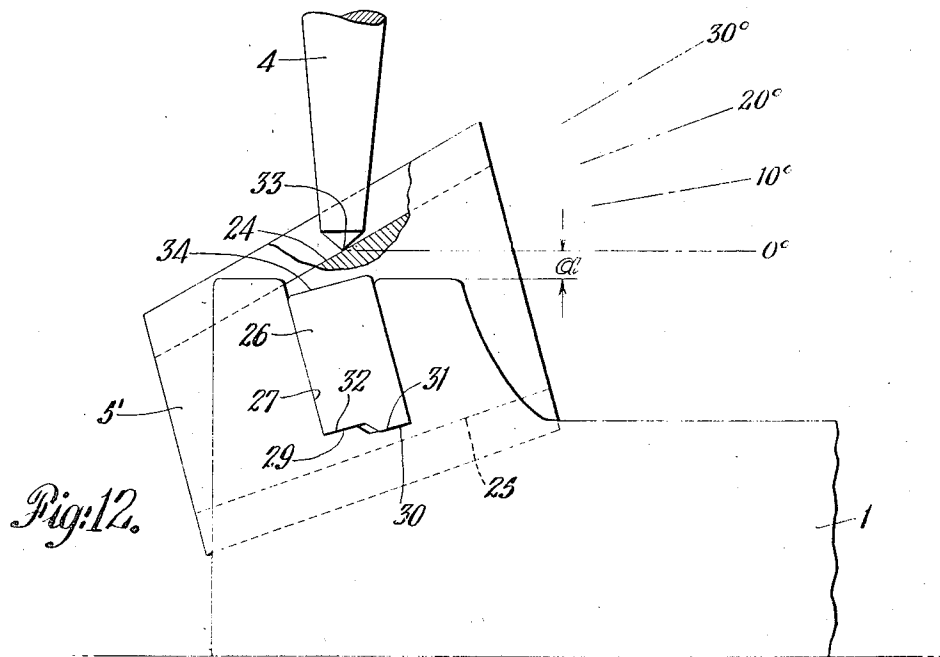
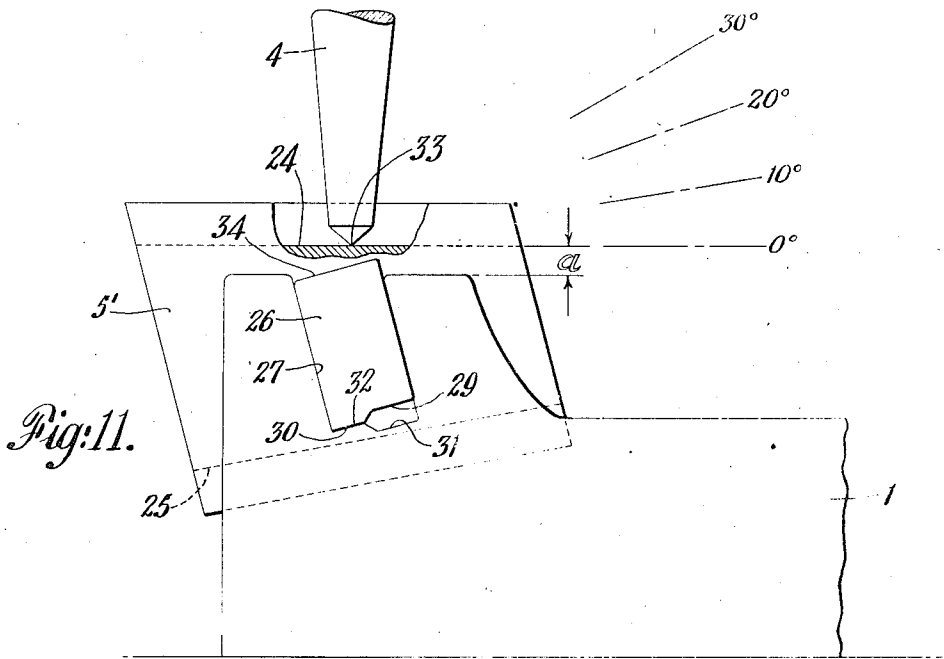
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DENTURE ARTICULATOR

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3 Sheets-Sheet 3



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## UNITED STATES PATENT OFFICE

2,389,101

## DENTURE ARTICULATOR

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Application April 7, 1945, Serial No. 587,186

9 Claims. (Cl. 32—32)

The invention relates to dental articulators employed in denture prosthesis for arranging the teeth in harmony with average mandibular movements or with the mandibular movements of the individual.

Articulators are designed to reproduce as nearly as possible the movements of the human mandible. Some of these instruments are permanently adjusted to average movements. Others are partially or fully adjustable. As the movements of the mandible are quite complex, designers of dental articulators have been compelled to devise elaborate mechanisms in order that these complex movements may be reproduced as faithfully as possible. Articulators of the type which are permanently adjusted to average movements have a fixed incisal table, whereas the partially or fully adjustable type generally has an adjustable incisal table. However, the incisal table adjusting mechanisms heretofore known or used have been subject to a number of disadvantages. They have been quite complicated in construction, requiring a high degree of knowledge and skill for correct operation, as well as being expensive to manufacture. This is true, for example, of one of the best designs of articulator now on the market, which has an incisal table with a pivotal mounting which carries a degree quadrant, and which has locking means for holding the table in various positions of angular adjustment. It is an object of my invention to provide an articulator having a simplified incisal table adjustment which is both less expensive to manufacture and which can readily be manipulated by the least experienced laboratory technician to give a variety of predetermined angular adjustments of high precision, and which is adapted for incorporation in the design of articulators of all of the types mentioned above.

Other objects and advantages of my invention will appear as the description proceeds. In the drawings:

Fig. 1 is a side elevational view of a preferred form of my improved articulator.

Figs. 2 and 3 are top plan and front elevational views of the same.

Figs. 4, 5 and 6 are detail views of the incisal table construction, showing its several positions of adjustment for cooperation with the incisor guide pin during movement of the upper bow in reproducing or simulating movements of the human mandible.

Figs. 7, 8, 9, 10 are detail views of a modified construction providing an additional range of adjustment.

Figs. 11 and 12 are enlarged diagrammatic views of the modified construction, illustrating the manner in which the engaging elements of the table and lower bow cooperate to maintain the same elevation of the center of the table for all angular adjustments of the table.

In its general arrangement, the articulator comprises a lower model bow 1, frame 2, upper model bow 3, and an incisor guide pin 4 which cooperates with an incisal table member 5 carried by the lower bow.

The upper and lower bows have apertures 6 in which the plaster models of upper and lower dentures are mounted. (Other well known means for mounting the models may be employed.) The frame 2 is fixed to the lower bow, as by the screws 7.

The upper bow is pivotally mounted on the frame in such a manner as to reproduce or simulate the movements of the human mandible when the upper bow is moved with the incisor guide pin in contact with the incisal table. To this end the upper bow is provided with a pair of pivot pins or screws 8 engaging arcuate depressions 9 in the top of the frame 2 to provide movable rotation centers between the upper bow and frame.

Relative movement between the upper and lower bows is controlled further by an approximate functional reproduction of the human condyles and glenoid fossae. For this purpose the upper bow is provided with a pair of forwardly and downwardly extending ears 10 having arcuate lower surfaces 11 simulating glenoid fossae and arranged for slidable engagement with the upper ends of the respective pins 12 simulating the condyles. Relative movement between the upper and lower bows and the jaw or jaws carried thereby is controlled in part by the condyle path predetermined by the disposition of the glenoid fossae 11 and the condyle pins.

A spring 13 secured to the frame 2 as by a screw 14 may be provided to urge the bows together. This spring may further be arranged for cooperation with a surface 15 on the upper bow to hold it in a raised position during mounting of the models or in making adjustments in the dentures.

The pivotal construction which I have described forms no part of the present invention except as utilized in conjunction with my novel incisal table construction, and it will be understood by those skilled in the art that other well-known constructions may be employed for simulating the action of the human condyle and

glenoid fossa with suitable adjustment thereof, as may be desired.

We come now to the incisal table construction to which my invention is more particularly directed. Adjustment of the angular disposition of the incisal table controls the overbite and is used to advantage in modifying cusp inclinations to increase denture stability. Posterior teeth of various cusp inclinations are in common use today, for example, those which are generally known as 20°, 30°, and 45° posteriors. The proper incisal table angle is determined with relation to the cusp angle, and also with relation to the condyle inclination, whether the latter is fixed or adjustable. With a fixed, or average, condyle inclination, a chart can be furnished showing the correct table angle for each cusp inclination. With an adjustable condyle inclination, determination of the desirable table inclination can be determined in accordance with conventional practice.

Assuming an average condyle inclination, a tabulation can be worked out showing the correct incisal table angle for various average cusp angles.

I will first describe my incisal table construction with more particular reference to the embodiment illustrated in Figs. 1 to 6, inclusive, which is adapted to adjustment of the table angle to three predetermined positions, for example, 0°, plus 8°, and plus 31°. Other combinations of angles can be used. The incisal table member 5 comprises a block which preferably is made of metal and has incisal table surfaces 16 and 17 on opposite sides thereof arranged at an acute angle to one another. Lateral flanges 18 extending vertically at the edges of the incisal table surfaces serve to limit the extent of the lateral movement of the incisor guide pin. Cooperating engaging elements are provided on the incisal table block and lower bow, respectively, arranged for mounting the block on the lower bow in a plurality of predetermined fixed positions selectively to place the opposed incisal table surfaces 16 and 17 at various angles to the horizontal. In the preferred embodiment I illustrated, these cooperating engaging elements take the form of laterally projecting lugs 19 at the ends of the block and a complementary pair of slots 20 in the lower bow arranged to receive the lugs in normal, reversed and inverted positions—i. e., in at least three predetermined fixed positions so as to bring the opposed incisal table surfaces 16, 17 to at least three predetermined fixed angles to the horizontal.

As illustrated, the laterally projecting lugs 19 are generally rectangular in form so as to provide parallel flat surfaces engaging the complementary flat surfaces on the upstanding ears 21 defining the sides of the slot 20. The angular disposition of the complementary engaging surfaces of the block and lower bow, in conjunction with the angular disposition of the incisal table surfaces, determines the incisal table angle. For example, in the specific embodiment I have illustrated, the lugs 19 are set at an angle of 86° to the incisal table surface 16 of the block and the slots 20 are set at an angle of 86° to the plane of the lower bow, i. e., to the horizontal, so that when the block is assembled with the bow in the manner shown in Fig. 4, there is provided an incisal table which is parallel to the lower bow, or the angle of which may be said to be 0°. By removing the block 5 and reversing it anteriorly-posteriorly by rotating 180° about its vertical axis so that the

incisal table surface 16 remains uppermost, and then reinserting the block into the bow, we obtain a predetermined incisal table angle of 8° as shown in Fig. 5. Again, by lifting the block from the slots when in the position shown in Fig. 5 and inverting it by turning about a horizontal axis to bring the surface 17 uppermost and replacing the block in the bow, we obtain (assuming an angle of 23° between surfaces 16 and 17) a predetermined incisal table angle of 31° as shown in Fig. 6. This angle is determined by the relative disposition of the lugs and slots and the angle between the surfaces 16 and 17. Thus it will be seen that with only two incisal table surfaces there are provided a total of at least three predetermined fixed incisal table angles.

The angles preferably are marked on the incisal table surfaces in such a manner that as the operator faces the articulator and looks down at the table, the angular marking which he reads will correctly show the table setting. Thus the surface 16 will have two markings "0 degrees" and "8 degrees," each written near one edge of the surface, and having the base of the letters toward the edge. Thus, as the operator looks at the table, one of the degree markings will be inverted and the other will be right side up, and the one which is right side up will always give the true reading for the table angle. This will eliminate any possibility of confusion or errors in setting.

It will be observed that the lower bow 1 is recessed as at 22 so that the block is positioned between the vertical walls 23 forming the sides of this recess.

The modified construction shown in Figs. 7 to 12, inclusive, provides an additional range of adjustment of the incisal table angle, the angular disposition of the lugs and slots and the angle between the two incisal table surfaces 24 and 25 of the block 5' being selected to provide predetermined incisal table angles of 0°, plus 10°, plus 20°, and plus 30°. In the exemplified form of this embodiment, the lugs 26 are arranged at an angle of 85° to the incisal table surface 25, the slots 27 are arranged at an angle of 75° to the plane of the lower bow, i. e., to the horizontal, and the angle between the surfaces 24 and 25 is 10°, so that when the block is assembled with the bow in the manner shown in Fig. 7, there is provided an incisal table which is parallel to the bow, or the angle of which may be said to be 0°. By lifting the block 5' from the slots when in the position shown in Fig. 7 and inverting it by turning about a horizontal axis to bring the surface 25 uppermost and replacing the block in the bow, we obtain a predetermined incisal table angle of 10° as shown in Fig. 8. Again, by lifting the block from the slots when in the position shown in Fig. 8 and reversing it anteriorly-posteriorly by rotating 180° about its vertical axis so that the incisal table surface 25 remains uppermost and then reinserting the block into the bow, we obtain a predetermined incisal table angle of 20° as shown in Fig. 9. Finally, by lifting the block from the slots when in the position shown in Fig. 9 and inverting it by turning about a horizontal axis to again bring the surface 24 uppermost and replacing the block in the bow, we obtain a predetermined incisal table angle of 30° as shown in Fig. 10. These various angles are determined by the relative disposition of the lugs and slots and the angle between the surfaces 24 and 25. In this embodiment, with only two incisal

table surfaces, there are provided a total of four predetermined fixed incisal table angles.

With particular reference to Figs. 11 and 12, I will now describe an important feature of my preferred construction in which the engaging elements of the table and lower bow cooperate in such a manner as to maintain a uniform elevation of that point of the table engaged by the incisor guide pin when the latter is at its center position or position of rest, for all angular adjustments of the table. This is important in order that the upper and lower bows may be maintained in parallelism, again speaking with reference to the center position of the guide pin on the table.

In my preferred articulator design this is accomplished by so constructing the lugs on the block 5' and the slots in the lower bow 1 that the lugs will extend farther into the slots when the table is adjusted to one angle than they will when the table is adjusted to another angle as by reversing the table anteriorly-posteriorly. Thus, when the block is adjusted to give an incisal table angle of 0° as shown in Fig. 11, the lugs are maintained in a higher position in the slots than when the block is reversed to obtain a table angle of 30° as shown in Fig. 12. For this purpose the bottom of the lugs as viewed in Fig. 11 are stepped, as at 29, so that the forward parts 30 of the bottom surfaces are lower than the rearward parts 29. The terms "forward" and "rearward" are here used only with reference to what we may term the normal position of the incisal table member shown in Fig. 11. The bottom of the slot 27 also is stepped as at 31 so that it is higher toward its forward portion 32 than at the rearward portion. A comparison of Figs. 11 and 12 will show that the lugs 26 extend farther into the slots when the incisal table is in the position shown in Fig. 12 than they do when the table is in the position which we have termed the normal position. The height of the steps 29 and 31 is proportioned in such a way as to maintain a given central point 33 of the surface of the table at the same height for both the normal position of Fig. 11 and the reversed position of Fig. 12. This may be observed by noting that the height of the point 33 above the top of the lower bow is the same in both views, as shown at *a*.

Figs. 11 and 12 show the extreme positions of the particular incisal table arrangement here selected for the purpose of illustration. These extreme positions are the ones which would cause the greatest difference in the elevation of the given central point 33 of the surface of the table in the absence of the provision of the particular structure which I have just described. The two intermediate positions of 10° and 20° illustrated in Figs. 8 and 9 are close enough that the height of this given central point is substantially the same for the two positions. Hence it may not be necessary to provide a step in the top surface 34 of the lugs (34 is the lower surface as viewed in Figs. 8 and 9). However, wherever a disparity between the height of the given central point 33 becomes apparent between two reversed positions of the block, means similar to that shown for the 0° and 30° positions may be provided in order to insure that the incisor guide pin 4 will remain at the same elevation for the two positions, keeping the upper and lower bows in parallelism.

It may be observed here that Figs. 7 and 10 (corresponding to Figs. 11 and 12) represent reversed positions of the block with incisal table

surface 24 uppermost whereas Figs. 8 and 9 represent reversed positions of the block with incisal table surface 25 uppermost, "reversed" having reference to reversal anteriorly-posteriorly as accomplished by rotating the block 180° about its vertical axis.

A further adjustment between the upper and lower bows is provided by the sliding engagement between the incisal guide pin 4 and the sleeve 35 through which it extends. Normally, the pin is positioned with its upper end flush with the top of the upper bow 3 at 36, but this adjustment may be varied where desired by loosening the set screw 37 and sliding the pin a little one way or the other, locking it in its adjusted position by means of the set screw.

The projecting lugs 19 or 26 of the incisal table member may extend flush with the outer surface of the vertical walls 23 of the lower bow, although I prefer that they extend beyond these walls as shown in Fig. 3, for the lugs should have a snug fit with the slots, and in removing the incisal table member from the bow, it may be found advantageous to tap the under sides of the lug extensions with a mallet to assist in removal.

If desired, the articulator may be provided with means for attaching a face bow in pivotal relationship to the frame, such as the trunnions 28. It will be understood by those familiar with this art that other well-known features of articulators may be embodied as may be desired. The terms and expressions which I have employed are used in a descriptive and not a limiting sense, and I have no intention of excluding such equivalents of the invention described, or of portions thereof, as fall within the purview of the claims.

I claim:

1. In an articulator, an incisal table member comprising a block having incisal table surfaces on opposite sides thereof arranged at an acute angle to one another, a lower bow, and cooperating engaging elements on the block and lower bow respectively, arranged for mounting the block on the lower bow in a plurality of predetermined fixed positions selectively to place the opposed incisal table surfaces at various angles to the horizontal.

2. In an articulator, an incisal table member comprising a block having incisal table surfaces on opposite sides thereof arranged at an acute angle to one another, a lower bow, projecting lugs at the ends of the block, and slots in the lower bow arranged to receive the lugs in normal, reversed and inverted positions selectively to place the opposed incisal table surfaces at various angles to the horizontal.

3. In an articulator, an incisal table member comprising a block having incisal table surfaces on opposite sides thereof arranged at an acute angle to one another, a lower bow, a pair of laterally projecting lugs at the ends of the block, and a complementary pair of slots in the lower bow arranged to receive the lugs in a plurality of predetermined fixed positions.

4. In an articulator, an incisal table member comprising a block having incisal table surfaces on opposite sides thereof arranged at an acute angle to one another, a lower bow, a pair of laterally projecting lugs at the ends of the block, and a complementary pair of slots in the lower bow arranged to receive the lugs in at least three predetermined fixed positions.

5. In an articulator, an incisal table member comprising a block having incisal table surfaces on opposite sides thereof arranged at an acute

angle to one another, a lower bow, and cooperating engaging elements on the block and lower bow respectively, arranged for mounting the block on the lower bow in normal, reversed and inverted positions selectively to bring the opposed incisal table surfaces to at least three predetermined fixed angles to the horizontal.

6. In an articulator, an incisal table member and a lower bow, cooperating engaging elements on the incisal table member and lower bow respectively, arranged for mounting the incisal table member on the lower bow in a predetermined fixed position and also in a second predetermined fixed position in which the incisal table member is reversed anteriorly-posteriorly from the first-named fixed position.

7. In an articulator, an incisal table member and a lower bow, cooperating engaging elements on the incisal table member and lower bow respectively, arranged for mounting the incisal table member on the lower bow in a predetermined fixed position and also in a second predetermined fixed position in which the incisal table member is reversed anteriorly-posteriorly from the first-named fixed position, the cooperating engaging elements on the incisal table member and lower

bow being constructed and arranged to maintain a given central point of the surface of the table at the same height for both of said positions.

8. In an articulator, an incisal table member and a lower bow, projecting lugs at the ends of the table member, and slots in the lower bow arranged to receive the lugs when the table member is in one position and when it is in an anteriorly-posteriorly reversed position selectively to place the surface of the incisal table member at different angles to the horizontal.

9. In an articulator, an incisal table member and a lower bow, projecting lugs at the ends of the table member, and slots in the lower bow arranged to receive the lugs when the table member is in one position and when it is in an anteriorly-posteriorly reversed position selectively to place the surface of the incisal table member at different angles to the horizontal, the bottom of the lugs and the bottom of the slots being stepped so that the lugs extend farther into the slots in the one position than in the other whereby a given central point of the surface of the table is at the same height for the different angles of adjustment.

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