July 14, 1931. C. FRITZENWALLNER 1,814,750

DENTAL ARTICULATOR

Filed May 2, 1928

Fig. 1.

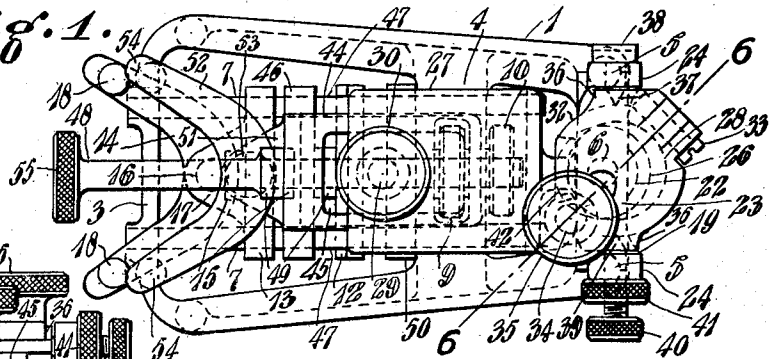


Fig. 2.

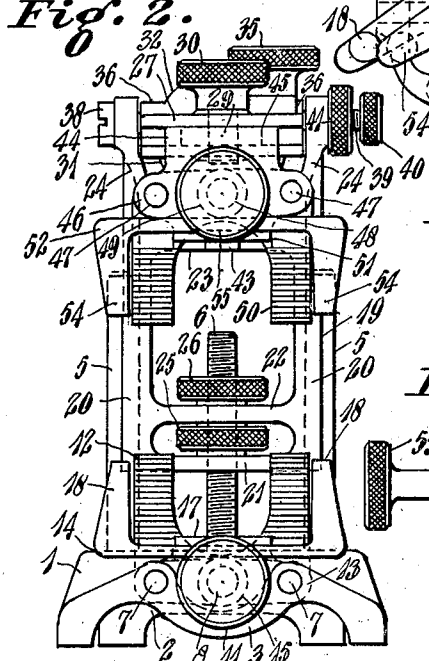


Fig. 5.

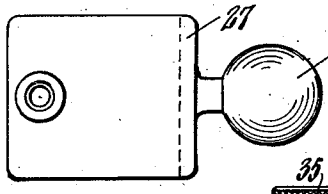


Fig. 3.

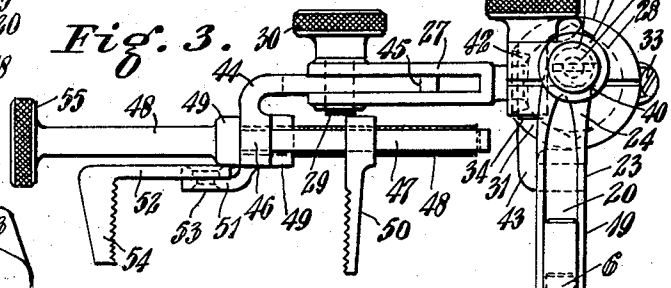


Fig. 4.

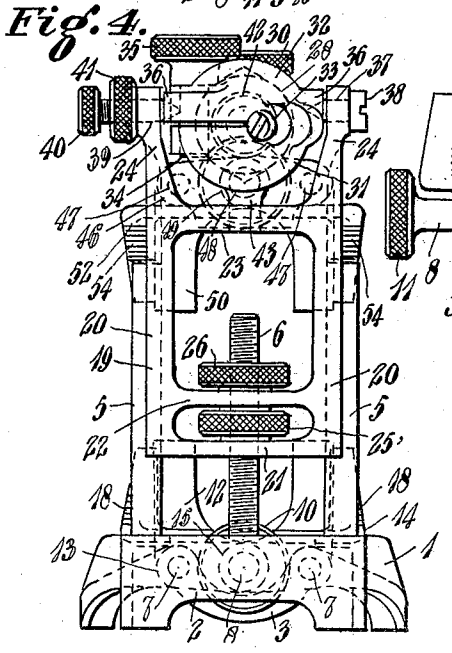


Fig. 7.

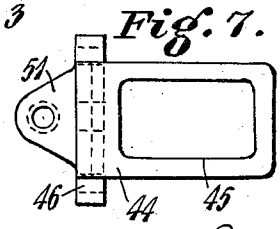
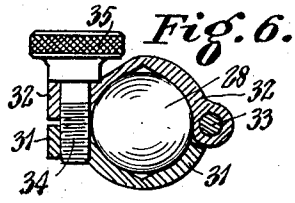


Fig. 6.



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UNITED STATES PATENT OFFICE

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DENTAL ARTICULATOR

Application filed May 2, 1928. Serial No. 274,506.

My invention relates to articulators used in fitting artificial teeth, bridges, crowns, etc., to the proper bite, with the aid of plaster casts taken from the patient's mouth; and more especially to the simpler forms of such apparatus directly performing such fitting, as distinguished from those involving certain amounts of mathematical calculation with reference to the anatomy of the face and jaws.

The object of my invention is to afford such a device which will be simple and reasonably inexpensive, as well as easy to understand and operate, permitting the work to be done more quickly than has been possible with articulators of this type as heretofore disclosed, and yet permit of the high degree of accuracy which the cases require. With this object in view, further objects are to have device light, yet amply strong, easy to adjust, yet rigid in every adjustment; and to avoid the necessity of setting the casts in plaster attachments to the articulator, as has been the usual practice, without reducing the accuracy of fitting. Other objects will appear in the course of the following description.

In the drawings:

Fig. 1 is a plan view of a device embodying my invention;

Fig. 2 is a front elevation of the same;

Fig. 3 is a side elevation of the same;

Fig. 4 is a rear elevation of the same;

Fig. 5 is a detail plan view of the upper arm;

Fig. 6 is a section of the ball-and-socket joint, on a vertical plane along the line 6—6 of Fig. 1;

Fig. 7 is a detail plan view of the upper slide.

The base 1 comprises front-to-rear side members joined at their rear ends by the back bar 2, at their front ends by the front bar 3, and some distance forward from their rear ends by the middle bar 4 which has a slot in its middle, vertically therethrough and lying transversely of the base. At respective rear corners posts 5 extend up, and midway between these posts a screw 6 extends up from the back bar 2. The front bar 3 inclines up from the side members to hubs in which the front ends of guide bars 7 are fixed, these bars having their rear ends fixed in the middle bar 4, and the front bar 3 curves down in its middle extent from one hub to the other to make room for the lower-jaw clamping and adjusting screw 8, the rear part of which is journaled in the middle bar 4 and has a nut 9 threaded on it in the slot of this bar 4, and a lock nut 10 threaded on it back of this bar 4; the front end of the screw 8 having a head 11 some distance forward from the front end of the base. The lower rear jaw 12 has bearings embracing the guide bars 7, and has the screw 8 threaded through it; this jaw 12 being forward of the middle bar 4. Forward of this jaw 12 is the carrier 13 for the front lower jaw 14; this carrier having bearings embracing the guide bars 7, and the screw 8 having a journal bearing therein, with collars 15 at front and rear of the carrier. The lower front jaw 14 comprises a U-shaped bottom part, the middle of which has a pivot 16 connecting it to an ear 17 extending upward and then forward from the carrier 13, and upstanding grippers 18 fixed to the front ends of the bottom part, with their inner or rear sides corrugated, as are also the front sides of the upper prongs of the rear jaw 12.

The vertical slide 19 comprises side members 20 with longitudinal grooves receiving the posts 5 of the base 1, two lower cross bars 21 and 22, an upper cross bar 23, and arms 24 extending up from the side members 20 above the upper bar 23. The lower bars 21 and 22 are widened and apertured at their middles for passage of the screw 6, on which are threaded nuts 25 and 26, one between these bars and the other above the upper one of them.

The upper arm 27 is broad and flat, with a slot opening out through its side and front edges; its closed rear edge having at its middle a neck connecting it with a ball 28. Near its front end, at its middle, this arm has a clamp screw 29 with a head 30 on its upper end, having a hub on its under side bearing against a boss on the top of the arm 27, through which the screw 29 passes loosely to thread into the bottom part of the arm. To

clamp the ball 28, a lower socket member 31 and an upper socket member 32 are hinged together by the screw 33, at the rear and at one side; and at the front and at the opposite side a clamp screw 34 passes down through ears on the respective members 31 and 32, being threaded in the lower one and passing loosely through the upper one, with a head 35 having a hub on its lower side to bear on the ear of the upper member 32. At its extreme lateral sides this upper member 32 has bosses 36 with conical sockets opening laterally outwardly; the one at the hinge side receiving the conical end of a screw 37 screwed in through the adjacent arm 24 of the vertical slide 19 and having its head 38 locking against the outside of this arm, while the opposite boss 36 receives in its socket the conical end of a screw 39 threaded in through the opposite arm 24 of the vertical slide 19 and having a head 40 some distance out from this arm and receiving a lock nut 41 between this head and the arm, to be locked against the arm. The front side of this pair of sockets thus held together and mounted has an aperture 42 through which the neck extends forward from the ball 28 held in the socket members, considerably larger than the neck, allowing the arm 27 to swing in any direction when the members 31 and 32 are unclamped from the ball 28. The lower socket member 31 has a stop lug 43 projecting down from its front side just below the aperture 42, adapted to engage with the upper cross bar 23 of the vertical slide and thus limit downward swinging of the front parts of the socket members, with the screws 37 and 39 as pivots or trunnions; and, consequently, such swinging of the arm 27 when clamped by these members as just described.

The upper slide 44 comprises the upper rear flat part fitting in the slot of the upper arm 27 and having a slot 45 down through it wide and long enough to permit the slide to move considerable distances sidewise and endwise before engaging the clamp screw 29 passing down therethrough from the upper to the lower part of the arm 27, and a front downward extension 46, the lower parts of which are inverted duplicates of the lower front jaw carrier 13, with lateral end bosses in which are fixed the front ends of guide bars 47, and a middle journal bearing for the upper jaw clamp screw 48 having collars 49 at front and rear of the extension 46 and being threaded through the upper rear jaw 50, which is an inverted duplicate of the lower rear jaw 12, having bearings embracing the guide bars 47 and having the front sides of its downwardly projected prongs corrugated. The ear 51 of the extension 46, extending downward and then forward, supports the upper front jaw 52, which is an inverted duplicate of the lower front jaw 14, having in its middle the pivot 53 connecting it to the ear 51, and having projecting down from its front ends the grippers 54 with their rear or inner sides corrugated. The front end of the upper jaw clamp screw 48 has a head 55.

Operation:—The lower plaster cast, or model, is clamped by the jaws 12 and 14, with its bottom resting on the ear 17 and adjacent bottom parts of the jaw 14, with the corrugations of the jaw 12 and grippers 18 cutting into the sides of the model; this being effected while the rear lock nut 10 is loose, allowing the screw 8 to be turned to draw the rear jaw 12 forward. In the same manner, the upper model is clamped by the jaws 50 and 52, with its top up against the ear 51 and adjacent parts of the jaw 52, with the corrugations of the rear jaw 50 and of the front grippers 54 cutting into the sides of the model; this being effected by turning the screw 48 to draw the rear jaw 50 forward. In either case, the collars 15 of the lower screw 8, or 49 of the upper screw 48, prevent endwise motion of the screw relative to the front jaw 14 or 52, compelling the rear jaw 12 or 50 to approach the front jaw.

This clamping of the models is done without especial attention to accuracy of relation of the models to each other; the only necessary precaution at this stage of the operation being to see that each model is rigidly held by the jaws, so as not to slip during or after the subsequent accurate adjustments performed by the other parts of the device. This being done, the models now may be brought into correct relation as regards front to rear direction. The lower model may be moved forward or rearward by means of the nut 9 held from front-to-rear movement in the slot of the middle bar 4 of the base, and, when turned, moving the screw 8 and the jaws 12 and 14 and the model held thereby. Any such adjustment thus made may be maintained by locking the lock nut 10 against the rear of the base bar 4. Forward and rearward, as well as lateral, adjustment of the upper model is effected by sliding the slide 44 in the slot of the arm 27 while the clamp screw 29 is loosened; and may be maintained by tightening this screw. The models may thus be brought into approximately correct anterior-posterior relation, whether the patient have the upper teeth projecting forward of the lower, or even with, or to the rear of the lower teeth; and the lateral adjustment of the upper model permits the models to be brought into approximately correct relation as regards lateral direction. Pending the further adjustments, the lock nut 10 and clamp screw 29 should be left loose or only slightly tightened; as during these, the final accurate anterior-posterior and lateral adjustments will be effected. These further adjustments may be described as the anterior-posterior and lateral inclinations of the up-

per model to the lower model; and the final accurate adjustment will involve a combination of these inclinations, in turn combined with the anterior-posterior and lateral adjustments horizontally, as well as adjustment of the upper model vertically to or from the lower model as called for by the other adjustments, until the teeth of the two models nicely fit the bite obtained from the patient, as is well understood in the art.

The mounting of the upper arm 27 on the vertical slide 19 by the ball-and-socket joint permits the upper model, held on this arm, to be swung up or down, or tilted laterally; and vertical adjustment of the slide 19 by means of the nut 25 compensates for any approach or recession of the upper model relative to the lower model incident to such swinging or tilting. The ball-and-socket connection also permits sidewise swinging, which is a lateral adjustment which may be used in addition to or in conjunction with that afforded by the slide 44 in the arm 27; the latter also being available for angular adjustment of the upper model in a transverse plane, or in conjunction with the same kind of adjustment permitted by the ball-and-socket connection.

After all necessary adjustments have been made, by any or all of the above means, they may be fixed by clamping the slide screw 29, the ball-and-socket screw 34, and the lock nut 26 of the vertical slide 19; as well as the lock nut 10 of the lower jaws. The models may be swung apart with the screws 37 and 39 as pivots, and when swung together again their degree of approach will be maintained by the engagement of the stop lug 43 with the vertical slide top bar 23; and this pivotal mounting may be kept firm by the adjustment of the screw 39 inward and locking it with the nut 41, thus affording means for taking up the wear at these pivots. Removal of the models from the device requires only the loosening of the jaws by reverse turning of the screws 8 and 48.

It is readily seen that this simple clamping and unclamping of the models requires much less time than setting them in plaster on the articulator; but this would not be the case in the absence of the universal adjustments provided, including the vertical adjustment together with the ball-and-socket pivoting, because too much care would be necessary to clamp the models with the required accuracy in the jaws, and in many cases would prove practically impossible. Rigidity of the parts, and of the clamping, is necessary for the required accuracy; and I have provided for this by careful location of the parts relatively to each other.

By pivoting the front jaws 14 and 52 on their carriers, for lateral swinging, I permit these to adjust their grippers 18 and 54 automatically to the rounded front edges of the plaster models; the fixed transversely straight rear jaws 12 and 50 having to contact with the usually concave rear edges of the models. The heads 11 and 55 of the jaw clamping screws are placed at the front, where most easily accessible, yet below and above, respectively, the models which they clamp, and thus not obstructing access to these for observing the fitting and making the necessary alterations in course of fitting. The nuts 9 and 10 concerned in adjusting the lower model forward or backward are easily accessible when the device is tipped back, which is the customary position in which such devices are held while being worked upon. The nuts 25 and 26 for vertical adjustment are easily accessible at any position of the device; and the ball-and-socket clamp screw 34, placed forward from the trunnion arrangement at the screw 39, may be made amply large for the firm clamping of the ball-and-socket connection without interfering with or limiting the size of the trunnion arrangement; this also being true of the hinge connection, at the rear and opposite side, with respect to the opposite trunnion arrangement. These various provisions permit rigidity and strength without complication or undue weight; and lightness, for ease of handling, is an important property of an articulator, which I have afforded although adding to the number of adjustments possible, and thereby to the ease of accurate operation. I have found that with my articulator from five to ten minutes time may be saved per case, in addition to the reduced liability to making inaccurate fittings owing to the ease of adjustments.

Modifications may occur, and while I have disclosed somewhat specifically a preferred example of my invention, I do not wish to be limited to such precise disclosure, but what I claim as new and desire to secure by Letters Patent is:

1. In a dental articulator, a pair of jaws to clamp a model, a screw journaled in and held against axial movement relatively to one jaw and threaded to the other jaw, a support on which said jaws are slidable in the direction of the axis of said screw, a nut threaded on said screw, means on said support preventing axial movement of said nut, whereby said jaws and screw may be slid along said support by turning said nut, and means for holding another model for fitting to the model held by said jaws.

2. In a dental articulator, a pair of jaws, a slotted arm, a slide in the slot of said arm and having one of said jaws mounted thereon, a screw journaled in and held against axial movement in said slide, a guide element on said slide, parallel to said screw, the other jaw being slidable on said guide element and said screw being threaded to said other jaw, and means for holding another model for fitting to the model held by said jaws.

3. In a dental articulator, two pairs of jaws, each to clamp a model, a ball supporting one pair of jaws, a socket to hold said ball, a slide in which said socket is trunnioned at opposite sides of said ball, a support for the other pair of jaws, and means on said support under said ball whereby the pairs of jaws may be adjusted rectilinearly to and from each other.

4. In a dental articulator, a trunnioned socket comprising sections hinged together beside one trunnion and clamped together beside the other trunnion, a ball clamped by said sections, and means connected to said socket and said ball, respectively, for holding models to be fitted to each other.

5. In a dental articulator, a support, posts on said support, a slide guided between said posts, a screw on said support parallel with said posts, nuts threaded on said screw in clamping engagement with said slide, and means connected to said support and said slide, respectively, for holding models to be fitted to each other.

6. In a dental articulator, a base, parallel guides along said base, a screw between and parallel with said guides, a nut on said screw, means on said base preventing axial movement of said nut, a rear jaw guided on said guides and having said screw threaded thereto, a carrier in which said screw is journaled and prevented from movement axially relatively thereto, a front jaw pivoted to swing laterally on said carrier, posts on the rear of said base, a screw between and parallel with said posts, on said base, a slide guided between said posts, a nut threaded on said screw in engagement with said slide, socket sections hinged together, one section being trunnioned on said slide, means for clamping said sections together, an arm comprising a ball clamped between said sections and having a laterally and forwardly opening slot, a slide in said slot, means for clamping said slide in said slot, parallel guides along said slide, a screw between and parallel with said guides, journaled in said slide and prevented from movement axially relatively thereto, a rear jaw guided on said guides and having said screw threaded thereto, and a front jaw pivoted to swing laterally on said slide.

7. In a dental articulator, a base, parallel guides along said base, a screw between and parallel with said guides, a nut on said screw, means on said base preventing axial movement of said nut, a rear jaw guided on said guides and having said screw threaded thereto, a carrier on which said screw is journaled and prevented from movement axially relatively thereto, a front jaw on said carrier to clamp a model to said rear jaw, and means movably connected to said base to hold another model.

8. In a dental articulator, a base, parallel guides along said base, a screw between and parallel with said guides, a rear jaw threaded to said screw, a carrier in which said screw is journaled and prevented from axial movement, and a front jaw swinging on said carrier.

9. In a dental articulator, a base, means to hold a model on said base, posts on said base, a screw between and parallel with said posts, on said base, a slide guided between said posts, a nut threaded on said screw in engagement with said slide, socket sections hinged together, one section being trunnioned on said slide, means for clamping said sections together, an arm comprising a ball clamped between said sections, and means to hold a model on said arm.

10. In a dental articulator, two model-holding means, one comprising an upward extension, and the other comprising an arm movably connected to said extension and having a horizontally opening slot, a slide in said slot adjustable universally in a horizontal plane and means for clamping said slide in said slot.

CONRAD FRITZENWALLNER.