March 25, 1941. W. J. WILSON 2,236,204

ARTICULATOR

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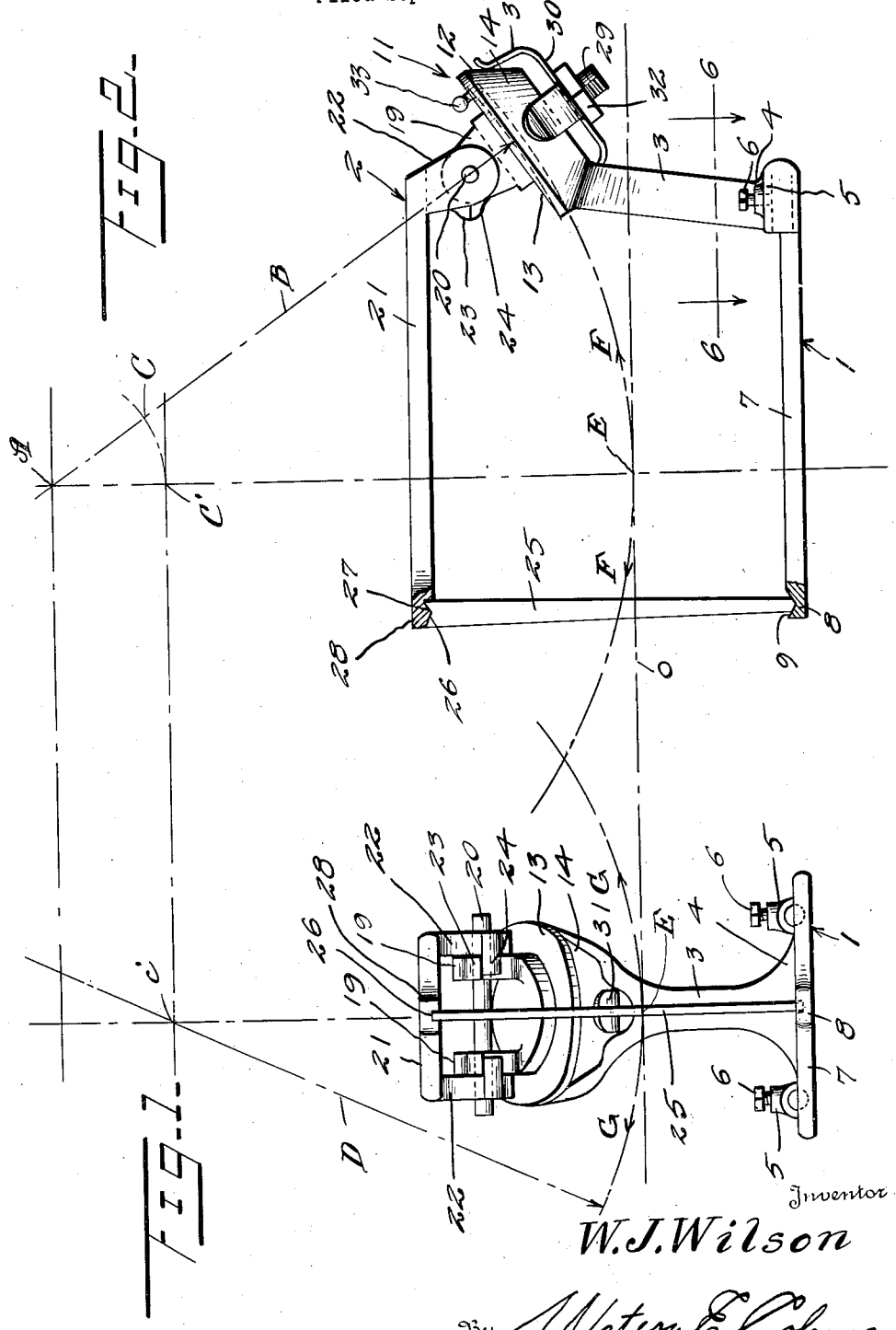


Fig. 2.

Fig. 1.

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Fig. 3.

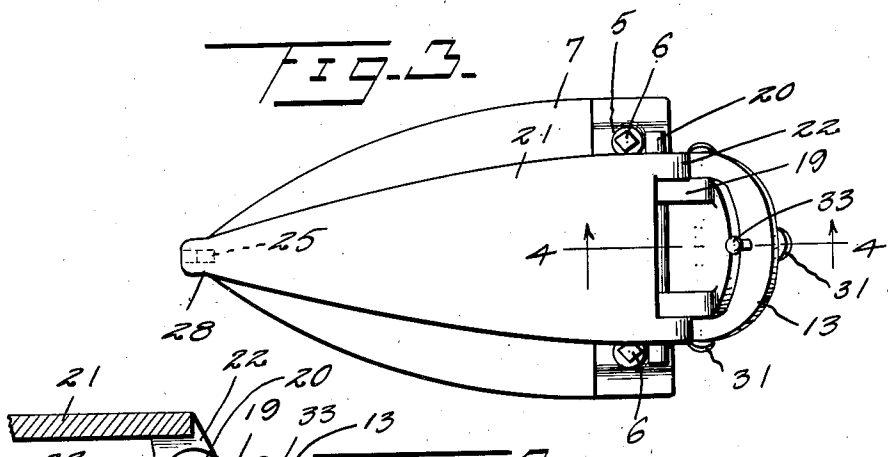


Fig. 4.

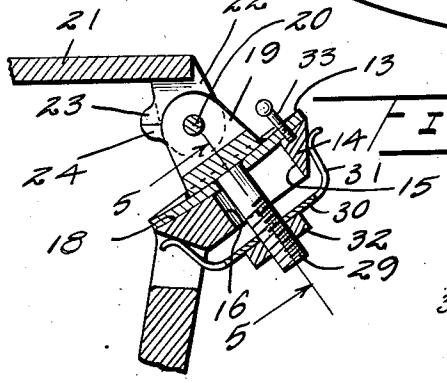


Fig. 5.

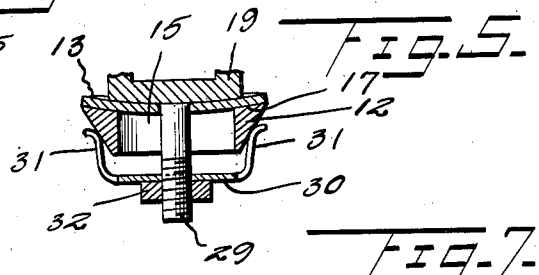


Fig. 7.

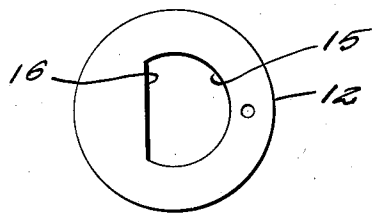


Fig. 6.

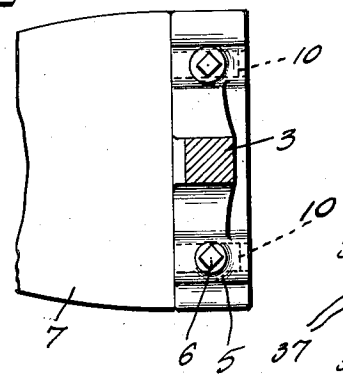
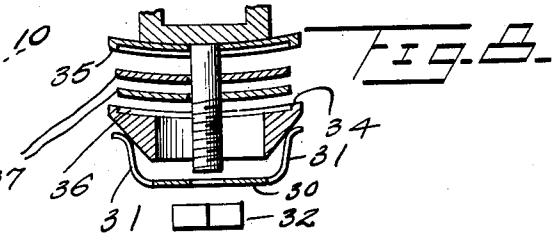


Fig. 8.



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Patented Mar. 25, 1941 2,236,204

UNITED STATES PATENT OFFICE

2,236,204

ARTICULATOR

Walter J. Wilson, Petersburg, Ind.

Application September 15, 1938, Serial No. 230,097

9 Claims. (Cl. 32—32)

This invention relates to the class of dentistry and pertains particularly to improvements in articulators.

The primary object of the present articulator is to provide a structure which is so designed that dentures set up thereon may be moved relatively along elliptic paths extending from the front to the back or mesio-distally and laterally or buccally in such a manner that the centers of the radii of the paths are in the central median line plane, the articulator being designed primarily for use in setting up dentures in which the posterior teeth have had the occlusal surfaces ground in a particular manner by means of a novel grinding apparatus which forms the subject-matter of my Patent No. 2,162,044 of June 13, 1939.

Another object of the invention is to provide an articulator in which the upper and lower cast holding portions are joined together by a novel articulating joint which is so designed that the teeth of upper and lower dentures may be moved along two curved paths which intersect in the central and median plane, one of which curved paths extends from the front to the back of the articulator while the other path extends transversely thereof, the first path having an arc of greater radius than that of the second path whereby the natural movements of the upper and lower teeth of the human jaws may be accurately simulated.

Still another object of the invention is to provide an articulator having a novel joint facilitating the making of the movements specified, wherein by certain adjustments slight changes may be made in the radii of the arcuate paths along which the upper and lower cast carrying portions of the articulator may be moved.

Still another object of the invention is to provide in an articulator of the above described character, a novel means of maintaining said joint tight at all times during the moving of the cast carrying portions of the instrument.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming part of this specification, with the understanding, however, that the invention is not to be confined to any strict conformity with the showing of the drawings but may be changed or modified so long as such changes or modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:

Fig. 1 is a view in front elevation of an articulator constructed in accordance with the present invention.

Fig. 2 is a view in side elevation of the same.

Fig. 3 is a view in top plan of the instrument.

Fig. 4 is a sectional view on the line 4—4 of Fig. 3.

Fig. 5 is a sectional view on the line 5—5 of Fig. 4.

Fig. 6 is a sectional view on the line 6—6 of Fig. 2.

Fig. 7 is a view in plan of one portion of the articulating joint.

Fig. 8 is a separated view of the joint showing inserted shims associated therewith for changing the radii of the arcs on which the cast carrying portions move.

Referring now more particularly to the drawings, the numeral 1 generally designates the lower portion of the articulator while the other portion which is moved relatively to the lower portion, is indicated as a whole by the numeral 2. The lower portion 1 of the articulator consists of a post or standard 3 the lower part of which has the lateral extensions 4, adjacent the outer end of each of which a pin receiving socket 5 is formed through a threaded aperture in which a set screw 6 is extended. The support or carrier for the cast of the lower denture comprises the elongated plate 7 which is relatively wide at its rear end tapers gradually to a point at its forward end, the pointed forward end being indicated by the numeral 8 and having a notch 9 in the top surface thereof and on a line extending medially longitudinally of the carriage.

The rear edge of the lower cast carrier 7 carries a pair of pins 10, each of which is adapted for engagement in a socket 5 so that the base, when disposed horizontally, maintains the post or standard 3 at a slight rearward inclination from the vertical.

At the upper end of the post 3 is an articulating joint indicated generally by the numeral 11 and consisting of a lower head portion 12 and an upper plate 13. The head and plate of the joint are preferably circular as shown, and the head is formed integrally with the upper end of the post 3 and is relatively thick, having the peripheral wall thereof downwardly tapering as indicated at 14. Through the center of the head 12 is an opening 15, one side of which is straight, as indicated at 16, the straight edge of the opening lying nearest to and transversely of the post 3.

The plate 13 forming the upper half of the joint 11 has a convex face 17 which is adapted to posi-

tion against the top face of the head 12 which is concave, as indicated at 18, and these opposing concave convex faces are formed on two arcs, one of which extends from front to rear or mesio-distally with respect to the articulator while the other one extends transversely or buccally and the mesio-distal arc is struck from a slightly greater radius than the transverse arc. The two contacting working surfaces of the bodies 12 and 13 are concave elliptic and convex elliptic and the concave elliptic surface is in a plane generated from a 5'' radius and the convex elliptic surface is in a plane generated from a 4'' radius, or from the points A and C, respectively, the planes being at right angles to each other which may be designated as at the point indicated by the arrow at the end of line B in the center of the joint 11. The generating point for the concave elliptic surface of the member or body 12 is at A and extends along the line B whereas the generating point for the convex elliptic surface of the body 13 is 1'' inwardly from the point A on the line B or at the point C. As stated in the first part of this application, the present articulator is designed for use in setting up dentures in which the posterior teeth have had the occlusal surfaces ground by a grinding apparatus forming the subject-matter of a separate application, and this grinding apparatus is designed for forming such tooth surfaces so that the cusps of the upper and lower teeth will have slight elliptic concave and convex surfaces formed on a curved outline. The line G passes through the occlusal plane at the lowest point of these curved cusp surfaces and at only one point, the occlusal plane being an arcuate surface and is the plane in which the teeth come in contact and is at right angles to the median line plane by which is meant an imaginary plane extending through the head and neck from front to back on the exact center dividing the body into two equal parts.

If the joint 11 were moved along the arc F—F, which is the plane of the concave elliptic surface of the body 12, so that the center of the joint coincides with E, then the radius point C will be at point C', which will be the center of the joint and in line with center A. The arc G—G of the 4'' radius D, which is perpendicular to the arc of the 5'' radius, as shown in Fig. 1, will intersect the arc F—F of the radius B in the occlusal plane 9. It would not matter where the joint 11 were positioned along the arc F—F as long as the movements were mechanically communicated to the casts by the rigid supports as the point E exists at any point along F—F so long as the joint remains on center and the centers stay in line at the intersection of the two planes while the joint is on center.

Considering the arcs F—F and G—G as sections of an elliptical solid, the center of the minor axis will be at the point C', the line A—E being the vertical center of the articulator. All movement radiates from point E, the center of the articulator and at the intersection of the major or 10'' axis forming the arc F—F with the minor or 8'' axis forming the arc G—G. In every case where an elliptic surface has been mentioned, it is intended that it be understood that this represents a portion of a surface of an elliptical solid. When a cast is in the articulator, any movement of the joint 11 is reproduced at E, and if such movement is along G—G, then the center A moves out of line, and if the movement is along F—F, then the center C moves out of line. If the movement of the point E is in any direction other than on G—G or F—F, then both centers A and C move from the median line. It will be understood that the occlusal plane of the teeth is tangent to the surface of the elliptical solid and the point E may be any point on G—G or F—F. Any point on the occlusal surface of the teeth will describe all movements which the joint makes.

If the occlusal surface should be raised ½'' above the point E and the case secured in the articulator, then the movement laterally would be on a 3½'' radius instead of a 4'' radius and the mesio-distal movement would be on a 4½'' radius instead of a 5'' radius and if the occlusal surface were lowered below E, both measurements would be ½'' greater. By this it will be seen that the design of the tooth produced with the said arcuate cusps may be changed and still set up in the present articulator.

The plate 13 has secured to the top thereof the pair of upstanding ears 19 between which extends a pivot pin 20. The upper cast carrier of the articulator comprises a plate portion 21 which is of substantially the same configuration as the cast carrier 7, as shown in Fig. 3, but is of less width than the lower carrier and at its rear it is provided with downwardly extending ears 22 which straddle the ears 19 and have the pivot pin 20 extended therethrough whereby the carrier 21 is connected with the joint 11 for vertical oscillation. The adjacent ears 19 and 22 have engaging lips 23 and 24, respectively, which limit the downward movement of the upper carrier 21. In addition to these movement limiting lips, there is provided a support 25, the lower end of which is pointed to engage in the notch 9 of the lower carrier while the upper end is notched, as indicated at 26, to receive the downwardly directed rib 27 formed in the underside of the upper carrier 21 at the outer or pointed end portion 28 thereof.

Formed integral with the ears 19 and passing through the plate 17 is a threaded stud 29 which passes obliquely downwardly through the substantially semi-circular opening 15 in the head 12. This stud extends through the central portion of a spring tensioning unit which is in the form of a plate 30 having integral resilient arms 31 which extend substantially perpendicularly to the side of the face nearest the head 12 for frictional engagement with the inclined or tapered surface 14 of the head and a securing nut 32 threaded on the stem 29 bears against the tension unit and, forcing the unit toward the head 12, constantly draws the plate 13 into tight engagement with the head.

The plate and head are provided with corresponding apertures for the reception of a retaining pin 33 which is employed to hold the parts on center while the dentist uses the pivot or hinge joint during the setting of the teeth.

In Fig. 8, which shows a cross-section of the articulating joint, the opposed head and plate are designated by the numerals 34 and 35, respectively, and have their opposing faces ground to have the same curvature as the opposing faces of the plates 12 and 13, but this view illustrates a means by which the joint may be made with removable plates to change the radii of the movement. This is accomplished by providing the opposing faces of the plate and head with recesses 36 in which the inserted plates 37 may engage, such plates being, of course, provided with opposing faces having the same curvature as the plate and head.

From the foregoing, it will be seen that the

joint 11 constitutes substantially a ball joint in which the two opposing surfaces are specially ground and provided with 5'' and 4'' radii at right angles to each other.

After the teeth have been set in the articulator, the movement of the upper portion 21 from front to rear will move the opposing teeth along the arc having the 5'' radius, thus giving a curved motion from front to rear along the path F—F. The lateral movement from side to side is on the 4'' radius through the path indicated by the characters G—G. This makes a combination of elliptic curves, the centers for both radii B and D being in the median line plane but during the action of the joint 11, the centers describe a halo of their own according to the movement being lateral or mesio-distal. The right and left mandibular joints have actually been combined into one joint and every motion is a combined curve or elliptic motion. The opening 15 in the head 12 limits the motion of the joint 11 which for practical purposes will never be more than $\frac{3}{16}$''. It also permits a distal movement simulating the retruded bite when all teeth are in contact.

The pin 33, previously referred to, is employed for rendering the joint 11 immovable as it is necessary for the dentist to have it while setting the teeth to an approximate outline, just using the opening and closing movement of the hinge 22 which is limited in its action by the lips 23 and 24. However, if there is very much pressure exerted on the upper and lower plates 21 and 7, the parts will give enough to make the set-up slightly inaccurate. The pin 25 would be in the way while making the set up and so provision is made for its removal while setting the teeth. After the anteror teeth are accurately arranged in the wax pattern and the posterior teeth are set approximately, the pin 33 is removed, the wax around the posterior teeth is warmed and the lower case is moved against the upper case guided by the movements of the joint 11 permitting the posterior teeth to take a position to conform to the several movements. The pin 33 is then re-inserted and pin 25 put into place as a check-up on any give or springing out of place which might have occurred during the setting up of the teeth. If necessary, the slight inaccuracy is adjusted with pin 25 in place. It will thus be seen that the pin 25 together with the pin 33 provide a means of checking up on any springing together which might occur between parts 7 and 21 in setting up the teeth.

What is claimed is:

1. An articulator, comprising vertically spaced upper and lower carriers and hinge means connecting said carriers and consisting of two members having contacting concave and convex faces, the said faces of the members each having right angularly related curved surfaces struck from vertically spaced points in the vertical median plane of the articulator and the hinge between the hinge and the front of the articulator, whereby the upper carrier may be moved in an arcuate path extending from the front to the rear of the articulator and in an arcuate path extending transversely thereof, the said arcuate paths intersecting in a plane lying between the upper and lower carriers, the said last plane corresponding to the occlusal plane for dentures on the carriers.

2. An articulator, comprising vertically spaced upper and lower carriers, and a pivotal connection between said carriers consisting of two bodies having coacting convex and concave faces arranged relative to the carriers so that the upper carrier may be moved in an arcuate path extending mesio-distally of the articulator and in an arcuate path extending buccally of the articulator, the said faces being so formed that the last-mentioned arcuate path has a shorter radius than the first, and both paths having their lowest parts at the point of their intersection.

3. An articulator, comprising vertically spaced upper and lower carriers, and a pivotal connection between said carriers consisting of two bodies having coacting convex and concave faces, the connection being disposed to have the radius line of said faces extending obliquely to a vertical line passing through the intersecting longitudinal and transverse centers of the carriers whereby the upper carrier may be moved in an arcuate path extending mesio-distally of the articulator and in an arcuate path extending buccally of the articulator, the mesio-distal arcuate path having a radius greater than the buccal arcuate path.

4. An articulator, comprising spaced upper and lower denture carriers, a post extending upwardly from the rear part of the lower carrier, a pivotal connection between the upper end of said post and the rear part of the upper carrier, said pivotal connection comprising upper and lower contacting members, said lower member having a concave upper face and the upper member having a convex lower face, the said contacting faces of the two members each being formed with two different curvatures, the arc of one curvature of each face extending mesio-distally of the articulator and the arc of the other curvature of each face extending at right angles to and having a shorter radius than the first arc whereby the said upper carrier may be given oscillatory motion through right angularly related arcs of movement having different radii.

5. An articulator, comprising a lower carrier body, a post extending upwardly from the rear part of said carrier body and inclined outwardly from the vertical, a circular body carried by said post and having an upper concave face, said circular body being in a plane inclined from the horizontal whereby the axial center thereof is directed upwardly toward and intersects an imaginary vertical line passing through said carrier body upon the longitudinal center thereof, said circular body having a relatively large aperture therethrough, a plate having a convex face conforming to the curvature of and engaging the concave face of the circular body, a threaded stud extending from said plate through said aperture, the aperture being materially larger than the stud to permit a relatively wide degree of movement of the stud relatively to the body in all directions from the center of the body, means engaging said stud upon the opposite side of the circular body from the plate and resiliently retaining the plate in contact with the circular body and permitting a limited circular movement of the plate on the body, and an upper carrier body connected with said plate.

6. An articulator, comprising a lower carrier body, a post extending upwardly from the rear part of said carrier body and inclined outwardly from the vertical, a circular body carried by said post and having an upper concave face, said circular body being in a plane inclined from the horizontal whereby the axial center thereof is directed upwardly toward and intersects an imaginary vertical line passing through said carrier body upon the longitudinal center thereof,

said circular body having a relatively large aperture therethrough, a plate having a convex face conforming to the curvature of and engaging the concave face of the circular body, a threaded stud extending from said plate through said aperture, the aperture being materially larger than the stud to permit a relatively wide degree of movement of the stud relatively to the body in all directions from the center of the body, means engaging said stud upon the opposite side of the circular body from the plate and resiliently retaining the plate in contact with the circular body, and an upper carrier body connected with said plate, the said contacting faces of the plate and circular body having a common arcuate curvature struck from a point on said imaginary vertical line and extending from the front to the rear of the articulator and said contacting faces having a common arcuate curvature struck from another and lower point on said vertical imaginary line and extending transversely of the articulator, the said arcs intersecting with said imaginary vertical line in the occlusal plane.

7. An articulator, comprising a lower carrier body, a post connected with and extending upwardly from said body, a head carried by said post, said head having an opening therethrough, a plate member, a ball-and-socket connection between said plate and said head, a pair of ears carried by said plate member, a pair of ears carried by said upper carrier body and disposed in side by side relation with the ears of said plate, a pivot pin coupling the ears of the plate and upper carrier body, said pivot being horizontal to permit vertical oscillation of the upper carrier body, a threaded stud integral with said plate and extending through the aperture in said head, said head having a tapered edge surface, a plate member having a central aperture and having laterally extending resilient legs, said stud extending through said aperture and said legs having their ends contacting the tapered surface of the head, securing means carried by said stud and engaging said last plate upon the opposite side of the same from the head whereby said first plate will be drawn into frictional contact with the head, and said first plate and head having their opposing surfaces of arcuate form whereby said upper carrier body may be oscillated along two right angularly related arcuate paths extending from the front to the rear and from side to side of said articulator, the said arcuate paths intersecting in a horizontal plane constituting the occlusal plane for dentures on the articulator carriers.

8. In an articulator having upper and lower carriers, a joint connecting said carriers and comprising two bodies one having a convex bearing surface and the other a concave bearing surface, means maintaining said bearing surfaces in contact, the said bearing surfaces being so constructed and arranged that the upper carrier may be oscillated in a long radius arc extending mesio-distally of the articulator and in a short radius arc extending laterally of the articulator, the said contacting bearing surfaces having curvatures struck from the same centers as said arcs, the arcs intersecting at the central part of the articulator in a plane lying horizontally between the carriers, the said last plane corresponding to the occlusal plane for dentures attached to the carriers.

9. In an articular having upper and lower carriers, a joint connecting said carriers and disposed in the area lying between the horizontal planes of the carriers and offset from the vertical center of the articulator, said joint comprising two bodies one having a convex bearing surface and the other a concave bearing surface, means maintaining said bearing surfaces in contact, the said bearing surfaces being so constructed and arranged that the upper carrier may be oscillated in a long radius arc extending mesio-distally of the articulator and in a short radius arc extending laterally of the articulator, the said contacting bearing surfaces having curvatures struck from the same centers as said arcs, the arcs intersecting at the central part of the articulator in a plane lying horizontally between the carriers, the said last plane corresponding to the occlusal plane for dentures attached to the carriers.

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