Dec. 10, 1968 E. J. CAYO 3,414,977

DENTAL ARTICULATOR

Filed Oct. 19, 1966 2 Sheets-Sheet 1

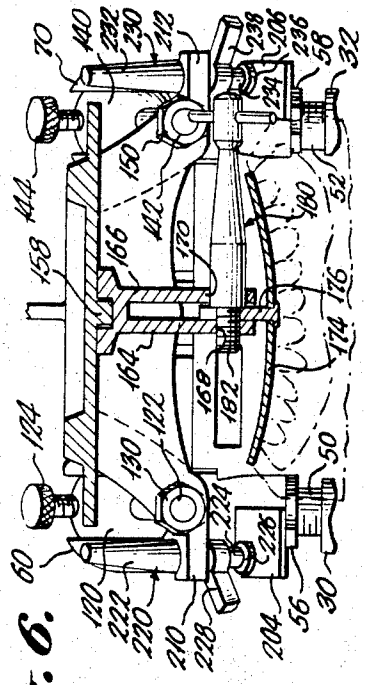


Fig. 6.

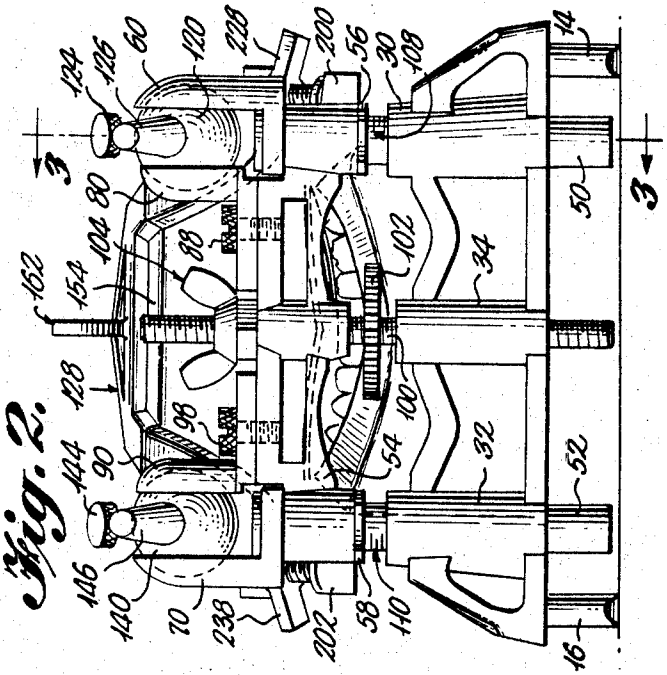


Fig. 2.

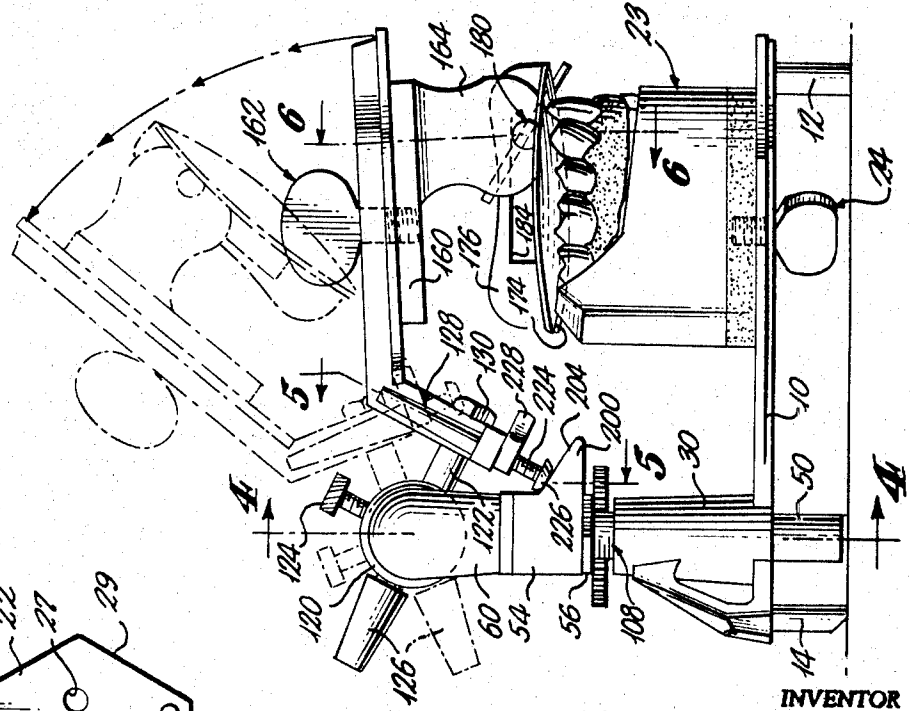


Fig. 1.

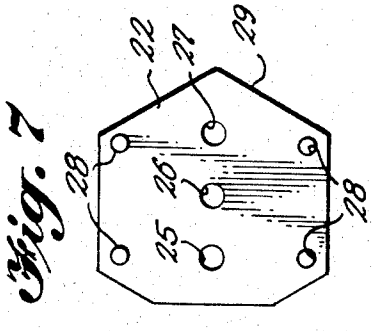


Fig. 7

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Fig. 3.

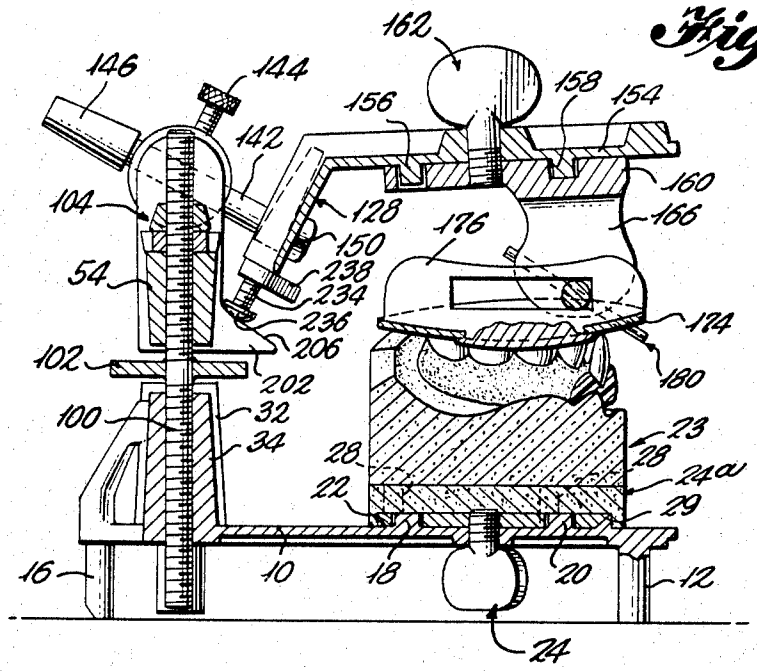


Fig. 4.

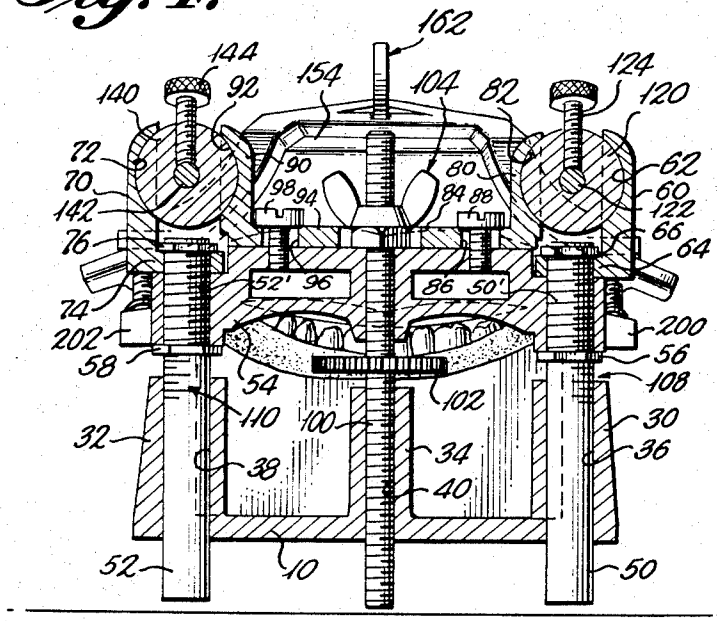
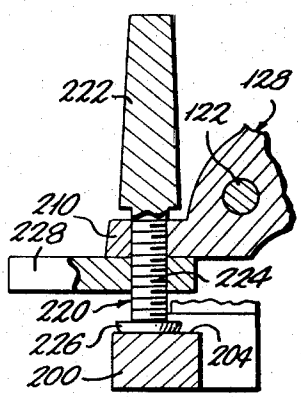


Fig. 5.



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DENTAL ARTICULATOR

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12 Claims. (Cl. 32—32)

The present invention relates to a new and novel dental articulator, and more particularly to an articulator for making and fitting artificial dentures.

The present invention represents an improvement over U.S. Patent No. 2,348,606. The articulator of the present invention is adapted to be utilized in the same manner as that illustrated in the aforementioned U.S. patent, the only difference in the operating procedure being the fact that the template of the present invention may be employed in a different manner from that suggested in the aforementioned patent. Otherwise, the same general steps of making and fitting artificial dentures may be followed.

The present invention represents an improvement over the aforementioned patent structure in providing adjustable stop means to limit the downward movement of the support means of the apparatus whereby such downward movement may be accurately predetermined. With this arrangement, the support means may be provided with a certain amount of swinging movement when setting up the teeth, and then the adjustable stop members may be adjusted so as to further limit downward movement of the support means so that it will not swing downwardly as far to thereby allow milling of the teeth to provide the finished product.

An additional novel feature of the present invention is the provision of an additional support socket member for each of the spherical fulcrum members. These additional socket members provide better alignment of the support means supported by such fulcrum members, and in addition, the socket members are adjustably mounted so that the degree of freedom of movement of the spherical fulcrum members can be readily varied as desired.

A further improved feature of the present invention is the provision of novel indicating means on particular portions of the apparatus which readily visibly indicates the exact spacing of the crosshead and support means of the structure with respect to the base means thereby enabling the spacing to be quickly and accurately adjusted.

Another feature of the present invention is the provision of a novel denture model including the unique mounting plate or platform which enables the plaster mounting of the model to be of thicker construction so as to prevent cracking thereof, and wherein the plate or platform is of such a construction as to provide a better mechanical interconnection with the plaster mounting.

An object of the present invention is to provide a new and novel dental articulator for making and fitting artificial dentures.

Another object of the invention is the provision of a dental articulator including adjustable stop means to adjustably limit the swinging movement of the support means of the apparatus with respect to the base means thereof.

Still another object of the invention is to provide a dental articulator including special support socket means for the spherical fulcrum members thereof to provide better alignment and to enable adjustment of the freedom of movement of such fulcrum members.

Yet another object of the invention is to provide means for readily indicating the spacing of the support means with respect to the base means.

Yet a further object of the invention is to provide a dental articulator which is simple and inexpensive in construction, and yet which at the same time is quite efficient and reliable in use.

A still further object of the invention is the provision of a novel denture model including a plate or platform therein which enables the plaster mounting to be of thicker construction and which provides a better mechanical interconnection with the plaster mounting.

Other objects and many attendant advantages of the invention will become more apparent when considered in connection with the specification and accompanying drawings, wherein:

FIG. 1 is a side view of the articulator according to the present invention;

FIG. 2 is a rear view of the structure illustrated in FIG. 1;

FIG. 3 is a sectional view taken substantially along line 3—3 of FIG. 2 looking in the direction of the arrows;

FIG. 4 is a sectional view taken substantially along line 4—4 of FIG 1 looking in the direction of the arrows;

FIG. 5 is a sectional view taken substantially along line 5—5 of FIG. 1 looking in the direction of the arrows;

FIG. 6 is a sectional view taken substantially along line 6—6 of FIG. 1 looking in the direction of the arrows; and

FIG. 7 is a top view of the plate or platform mounted in the denture model employed with the articulator of the present invention.

Referring now to the drawings wherein like reference characters designate corresponding parts throughout the several views, the base means includes a base plate **10** having three integral leg portions **12**, **14** and **16** extending downwardly therefrom for supporting the base plate above a suitable supporting surface. As seen particularly in FIG. 3, base plate **10** includes a pair of upwardly extending projections **18** and **20** which are adapted to fit within corresponding recesses provided within a plate or platform **22** mounted in the lower portion of a mandibular model indicated generally by reference numeral **23**. Anchor means for holding the mandibular model in place includes a wing screw **24** extending upwardly through a hole provided in plate **10** and being threaded into a correspondingly threaded hole provided in platform **22**. It will be understood that wing screw **24** is adapted to support either a model or a template upon the base plate **10** as desired.

Referring particularly to FIG. 7 which illustrates a top view of the plate or platform **22**, it will be noted that three holes **25**, **26** and **27** are provided through plate **22**. Holes **25** and **26** are adapted to receive the projections **18** and **20** previously described, and the central hole **26** is threaded for receiving the wing screw **24**. Four posts **28** of generally cylindrical configuration extend upwardly from the upper surface of the plate and are embedded within the plaster mounting portion **24***a* of the model **24** as seen in FIG. 3. Referring again to FIG. 7, it will be noted that the posts **28** are disposed symmetrically about the plate, and these posts enable the plaster mounting to be of a thicker construction thereby substantially eliminating cracking of such mounting. The outer edge **29** of plate **22** is beveled as seen most clearly in FIG. 3 so as to flare upwardly and outwardly away from the undersurface of the model thereby providing a better mechanical interconnection with the plaster mounting.

The base plate **10** includes a plurality of integral upwardly extending bosses **30** and **32** at opposite sides thereof and a central boss **34**. As seen in FIGURE 4, the bosses **30** and **32** include vertically extending relatively smooth bores **36** and **38** therewithin, while the bore **40** disposed within boss **34** is threaded for receiving an adjusting screw hereinafter described.

As seen most clearly in FIG. 4, a pair of guide members **50** and **52** which may be of generally tubular con-

struction are slidably received within the bores **36** and **38** of bosses **30** and **32** respectively. The upper ends **50'** and **52'** of the guide members **50** and **52** respectively are threaded and are threaded within correspondingly threaded bores provided in a crosshead member **54** spanning the two guide members. Lock nuts **56** and **58** are threaded on guide members **50** and **52** and are disposed in abutting relationship with the undersurface of crosshead member **54** for retaining the structure in the operative assembled relationship illustrated.

A first socket member **60** includes an inwardly facing recess **62** defining a portion of a spherical surface. Member **60** also includes a generally horizontally extending portion **64** having a threaded bore formed therethrough for receiving the upper threaded end of guide member **50**. A lock nut **66** is threaded on the uppermost end of guide member **50** for retaining the socket member **60** in the operative position shown.

A similar socket member **70** is provided having a vertically extending portion defining on the inner surface thereof a recess **72** which is a portion of a spherical surface. Socket member **70** also includes a generally horizontally extending portion **74** having a threaded bore formed therethrough for receiving the upper threaded end of guide member **52**. A lock nut **76** is threaded on the uppermost end of guide member **52** for retaining socket member **70** in the operative position illustrated.

A further socket member **80** includes a generally vertically extending portion having a recess **82** on the inner surface thereof defining a portion of a spherical surface, this last-mentioned recess being disposed in opposed facing relationship to the recess **62** previously described. Socket member **80** also includes a generally horizontally extending portion **84** having a slot **86** formed therethrough which receives a locking screw **88** which is threaded into a suitable threaded bore provided in the upper surface of the cross member **54**. With this arrangement, the position of socket member **80** may be adjusted toward and away from the socket member **60** so as to provide the desired degree of pressure on the spherical fulcrum member received therebetween as hereinafter described.

A further socket member **90** includes a generally vertically extending portion having a recess **92** in the inner surface thereof defining a portion of a spherical surface. Recess **92** is disposed in opposed facing relationship to recess **72** and is adapted to receive a sperical fulcrum member therewithin. Socket member **90** includes a generally horizontally extending portion **94** having a slot formed therethrough which receives a lock screw **98** which is threaded into a suitable threaded bore provided in the upper surface of crosshead member **54**. With this arrangement, the position of socket member **90** may be adjusted with respect to the aforedescribed socket member **70**.

The means for adjusting the position of the crosshead with respect to the base means comprises an adjusting screw **100** having opposite threads disposed thereon above and below a thumb wheel **102** disposed at an intermediate portion thereof. The lower portion of the adjusting screw is threaded within the bore **40** provided in the boss **34** previously described on the base means, and the upper portion of the adjusting screw is threaded within a suitable bore provided in the central part of crosshead member **54**. A lock means in the form of a wing nut **104** is threadedly mounted on the upper end of adjusting screw **100** for locking it in desired operative position.

The guide members **50** and **52** are provided with suitable indicating means **108** and **110** respectively on the outer surface thereof. This indicating means may take the form of lines scribed thereon, and if so desired these lines may be marked in a suitable manner. In any event, these lines may be aligned with the upper ends of the bosses **30** and **32** respectively. When a particular line is aligned with the top of a boss, it will indicate a specific spacing of the cross head and the supported components above the base means. In this manner, a means is provided for readily visibly indicating in a very accurate manner the exact spacing of the componens of the apparatus.

A first spherical fulcrum member **120** is journalled within the recesses **62** and **82** and has a bore extending through the axis thereof slidably receiving a rod **122**. A set screw **124** is threaded within a radial bore provided through fulcrum member **120** and is adapted to engage the rod **122** for securing it in desired operative relationship with respect to the fulcrum member. An enlarged portion **126** is formed at one end of the rod for facilitating manual grasping thereof, the opposite end of the rod being of reduced dimension and extending through a portion of the support means indicated by reference numeral **128**, the outermost end of rod **122** being threaded and receiving a nut **130** thereon for connecting the support means **128** to the rod. A similar spherical fulcrum member **140** is journalled within the recesses **72** and **92**, this fulcrum member having a bore formed through the axis thereof and slidably receiving a rod **142**. Rod **142** includes an enlarged end **146**, and the opposite end thereof extends through a suitable hole provided in the support means **128** and is provided with a reduced threaded end portion receiving a nut **150** for connecting the support means to rod **142**.

The support means **128** includes a forwardly extending plate portion **154** having a pair of depending projections **156** and **158** formed thereon as seen most clearly in FIG. 3. These projections are adapted to fit within corresponding recesses provided within a suitable means such as the upper portion **160** of a template means. An anchor means in the form of a wing screw **162** extends downwardly through a suitable hole provided in plate portion **154** and as illustrated in FIG. 3 is threaded within a suitably threaded bore provided in the portion **160** of the template means. It will also be understood that screw **162** may be employed for supporting a maxillary model on the support means if so desired.

A pair of integral depending portions **164** and **166** extend downwardly from portion **160** and are provided with a threaded bore **168** and an enlarged bore **170** respectively as seen most clearly in FIG. 6. The template itself includes an arcuate plate-like portion **174** having a wing **176** extending upwardly therefrom as seen in FIG. 6, this wing being disposed between the spaced portions **164** and **166** previously described. An adjusting bolt **180** extends through the hole **170** provided in portion **166**, and the adjusting bolt includes a reduced threaded end portion **182** which may be threaded through the threaded hole **168** provided in portion **164**. The adjusting bolt may be employed for supporting the plate-like portion **174** in any suitable adjusted relationship with respect to the portions **164** and **166**.

It should be understood that the template is ordinarily employed for setting up the upper teeth initially in usual procedures. In the present invention, the template is illustrated as mounted in position so as to set up the lower teeth, and it should be understood that this procedure may be carried out prior to setting up the upper teeth if so desired.

As seen in FIG. 1, the wing **176** of the template is provided with an elongated slot **184** for facilitating suitable adjustment of the template.

The stop means of the present invention includes a pair of stop portions **200** and **202** formed integral with the crosshead member **54** and defining obliquely extending stop surfaces **204** and **206** respectively. As seen in FIG. 6, support means **128** is provided with laterally extending projections **210** and **212** adapted to support the adjustable support members of the present invention. As seen particularly in FIG. 5, a first adjustable support member indicated generally by reference numeral **220** includes an enlarged upper end portion **222** and a lower threaded end portion **224** which terminates in a stop portion **226**

adapted to engage the stop surface **204**. The threaded portion **224** is threaded through a suitable threaded opening provided in portion **210** of the support means **128** and through a member **228** which actually is a lock nut but includes a laterally extending portion to facilitate manual operation thereof.

A similar adjustable stop member is indicated generally by reference numeral **230**, this stop member including an enlarged upper end portion **232** and a lower threaded end portion **234** which terminates in a lower end portion **236** engageable with the stop surface **206**. Threaded portion **232** is threaded through suitable bores provided in projection **212** and a lock nut **238** having a laterally extending manually engageable projection.

In operation of the apparatus, the general procedures as set forth in the aforementioned U.S. patent are followed, and the indicating means **108** and **110** on the guide members **50** and **52** respectively will enable accurate positioning of the crosshead and support means with respect to the base means. Additionally, the socket members **80** and **90** may be adjusted toward and away from the socket members **60** and **70** respectively for adjusting the freedom of movement of the fulcrum members **120** and **140** and to also obtain better alignment of the support means with respect to the base means. After having set up the teeth in the usual maner and utilizing a predetermined adjustment of the adjustable stop means to ensure that the plate portion **154** of the support means is substantially parallel with the base plate means **10**, the adjustable stop members may then be readjusted by loosening up the lock nuts **228** and **238** and then threading the members **220** and **230** so as to extend them further downwardly thereby limiting the downward swinging movement of the support means **128**. After having made this adjustment, the teeth may be milled wherein the teeth are supported both on the base means and the support means to obtain the desired end product. The adjustable stop members may then be subsequently readjusted for setting up a new artificial denture.

It is apparent from the foregoing that there is provided according to the present invention a new and novel dental articulator especially adapted for making and fitting artificial dentures. Adjustable stop members are provided for adjusting the swinging movement of the support means with respect to the base means. Special fulcrum support members are provided for providing better alignment of the support means with respect to the base means and for adjusting the freedom of movement of the support means. In addition, means is provided for readily visually indicating the exact spacing of the support means and crosshead with respect to the base means. The apparatus is additionally quite simple and inexpensive in construction, and yet efficient and reliable in use.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, and since the scope of the invention is defined by the appended claims, all changes that fall within the metes and bounds of the claims or that form their functional as well as conjointly cooperative equivalents are therefore intended to be embraced by those claims.

I claim:

1. A dental articulator comprising base means, anchor means on said base means for supporting a model means thereon, guide means on said base means, a crosshead including guide means slidably engaging said first guide means for guiding movement of said crosshead with respect to said base means, adjusting means for manually adjusting the position of said crosshead with respect to said base means, first socket means mounted on said crosshead and defining a pair of spaced opposed recesses each of which defines a portion of spherical surface, a pair of spherical fulcrum members each of which is received in one of said recesses and held in place therewithin, a pair of rods each of which adjustably extends through the axis of one of said fulcrum members, support means connected with said rods, anchor means on said support means for supporting a model means thereon, and adjustable stop on said support means for limiting the swinging movement of said support means with respect to said crosshead and base means.

2. Apparatus as defined in claim **1** wherein said stop means includes a pair of stop members mounted on said crosshead, and a pair of stop members mounted on said support means, said last-mentioned stop members each being adjustably mounted with respect to said support means for adjusting the position of the last-mentioned stop members with respect to the support means.

3. Apparatus as defined in claim **2** wherein each of said stop members mounted on said support means is threadedly mounted thereon for permitting ready adjustment thereof.

4. Apparatus as defined in claim **3** including lock nut means for locking the position of the last-mentioned stop members for holding such stop members in desired adjusted position.

5. Aparatus as defined in claim **1** including second socket means comprising a pair of socket members each of which has a recess therein defining a portion of a spherical surface, each of said last-mentioned socket members being adjustably mounted on said crosshead and being in facing opposed relation to one of said first-mentioned socket means.

6. Apparatus as defined in claim **5** including means for locking said adjustable socket members in desired spaced relationship to said first-mentioned socket means for adjusting the freedom of movement of said spherical fulcrum members.

7. Apparatus as defined in claim **1** wherein the guide means on said base means comprises a pair of hollow bosses, the guide means on said crosshead comprising a pair of guide members each of which is slidably positioned within one of said bosses, said guide members having indicating means thereon for accurately indicating the spacing of the crosshead and associated support means with respect to the base means.

8. Apparatus as defined in claim **1** wherein the guide means on said base means comprises a pair of hollow bosses, the guide means on said crosshead comprising a pair of guide members each of which is slidably positioned within one of said bosses, said adjusting means comprising an adjusting screw, one end of said adjusting screw being threaded within a boss mounted on said base means, the opposite end of said adjusting screw being threaded within a boss on said crosshead, each of said spherical fulcrum members having a bore formed therethrough, each of said rods being slidably positioned within the bore of an associated fulcrum member, means for locking the rods in desired operative relationship with respect to said fulcrum members, said adjustable stop means comprising a pair of stop members disposed in fixed relationship with respect to said crosshead, and a pair of adjustable stop members mounted on said support means, each of said last-mentioned stop members being independently adjustable with respect to said support means and engageable with said first-mentioned stop members, and lock means for locking said adjustable stop members in desired adjusted position.

9. Apparatus as defined in claim **8** including second socket means comprising a pair of socket members each of which includes a recess defining a portion of a spherical surface, each of said last-mentioned socket members being adjustably mounted upon said crosshead and being in opposed facing relationship to one of said first-mentioned socket means.

10. Apparatus as defined in claim **8** wherein at least one of said guide members on said crosshead is provided with indicating means thereon for accurately indicating the

spacing of said crosshead and said support means with respect to said base means.

11. Apparatus as defined in claim **1** including template means adjustably supported on said support means and retained in position by said anchor means on said support means.

12. A denture model for use on an articulator including a plaster mounting of substantial thickness, a rigid plate mounted in the lower portion of said plaster mounting, said plate having a plurality of holes formed therethrough one of which is threaded for receiving an anchor means, said holes being exposed at the undersurface of said model, said plate including post means extending from said plate into the plaster mounting to enable the plaster mounting to be of substantial thickness, the edge portions of said plate being beveled to provide an improved interconnection between the plate and the plaster mounting, the edges of said plate flare upwardly and outwardly away from the undersurface of said model.

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