Nov. 4, 1952 W. F. RODIN 2,616,176

DENTAL CLASP SURVEYOR AND PARALLELOMETER

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Fig. 1

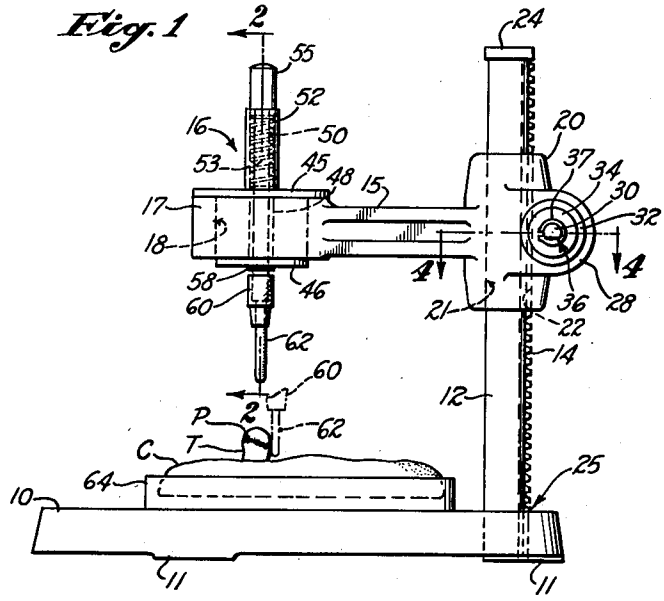


Fig. 2

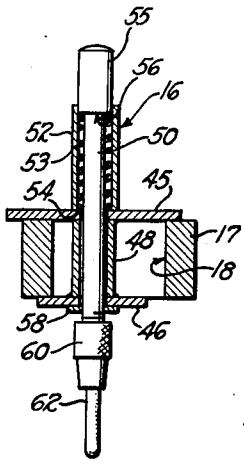


Fig. 3

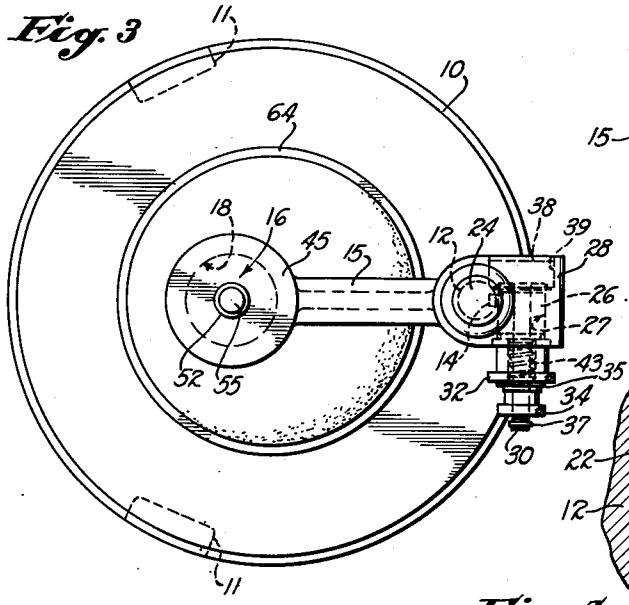


Fig. 4

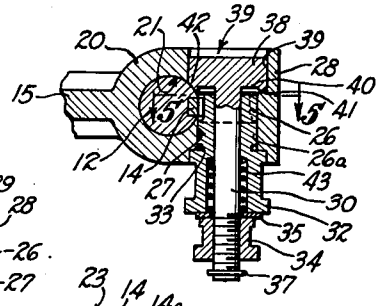
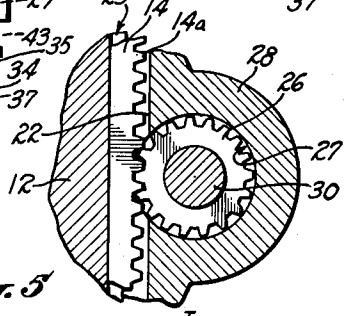


Fig. 5



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2,616,176

DENTAL CLASP SURVEYOR AND PARALLELOMETER

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19 Claims. (Cl. 32—67)

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This invention relates principally to dental survey devices, and it is especially applicable to means for accurately determining contours of teeth to which denture clasps are to be fitted.

In dental laboratory technic it is the universal practice to provide dentures with clasps which are to be secured to sound teeth for the purpose of anchoring such dentures to the sound teeth. It is important for successful dentures that the clasps conform accurately to the sound tooth contours.

One object of this invention is to provide a dental survey apparatus by means of which the tooth contour in any given instance may be accurately determined so that a proper clasp may be produced.

Another object is to provide comparatively simple means by which accurate surveying may be easily accomplished through simple manipulations.

Still another object of the invention is to provide dental survey means which may be quickly moved into proper surveying position and may be easily moved in any direction necessary for properly circumscribing a cast replica of the sound tooth to which the denture is to be affixed.

It is also an object of the invention to provide a mounting by means of which a tool carrying the circumscribing means may be at all times held in exact parallelism with a determined axis while at the same time permitting free movement of the tool in any direction perpendicular to any such axis.

Another object is to provide in such a tool a yielding mounting which will permit the circumscribing means to be easily depressed by the operator into any required contacting position, the tool to be automatically retracted upon release by the operator.

An additional object is to provide easily operable means for locking an overhanging support for said tool in any desired position of adjustment above the dental unit to be surveyed.

Other objects of the invention and the various features of construction thereof will become apparent to those skilled in this art upon reference to the following specification and the accompanying drawing wherein one embodiment is described by way of illustration.

In the drawing:

Fig. 1 is a side elevation of a dental survey apparatus constructed in accordance with this invention;

Fig. 2 is a vertical section on an enlarged scale taken from the line 2—2 of Fig. 1;

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Fig. 3 is a plan view of the apparatus shown in Fig. 1;

Fig. 4 is a fragmentary transverse section taken on an enlarged scale; and

Fig. 5 is a vertical sectional detail taken on a further enlarged scale approximately from the line 5—5 of Fig. 4.

The structure illustrated in the drawing comprises a circular base 10, which may be provided with suitable rests 11, an upstanding post 12 being positioned adjacent one edge of the base and fixedly secured therein as by means of a press fit. The post 12 is provided on one side with a rack 14 and slidably receives an overhanging supporting arm 15 which carries at its outer end a surveying tool 16 mounted upon a supporting head 17 provided with a comparatively large cylindrical opening 18 formed upon a vertical axis and causing the head 17 to constitute an eye through which the tool 16 depends.

The mounting of the arm 15 upon the post 12 is accomplished through the medium of a vertically extending box 20 provided with a cylindrical bore 21 which receives the post 12. At one side of the bore 21 a longitudinal guide slot 22 (Fig. 5) in communication with the bore 21 receives the teeth 14a of the rack 14. The post 12 is provided with a longitudinally extending groove 23 which is disposed in alignment with the guide slot 22 and fixedly receives the rack 14 as by means of a press fit. If desired, a cap 24 pressed upon the top of the post 12 further retains the upper end of the rack 14, and in addition the lower end of the rack 14 may be fixed in the base 10, as indicated at 25, by being pressed into firm position when the post 12 is press fitted in its seat in the base 10.

Movement of the arm 15 and its box 20 vertically along the post 12 is accomplished through the medium of a pinion 26 which meshes with the teeth 14a of the rack 14 and is positioned in a transverse bore 27 provided in a boss 28 integral with the box 20. The pinion 26 is journaled upon a transverse shaft 30 carried in the boss 28 and also mounted by a rotary fit within the bore 27 through the medium of an integral bearing portion 26a fitting the bore 27. The pinion 26 is adapted to be rotated while engaging the rack 14, and this is accomplished through the medium of a knurled turning head 32 which is integral with the pinion 26 and its bearing portion 26a. As shown, the turning head 32 is of larger diameter than the pinion 26 and its bearing portion 26a and is partially sunk in a counterbore which provides a binding shoulder 33 (Fig.

4) against which the turning head 32 may be locked by tightening a lock nut 34 which is threaded on the outer end of the shaft 30. Preferably, a washer 35 is positioned between the turning head 32 and the lock nut 34, and this washer is shaped in a conventional manner to conform with a flattened side 36 (Fig. 1) near the end of the shaft 30 to prevent turning of the washer. If desired, a retainer clip 37 may be employed upon the extreme outer end of the shaft 30.

The shaft 30 is provided with an enlarged head 38 which is sunk in a counterbore 39 in the boss 28 of the box 20. The head 38 may itself be counterbored at 40 on its inner side to provide for reception of the respective end of the pinion 26, if required. Such counterboring at 40 leaves an annular rim 41 which may be used to bind against an adjacent shoulder in the boss 28 at the bottom of the bore 39, but is especially provided at one side with an arcuate shoulder 42 which, when the turning head 32 is tightened, is bound against the corresponding cylindrical portion of the post 12 because the counterbore 39 penetrates the bore 21 in the box 20 at this point. Since the arcuate shoulder 42 represents a segment of a cylinder, it serves to lock the shaft head 38 against rotation both when actuating the pinion 26 through its head 32 and when tightening or loosening the lock nut 34. The turning head 32 is preferably counterbored and such counterbore receives a spring 43 whose outer end bears against the washer 35 and urges the head 32 against its shoulder 33 in the box 20.

The mounting of the tool 16 in the apertured supporting head 17 on the outer end of the overhanging arm 15 is accomplished through the medium of an upper bearing plate 45 and a parallel lower guide plate 46, these two plates being secured, as by welding to a connecting sleeve 48, Fig. 2. The length of the sleeve 48 is approximately equal to the depth of the opening 18 in the supporting head 17. The upper and lower faces of the head 17 are machined in parallelism for sliding contact of the plates 45 and 46 therewith, and the working clearance is only sufficient to permit free sliding, thereby insuring maintenance of parallelism of the axis of the tool 16 with the axis of the eye of the supporting head 17. The guide plate 46 has a diameter very slightly less than that of the cylindrical opening 18, this smaller size permitting the guide plate 46 to be passed through the opening 18 as the parts are assembled. Since the plates 45 and 46 are parallel, they cooperate as accurate guides.

Extending upward through the connecting sleeve 48 is an elongated stem 50 which constitutes the body of the surveying tool 16. This stem 50 extends above the bearing plate 45 and is disposed within a sleeve 52 fixed, as by welding, to the upper side of the plate 45 and housing a spring 53. The sleeve 52 has an internal diameter somewhat greater than the internal diameter of the connecting sleeve 48 and the diameter of a corresponding aperture in the plate 45. As a consequence, the plate 45 provides a shoulder 54 which serves as a bearing for the lower end of the spring 53. The upper end of the stem 50 is provided with a head 55 whose external diameter is approximately equal to the internal diameter of the sleeve 52 and thereby provides a shoulder 56 disposed within the sleeve 52 and constituting a bearing for the upper end of the spring 53. To the lower portion of the stem 50 lying below the guide plate 46 there is secured, as by welding, a stop disk 58 which limits the upward movement of the stem 50 under the influence of the spring 53. Mounted upon the lower extremity of the stem 50 is a conventional crayon holder 60 adapted for removably receiving a crayon 62 of a sufficient length to be disposed alongside a cast replica T of a sound tooth, as indicated in dotted lines in Fig. 1, so that the crayon 62 may be moved entirely around the tooth replica T to contact all of the outlying points around the periphery of the tooth replica T. The replica T is conventionally carried in an appropriate casting C or other mounting device which is carried in a cup 64 supported by the base 10 of the apparatus. The cup 64 and the casting C are retained by reason of their own weight or in any other suitable manner so that the crayon 62 may circumscribe all of the bulging portions around the periphery of the replica T through the simple expedient of depressing the tool 16 into approximately the dotted line position and then sliding the plates 45 and 46 to describe a path corresponding with the periphery of the replica T.

Operation

When the tooth replica T has been formed and positioned in the casting C, or other holder, it is conventionally disposed with its longitudinal axis directed upward, and the cup 64 receiving the casting C is positioned to bring the replica T into approximately vertical alignment with the axis of the eye presented by the apertured supporting head 17. The lock nut 34 on the pinion carrying shaft 30 is then loosened to free the knurled turning head 32. The turning head 32 is then rotated to rotate the pinion 26, which, by reason of its engagement with the rack 14, causes the arm 15 and its box 20 to move vertically to adjust the tool 16 and the supporting head 17. Such adjustment is maintained by tightening the lock nut 34. The operator then depresses the head 55 at the upper end of the stem 50 of the tool 16 sufficiently to bring the crayon 62 alongside the tooth replica T. While maintaining such depression, the operator, while holding the sleeve 52 between his thumb and finger, slides the bearing plate 45 in a roughly circular path upon the upper face of the supporting head 17 so that the crayon 62 moves around the tooth replica T in contact with its peripheral portions which bulge outward the farthest. Since the guide plate 46 always engages a considerable portion of the supporting head 17, absolute parallelism of the axis of the stem 50 with the axis of the supporting head 17 and the tooth replica T is maintained. Thus the crayon 62 marks a continuous line around the tooth replica T and the path thus established, which is represented by the shading P in Fig. 1, represents the position which must be assumed by clasps to be carried by a denture and to be affixed to the corresponding sound tooth of the patient.

It will be apparent from the foregoing description that I have presented a dental survey device in the nature of a parallelometer which may be quickly adjusted vertically on a post 12 to bring the crayon 62 adjacent the tooth replica T, somewhat as indicated in solid lines in Fig. 1, and then to lock the arm 15 in such position by the simple expedient of tightening the lock nut 34. Also, it will be apparent that the tool 16 may be easily slid about upon the overhanging supporting head 17, its axis being always maintained in strict parallelism with the axis of the head 17 and with

the corresponding axis of the tooth replica T. The range of excursion of the tool 16 is limited only by the space between the inner walls of the opening 18 and the outer walls of the connecting sleeve 48. Since this space may be of any appropriate size, the apparatus is adaptable to the surveying of any desired dental unit such as the replica T.

Variations of the generic invention herein disclosed doubtless will occur to those skilled in this art, and it is therefore intended to protect all such structures as fall within the scope of the patent claims.

I claim as my invention:

1. In combination: a base adapted to receive a structure to be surveyed; an arm carried by and overhanging said base; a head carried by the outer end of said arm and having a relatively large aperture; a vertically disposed surveying tool of relatively small diameter positioned in said aperture and universally movable horizontally in said aperture; and guide means carried by said tool and engaging with said head to maintain said tool in vertical position during lateral movements in said aperture.

2. A combination as in claim 1 wherein said head is in the form of an enlarged eye having parallel upper and lower contact surfaces and said guide means includes a pair of spaced parallel plates adapted respectively to engage said surfaces simultaneously and be guided thereby.

3. A combination as in claim 1 whereby said head is in the form of an eye having an upper horizontal guiding surface and said guide means includes a plate slidable on said surface.

4. A combination as in claim 1 wherein said guide means carries yielding means holding said tool in elevated position on said guide means, said tool being depressible against said yielding means to bring the lower portion of said tool in operative engagement with said structure.

5. In combination in a dental survey device: a supporting base; an upstanding post carried by said base; an overhanging arm adjustably carried by said post; cooperating means carried by said arm and post for effecting vertical adjustment of said arm with respect to said post; a tool supporting head provided on the outer end of said overhanging arm, said head having a relatively large opening therethrough disposed on a vertical axis, said head having upper and lower, parallel sliding faces; an elongated tool disposed in said opening; upper and lower guide devices disposed in parallelism with one another and with said sliding faces and slidable laterally upon said sliding faces in any direction perpendicular to said axis; means carried on the lower end of said tool for surveying a dental structure; and means yieldingly mounting said tool on said guide devices for movement vertically of said surveying means.

6. A dental survey device comprising in combination: a base adapted to receive thereon a dental structure to be surveyed; an upstanding post on said base; an arm carried by said post; means for adjusting said arm vertically on said post, said arm being adapted to overhang said base; a head having a vertically directed eye on said arm to overhang said base; a slender tool depending through said eye and adapted for lateral movement in said eye in any direction; transversely disposed means carrying said tool and slidable laterally in any direction on said head to maintain said tool in a vertical position; and means on the lower end of said tool for engaging said dental structure.

7. A combination as in claim 6 wherein transversely disposed means includes spaced parallel members engageable with opposite sides of said head at said eye.

8. A combination as in claim 6 including yielding means mounting said tool on said sliding means for depression of said engaging means into position adjacent said dental structure.

9. In combination: a supporting base; an arm carried by said base; a tool supporting head carried by said arm and having a relatively large opening; a tool extending through said opening; spaced guide means carrying said tool and movable upon opposite sides of said head for guiding said tool in any direction laterally of said opening and maintaining the axis of said tool always in exact parallelism with the axis of said opening; and work-contacting means carried at one end of said tool.

10. In combination in a dental survey device: a base; a post upstanding from said base and carrying a vertically disposed rack; an arm having a tool carrying member overhanging said base and a box portion slidable on said post; a shaft having one end mounted in said box portion; a pinion rotatably mounted on said shaft and in engagement with said rack; rotating means engaging said box portion and connected to said pinion to rotate said pinion; and locking means on the other end of said shaft and engaging said rotating means to bind said rotating means and shaft and lock said pinion against rotation.

11. A combination as in claim 10 wherein said one end of said shaft is headed and is held in said box portion and said locking means is a nut device threaded on said other end of said shaft to lock said rotating means against said box portion.

12. A combination as in claim 10 wherein said pinion is mounted in a bore in said box portion and means is secured to said pinion and constitutes a bearing working in said bore.

13. A combination as in claim 12 wherein said pinion is in the form of a continuation of said bearing and said bore is intersected at one side to receive said rack.

14. In combination: a post; an arm having a member slidable along said post; a rack fixedly carried by said post; a pinion on said arm and meshing with said rack; a shaft having one end mounted in said member, said pinion being journaled on said shaft; turning means connected with said pinion and accessible to turn the pinion; and means on the other end of the shaft to lock said pinion turning means against rotation.

15. A combination as in claim 13 wherein said pinion is mounted in a bore in said member and is provided with means which centers said pinion in said bore and constitutes a bearing on the walls of said bore.

16. A combination as in claim 15 wherein said shaft is headed at said one end for engagement in a seat in said member upon movement of said locking means into locking position.

17. A combination as in claim 16 wherein said member of said arm is provided with a passage receiving said post and said passage intersects said seat whereby a portion of said head may be bound by said locking means in engagement with said post.

18. A combination as in claim 14 wherein said shaft is provided with a head at said one end and said member of said arm is provided with a seat receiving said head.

19. A combination as in claim 13 wherein said member of said arm is provided with a passage to receive said post and is provided with a seat to receive a head on said shaft, said passage intersecting said seat whereby a portion of said head may bind against said post.

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