

[54] **DRILL GUIDE FOR MANDIBULAR STAPLE AND STAPLE CONSTRUCTION**

[72] Inventor: **Irwin A. Small**, 751 Chestnut, Birmingham, Mich. 48008

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[51] Int. Cl.A61c 13/00

[58] Field of Search.....32/2, 10 A, 40, 67

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Primary Examiner—Robert Peshock

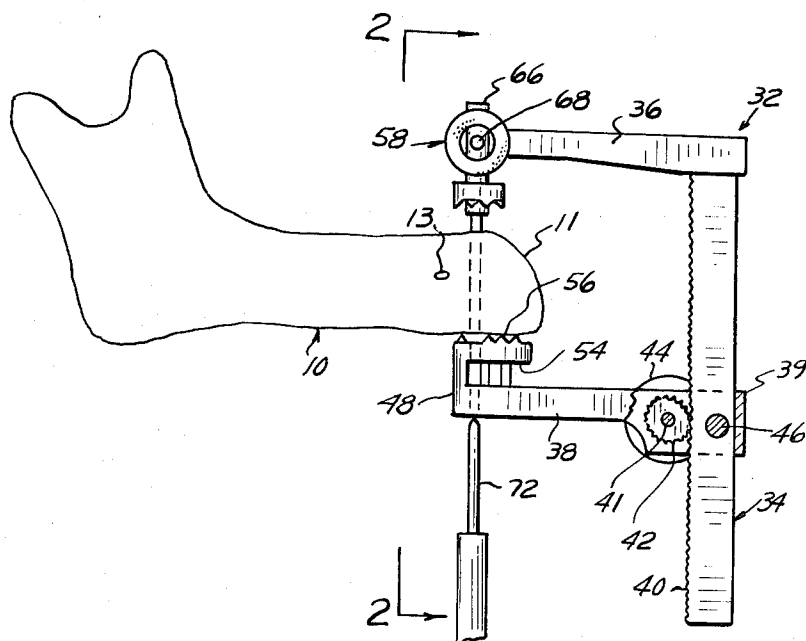
Attorney—Cullen, Settle, Sloman & Cantor

[57]

ABSTRACT

A drill guide for mandibular staples is disclosed which is adapted to accurately align a drill for drilling fastener holes in the mandibular lower jaw portion at precisely located positions for the attachment of fasteners therethrough by means of a staple to retain a dental appliance in secure position on the mandibular jaw portion; the method includes the construction of a staple which has a lower cross plate which is curvilinearly shaped to conform to the curvilinear shape of the front section of the jaw bone and to which are attached a plurality of fastener members adapted to protrude into and selectively through the jaw bone in accordance with the holes previously drilled through the jaw bone by means of the drill guide; the staple and the fastening portions of the staple are coated with a bio-ceramic such as aluminum oxide, titanium oxide, magnesium oxide, or the like, applied to the staple in open pore form to permit the bone tissue of the mandibular jaw to grow into the porous bio-ceramic coating to provide an additional interlock of the staple with the mandibular jaw tissues and to prevent bone deterioration due to the drilling operation and insertion of the metal staple.

13 Claims, 6 Drawing Figures



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3,664,022

2 Sheets-Sheet 1

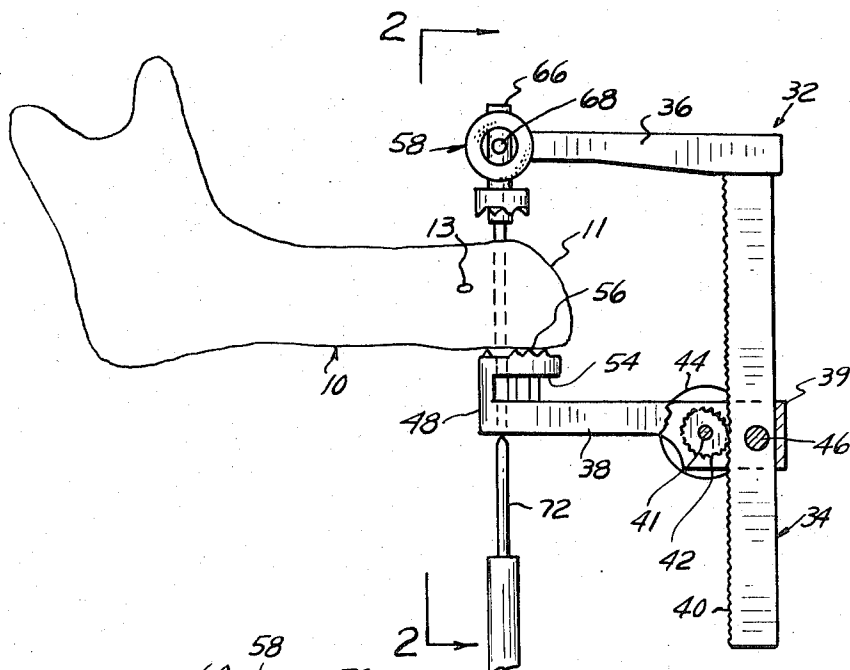


FIG. 1

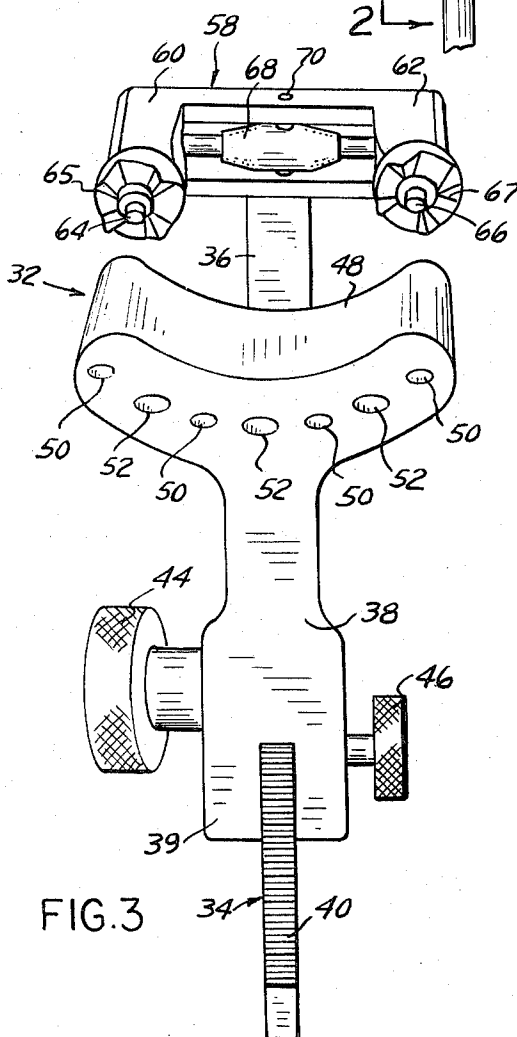


FIG. 3

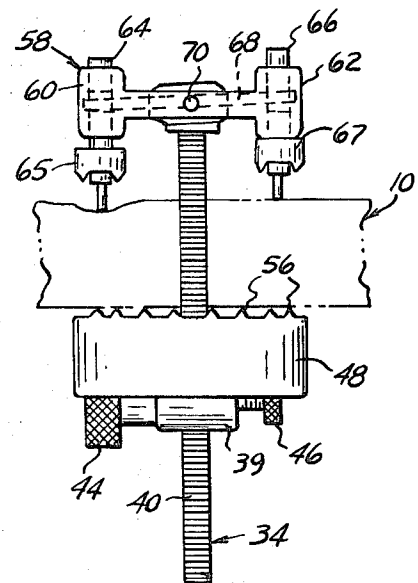


FIG. 2

INVENTOR

IRWIN A. SMALL

BY Sullen, Little, Sloman & Cantor

ATTORNEYS

FIG. 4

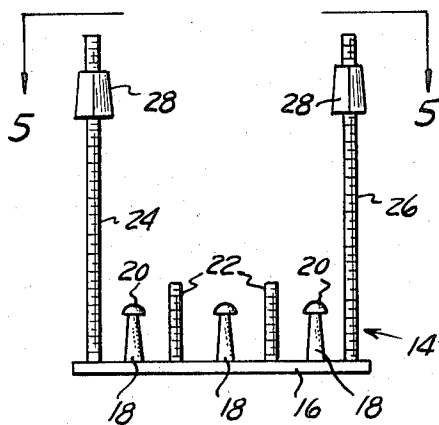


FIG. 5

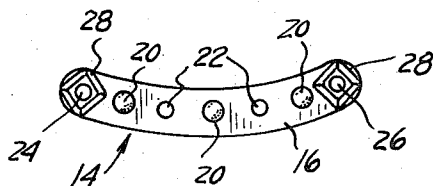
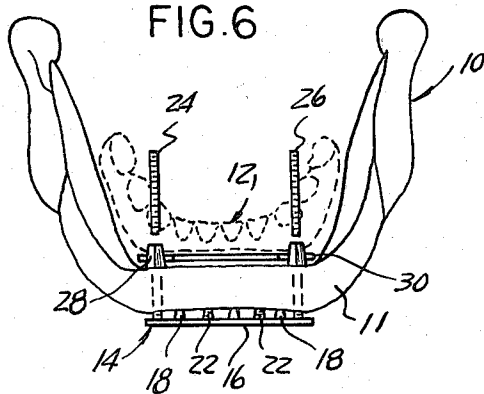


FIG. 6



INVENTOR
IRWIN A. SMALL

BY *Cullen, Little, Shuman & Cauter*

ATTORNEYS

DRILL GUIDE FOR MANDIBULAR STAPLE AND STAPLE CONSTRUCTION

REFERENCE TO RELATED APPLICATIONS

The present invention is an improvement over applicant's prior application Ser. No. 596,198 filed Nov. 22, 1966, now U.S. Pat. No. 3,414,975.

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates to drill guide for mandibular staples and to the construction of the mandibular staple itself used in the present invention.

The present invention is directed to a drill guide in the form of a jig bore for mandibular staples used in the mechanical attachment of dental appliances to the jaw bone of a patient. The present improved drill guide provides an accurate means for guiding the drilling of apertures through a mandibular jaw bone, be it human or animal, and which apertures at accurately spaced points are adapted to receive a mandibular staple made of metal provided with fastening means thereon to securely engage the jaw bone and to provide an interlock with the dental appliance normally removably mounted on the jaw bone, and to allow tissue ingrowth and attachment to the staple by coating the staples with a bio-ceramic oxide.

Heretofore, in the use of dental appliances of removable nature, particularly with reference to the lower mandibular jaw, natural suction of the dental appliance or cohesion is often reduced due to the aging and wasting away of jaw bone tissue. Various means are known to be employed in an effort to retain and anchor the lower removable dental appliance against accidental dislodgement from the jaw bone. However, the use of adhesives or known mechanical devices heretofore have been ineffective and inefficient for the intended purpose and, accordingly, it is the object of the present invention to provide for the use of a mandibular staple which is accurately secured to the mandibular jaw bone beneath the subcutaneous tissue and which, once secured in place by a pair of threaded fasteners, is so arranged that the threaded fasteners themselves are adapted to be interlockingly nested within undercut apertures provided in the dental appliance to anchor the dental appliance against accidental displacement with respect to the jaw bone.

Accordingly, in applicant's prior patent a drill fixture or guide is provided which has one portion adapted to underlie the curved front end of the mandibular jaw bone and another portion spaced forwardly therefrom which receives and secures a U-shaped guide pin. Both portions are provided with apertures aligned in co-planer vertical planes and spaced a predetermined distance corresponding to the distance between the opposed legs of the U-shaped mandibular staple. In the prior patent, the apertured front portion for abutment against the mandibular jaw bone as well as the staple itself are straight and thus cannot conform to the accurate shape of the front end of the mandibular jaw bone.

Therefore, the novel features of the present invention consist in the provision of an improved drilling guide which has an apertured curvilinear abutment portion suspended from the end of a vertically adjustable arm which is forwardly supported on a rod. The upper end of the rod supports a pair of spaced guide pins which are individually freely reciprocable to accommodate for unevenness in the thickness of the mandibular jaw bone and which are adapted to be in alignment with the outer most apertures of the curvilinear drill guide portion. The improved staple has a curvilinear fastener support plate substantially conforming to the curvilinear shape of the front end of the jaw bone. Attached to the support plate of the staple are a plurality of threaded and non-threaded fasteners for extension into apertures drilled into the jaw bone by means of the present improved drill guide. The two outer most threaded fastener means are adapted to extend through the jaw bone and beyond thereof to receive fastening nuts which project into undercut apertures provided in the dental appliance in

the manner as described in applicant's prior patent. The intermediate fastener means on the curvilinear support plate of the improved staple extend into blind apertures drilled into the jaw bone by means of the improved drill guide and which securely lock the staple to the jaw bone after application of the staple.

Additionally, an important improvement feature is provided in the present invention in that the staple itself as well as the projecting short fasteners and the lower portions of the outer most fastener members which receive the appliance securing nuts, are coated with a bio-ceramic such as aluminum oxide, titanium oxide, magnesium oxide or the like. The oxide is applied in porous form to the staple in order that growing tissue elements of the mandibular jaw bone be permitted to grow into the porous layer of bio-ceramic to provide an additional interlock of the staple with the jaw bone as well as to prevent bone deterioration in the bone structure of the jaw bone due to the mechanical drilling operation and insertion of a metal staple within the jaw bone.

Additional novel features and distinct advantages of the present improved mandibular drill guide and staple will become apparent by reference to the following detailed description in connection with the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings illustrate preferred embodiments of the invention in which:

FIG. 1 is a perspective illustration of the present improved mandibular drill guide shown in attached drilling position on the curvilinear front end of the mandibular jaw bone;

FIG. 2 is a separate front elevation view illustrating the present improved mandibular drill guide;

FIG. 3 is an enlarged perspective front end view of the present improved mandibular drill guide;

FIG. 4 is an enlarged separate illustration of the present improved mandibular staple;

FIG. 5 is a top plan view of the present improved mandibular staple as seen along the arrows 5-5 in FIG. 4;

FIG. 6 is a composite illustration as seen from the bottom of the mandibular jaw bone showing the present improved staple in attached position with the dental appliance being indicated on the jaw bone in dotted lines.

DETAILED DESCRIPTION OF THE INVENTION

With reference now to the drawings, FIGS. 1 and 6 illustrate a mandibular jaw bone 10, which could be either human or animal, and which is adapted to receive a removable lower dental appliance such as indicated at 12 in FIG. 6.

As shown in FIG. 6 mounted upon and with jaw bone 10 is the present improved mandibular staple generally indicated at 14 which is shown in detail in FIGS. 4 and 5.

With specific reference to FIGS. 4 and 5 the improved mandibular staple 14 of the present invention includes a lower flat support plate 16. In the attachment of the improved mandibular staple 14 to the jaw bone 10, the support plate 16 is adapted to abut against the underside of the jaw bone, as shown in FIG. 6. The support plate 16 of the mandibular staple 14, as shown, is curvilinear in plan view so as to substantially correspond to the curvilinear shape of the front end 11 of the jaw bone 10.

From the upper surface of the support plate 16 of staple 14 extend a first set of staple securing pins 18 which are braced or otherwise secured to the surface of the support plate 16. The first set of staple securing pins 18 are slightly upwardly tapered and provided at the upper end with a mushroom head formation 20. These securing pins 18 are equally spaced along the surface of the plate 16. There is further provided, and extending from the same surface of the support plate 16, another set of staple attaching pins or locator pins 22 which are likewise braced or otherwise secured to the surface of plate 16. These locator pins 22 are slightly longer than the mushroom head formed securing pins 18 and are externally

threaded or serrated as shown. Each of the threaded locator pins 22 are disposed intermediate a pair of adjoining staple securing pins 18, as shown.

The mandibular staple 14 is further provided with a pair of outer rods 24 and 26, respectively, which are of sufficient length so as to enable full extension of the rods 24-26 through the jaw bone 10. The outer rods 24-26 are externally threaded as shown for the purpose to each receive a dental appliance attaching nut member 28. As shown in FIG. 6, in assembly of the improved mandibular staple 14 to the jaw bone 10, the long threaded outer rods 24-26 are adapted to extend through predrilled holes provided in the front end portion 11 of the jaw bone 10 by means of provision of the present improved drill guide, as will be described hereafter. In assembly, as shown in FIG. 6, after the nuts 28 have been threaded over the outer rods 24-26 in abutment against the surface of the jaw bone 10 the free ends of the rods 24-26 extending above the nuts 28 are cut off and disposed as waste. The cut off ends of the rods 24-26 immediately above the nuts 28 may be filed or staked around the upper surface of the nut so as to retain the nuts in place on the jaw bone 10. The nuts 28 are four sided in cross-section and are slightly tapered upwardly and in assembly receive a spanner plate 30 which is provided with matching sockets at its outer end of snap over the nuts 28 in the manner described in applicant's prior U.S. Pat. No. 3,414,975. The nuts 28 are slotted at their upper end so that a quick setting plastic may be applied to the slots and when set, will prevent the nuts from turning on the threading of the outer rods. The dental appliance, indicated in broken lines at 12 in FIG. 6, as will be understood, is provided with appropriately spaced apertures which, in assembly, interlockingly engage the head portions of the nuts 28.

In the improved mandibular staple 14, in accordance with an important feature of the present invention, the support plate 16, locking pins 18, locator pins 22, outer rods 24-26 and nuts 28 are coated with a layer of bio-ceramic, preferably aluminum oxide, although other oxides such as titanium oxide and magnesium oxide may be employed. The oxide coating for mandibular staple 14 is applied such as to form a porous layer having an open pore system. In the application of the oxide-coated mandibular staple 14 to the jaw bone 10 by a dental surgeon, the tissue of the jaw bone is carefully loosened and moved away from the mandibular bone and the plurality of holes and blind apertures provided in the jaw bone 10 by means of the present improved drill guide. Thereafter the staple 14 with locator pins 18-22 and long securing rods 24-26 are aligned with the apertures provided in the jaw bone for attachment to the jaw bone. The tissue of the jaw bone for attachment to the jaw bone. The tissue of the jaw bone eventually grows together again around the apertures and grows into the pore system of the oxide coating provided on all of the securing members of the staple 14. Thus, there is provided an additional natural interlock of the jaw bone and jaw bone tissue with the mandibular staple 14 and wherein at the same time the oxide coating effectively prevents any deterioration of the jaw bone structure.

With reference now to FIGS. 1 to 3, the drilling of the respective apertures through the curvilinear front section 11 of the jaw bone 10, presents the most significant problem in the accurate application of the improved mandibular staple 14 so as not to have the staple bind or otherwise damage the jaw bone or to cause subsequent later problems and injury. Thus, it will be appreciated that the respective apertures must be drilled such as to be in perfect alignment with and corresponding to the spacing of locking pins 18, locator pins 22 and outer fastening rods 24-26 of the staple 14. It is likewise primarily essential that the drilled apertures through the jaw bone be accurately located with respect to the jaw bone centerline and inwardly of the open nerve centers of the jaw bone generally indicated at 13.

For this purpose there is provided the present improved drill guide, generally indicated at 32. The drill guide 32 consists essentially of an elongated post 34 which at the upper end sta-

tionarily supports an upper arm 36 and also supports a lower arm 38 which is slidable along the post 34 towards or away from the upper arm 36. In order to cause adjustment of the lower arm 38 relative to the upper arm 36, the inner surface of the post 34 is provided with rack teeth 40 which are engaged by a gear 42 suitably supported for rotation within an enlarged rear portion 39 of the lower arm 38.

The gear 42 is rotatable on a shaft 41 which carries a handwheel 44 at its outer end for rotation of the gear 42 by means of which the lower arm 38 can be moved longitudinally along the post 34 due to engagement of the gear 42 with the rack teeth 40. The enlarged portion 39 of the lower arm 38 further carries a lock screw 46 to lock the lower arm 38 in the desired adjusted position relative to the upper arm 36.

The front end of the lower arm 38 expands into a transverse curvilinear shaped drill guide portion 48 which, as shown in FIG. 3, is provided with a plurality of a first set of apertures 50 and a plurality of a second set of apertures 52 which are of larger diameter than the apertures 50. The apertures 50 and 52 in the curvilinear drill guide portion 48 are adapted to guidingly receive drills of different sizes for drilling holes in the mandibular jaw bone 10 for attachment of the staple 14, and thus correspond in spacing and number to the spacing and number of locking pins 18-22 and fastener rods 24-26 of the staple 14. Thus, the smaller apertures 50 are adapted for drilling apertures for the threaded locator pins 22 and fastener rods 24-26 whereas the larger apertures 52 are adapted for drilling apertures of slightly larger size for the locking pins 18 of the staple 14.

The curvilinear shape of the drill guide 48 corresponds to the curvilinear shape of the support plate 16 of the staple 14. As seen in FIG. 1, the rear of the drill guide portion 48 is slotted from end to end as at 54, intersecting the apertures 50 and 52 to provide a lateral opening for each of the apertures which permits powdered bone material and bone chips to be expelled during the drilling operation so as not to accumulate and clog the apertures.

The upper surface of the drill guide portion 48 is provided with a double row of upwardly protruding teeth 56 extending along the opposed outer edges of the drill guide portion and which, in assembly of the drill guide 32 to the jaw bone 10, are adapted to bite into the lower surface of the jaw bone, upon respective adjustment of the lower arm 38, to lock the drill guide portion 48 in place, in order to prevent slipping during the drilling operation.

The front end of the upper arm 36 supports a yoke member 58 which extends transversely of the arm to both sides thereof. Both outer ends of the yoke member 58 are formed cylindrically as at 60 and 62 and each supports a locator pin 64 and 66, respectively, for extension downwardly towards the drill guide portion 48. The locator pins 64-66 are yieldably supported for relative longitudinal up or down movement at opposite ends of a centrally pivoted see-saw lever 68 which extends longitudinally through the yoke member 58 and is pivotally secured therein at its center as at 70. Thus, as illustratively shown in FIG. 2, when one locator pin is moved upwardly the other opposite locator pin is forced to move downwardly and vice-versa. This pivotal reciprocating arrangement of the locator pins 64-66 is provided to accommodate for unevenness in the jaw bone thickness. The lower ends of each of the locator pins 64-66 carry a toothed abutment 65 and 67, respectively, for a purpose which will appear hereafter.

The pivotal locator pins 64-66 are positioned in vertical alignment with a respective outer end aperture 50 of the drill guide portion 48 at the lower arm 38, for a purpose to appear.

In use of the present improved mandibular drill guide 32 for application of the improved staple 14, the initial step includes making a plaster mold of the arcuate front portion 11 of the mandibular lower jaw of the patient and a clear plastic template corresponding to the gum portion of the denture 12. The template is then bored at two spaced locations at a predetermined distance such as to be clear of and between the exposed

nerve centers 13 on both sides of the jaw bone 10. The spacing between the apertures in the template are intended to correspond to the actual spacing of the opposed securing rods 24-26 of the selected staple 14. From this predrilled mold and gum template the proper drill guide assembly 32 can be selected and checked for accuracy by attaching the drill guide 32 to the mold and template and locating the two opposite locator pins 64-66 in the spaced bores provided in the template on the jaw mold. Since the locator pins 64-66, as previously described, are in vertical alignment with the outer end apertures 50 of the drill guide member 48, accurate selection of the proper drill guide assembly can be made for accurate drilling of the staple apertures through the front jaw bone portions 11 between the open nerve centers 13, which heretofore was a primary difficulty in the application of metal staples through the jaw bone of a patient to retain a dental appliance.

With more particular reference to FIGS. 1 and 6, the drill guide 32 is then attached to the curved front end 11 of the lower jaw bone 10 of the patient after first pulling back the tissue around the portions of the jaw bone which are to be drilled. The lower arm 38 of the drill guide assembly 32 is adjusted such as to abut against the underside of the curved front portion 11 of the jaw bone to clamp the jaw bone portion 11 between the drill guide member 48 and the upper locator pins 64-66 which accurately mark the position for the extension of the securing rods 24-26 of the staple through the jaw bone. The surface teeth 56 of the drill guide member 48, in attached position, bite into the jaw bone to prevent lateral or rotational displacement of the drill guide assembly 32 during the drilling operation. As previously mentioned, the curvature of the drill guide member 48 corresponds substantially with the curvature of the front end 11 of the mandibular jaw bone 10 to properly drill the apertures for the staple 14 along an arcuate path.

After the drill guide assembly 32 has been attached to the lower mandibular jaw bone 10 of the patient as described above a drill, indicated at 72 in FIG. 1, of the proper size is selected to first drill the two outer apertures in the jaw bone which are adapted to receive the securing rods 24-26 of the staple 14. The outer apertures 50 in the drill guide member 48 are of slightly larger diameter than the drill employed so as to prevent binding of the drill within the drill guide apertures. After the first through aperture is drilled through the mandibular jaw bone 10 by guidance of the drill through an outer end aperture 50 in the drill guide member 48, a Kirschner wire of proper diameter is inserted through the drill guide aperture 50 and through the aperture which has been drilled through the jaw bone 10 for the purpose of further anchoring the drill guide assembly 32 in its previously located position on the jaw bone to avoid accidental displacement during drilling of the remainder of the apertures. The second, opposite outer end aperture is then similarly drilled through the jaw bone by utilization of the opposite outer end aperture 50 in the drill guide member 48 and a second Kirschner wire of proper diameter is inserted through the drill guide aperture and the drilled aperture in the jaw bone whereby the drill guide assembly 32 is now anchored at two spaced points to positively prevent any displacement.

Thereafter, the remainder of the intermediate blind apertures are drilled on the jaw bone 10 for insertion of the locator pins 22 of the staple 14, utilizing a drill of the same size as previously employed for the outer end apertures. This drill, however, will be provided with an adjustable stop at a proper distance from its pointed tip, as is commonly known in drilling blind apertures. Thus, as previously explained, the apertures for the threaded locator pins 22 of the staple do not extend all the way through the mandibular jaw bone 10. Similarly, employing a drill of slightly larger diameter for extension through the larger drill guide apertures 52, another set of blind apertures is drilled into the jaw bone 10 in properly located positions to receive the locking pins 18 of the staple 14.

As also previously described, the radial slot 54 provided at the rear of the drill guide member 48 on the lower arm 38 of the drill guide assembly which intersects all of the apertures

50 and 52 on the drill guide member, provides for dispersion of powdered bone material and bone chips resulting from the drilling operation through the jaw bone 10, outwardly of the drill guide member so as not to accumulate and clog the apertures.

Once all the apertures have been drilled through the jaw bone at their preselected accurate locations, the drill guide assembly 32 is removed from the jaw bone and the staple 14 is properly attached by means of the drilled apertures in the jaw bone. The bio-ceramic coated staple 14 is assembled to the jaw bone from underneath, such that the opposed outer end securing rods 24-26 extend through the outer-most drilled bores in the jaw bone and the intermediate locator and locking pins 18-22 extend into their respective properly drilled blind apertures. The staple 14 must be hammered in place, which is done by using a non-metallic mallet or the like, preferably made of Teflon or other similar material. If a metal tool would be used in hammering the bio-ceramic coated staple 14 in place, molecules of a different metal would be implanted in the staple, which can cause undesirable tissue reaction.

After the staple 14 has been properly attached to the jaw bone 10, the securing nuts 28 are threaded over the outwardly extending free ends of the opposite securing rods 24-26 and are threaded downwardly into engagement with the upper surface of the jaw bone 10. Thereafter, the free ends of the securing rods 24-26 immediately above the threaded-down nuts 28, are cut away and disposed of. The cut off ends above the nuts 28 will then be smoothed and quick curing plastic is placed in the vertical slots of the nuts as to securely stake the nuts against loosening. Thereafter, the spanner 30 is put in place, which, as described, has socketed ends corresponding to the cross-sectional shape of the nuts 28. The dental appliance 12 is then placed on the jaw bone in such fashion that the nuts 28 are in alignment with undercut apertures previously provided in the dental appliance, to thus anchor the dental appliance against accidental displacement with respect to the jaw bone 10.

After the staple 14 has been in place for a certain time within the jaw bone 10, the previously penetrated subcutaneous and bone tissue around the locations of the apertures in the jaw bone, will grow back into place and around the multiple locking and securing pins of the staple 14 and eventually grow into the porous bio-ceramic coating of the staple to homogeneously lock the staple to the jaw bone.

As previously explained, the bio-ceramic coating with which the staple 14 is provided, (which itself is preferably made of a stainless steel alloy) aside from the interlocking ability by the tissue of the jaw bone, effectively prevents deterioration of the jaw bone structure.

Thus, it will be obvious from the foregoing description in connection with the appended drawings, that there is herein provided an improved mandibular drill guide and an improved mandibular staple for securement of a dental appliance on the lower jaw bone of a patient.

The improvement herein provides for an improved drill guide which is curvilinearly shaped in correspondence with the curvature of the front end of the jaw bone and the staple is provided with a plurality of locking and fastening pins, similarly arranged along a curvilinear line to fit the curvilinear shape of the jaw bone. The mandibular drill guide of the present invention further provides improved locator pin arrangements which are pivotally supported for opposite reciprocating movement to accommodate irregular surface conditions of the mandibular jaw bone.

Although the present invention has been described in connection with a preferred embodiment, it will be obvious to those skilled in the art to which the invention pertains that various changes in arrangement and detail may be asserted to without departing from the characteristic and spirit of the invention as defined by the following claims.

I claim:

1. A drill guide assembly for mandibular staples adapted for drilling a plurality of apertures in accurately located positions

through a jaw bone; said drill guide assembly comprising; an elongated post having a first arm member extending therefrom; a second arm member longitudinally movable along said post towards and away from said first arm member; means to lock said second arm member in adjusted position relative to said first arm member; said first arm member carrying a pair of spaced locator pins; said locator pins being pivotally supported around a common pivot for reciprocating movement in opposite directions in order to adapt to a jaw bone of uneven thickness; said second arm member carrying a jig fixture at its outer end; said jig fixture being arcuate in a horizontal plane and having a plurality of spaced apertures extending therethrough; said apertures being located along an arcuate line; the outermost of said apertures being in vertical alignment with said pair of spaced locator pins of said first arm member disposed above; the upper surface of said jig fixture being provided with a plurality of teeth; said locator pins of said first arm member being adapted to be placed in position on the upper surface of said jaw bone on a pair of prelocated points; said jig fixture of said second arm member being adapted to clampingly engage the lower surface of said jaw bone upon relative adjusting movement of said second arm member towards said first arm member along said post to cause said teeth on the upper surface of said jig fixture to bitingly engage said jaw bone to prevent displacement of said drill guide when said second arm member is locked in position by said locking means; the arcuate arrangement of said plurality of apertures corresponding substantially to the curvilinear shape of said jaw bone; and each of said apertures being adapted to guidingly receive a drill for drilling a plurality of apertures in said jaw bone at accurate predetermined locations.

2. In the drill guide assembly as defined in claim 1, said jig fixture on said second arm member being provided with a lateral slot extending from end to end; said slot intersecting each of said apertures so as to provide each of said apertures with an intermediate radial opening to permit bone substances removed during the drilling operation through said jaw bone to be expelled outwardly to prevent clogging of said apertures.

3. In the drill guide assembly as defined in claim 1, the outer-most of said apertures in said jig fixture on said second arm member adapted for drilling through-bores through said jaw bone for the securement of equally spaced opposite securing rods of said staple to said jaw bone; the remainder of said plurality of apertures being adapted for drilling blind bores into said jaw bone for receipt of a plurality of correspondingly spaced intermediate locking and locating pins of said staple.

4. In the drill guide assembly as defined in claim 1, one side of said elongated post being provided with rack teeth; a gear member rotatably supported on said second arm member for meshing engagement with said rack teeth on said post; said gear member being operably connected to a handwheel outwardly of said second arm member for manual rotation of said gear member to thereby longitudinally move said second arm member along said post; and said locking means comprising a lock screw retained on said second arm member for engagement with said post.

5. In combination with a drill guide of the type described, a mandibular staple adapted for attachment to a jaw bone to locate and retain a dental appliance on said jaw bone; said mandibular staple comprising an elongated support plate; a pair of securing rods extending upwardly from said support plate in parallel direction from both ends thereof; a plurality

of locking pins disposed between said pair of securing rods extending upwardly from said support plate in parallel direction with said securing rods, and a plurality of locating pins extending from said support plate located between said locking pins and in parallel alignment therewith; said locking pins and said locating pins being of substantially shorter length than said pair of outer end securing rods.

6. In the mandibular staple as defined in claim 5, said pair of securing rods being threaded externally to each receive a nut member adapted for retaining engagement within mating apertures predeterminedly located in said dental appliance.

7. In the mandibular staple as defined in claim 6, said pair of outer securing rods adapted for extension through equally spaced apertures drilled through said jaw bone by means of said drill guide and said plurality of shorter length locking and locating pins being adapted for extension into accurately spaced blind bores drilled into said jaw bone by means of said drill guide.

8. In the mandibular staple as defined in claim 7, said plurality of locking pins being each provided with a mushroom type head portion and said plurality of locating pins being externally threaded for interlocking engagement with the bone tissue within said blind bores provided in said jaw bone.

9. In the mandibular staple as defined in claim 5, said pair of securing rods and said plurality of locking pins and locating pins extending along an arcuate path substantially corresponding to the arcuate shape of said jaw bone.

10. In the mandibular staple as defined in claim 5, said support plate, securing rods and said plurality of locking and locator pins being coated with a layer of bio-ceramic material.

11. In the mandibular staple as defined in claim 10, said bio-ceramic coating being an oxide selected from the group consisting of aluminum oxide, titanium oxide and magnesium oxide.

12. In the mandibular staple as defined in claim 10, said bio-ceramic coating being of a porous nature to permit homogeneous intergrow with the bone tissue of said jaw bone upon application of said staple to said jaw bone.

13. The method of locating and retaining a removable dental appliance upon a mandibular jaw bone comprising the steps of:

1. accurately drilling a pair of spaced bores through said mandibular jaw bone;
2. accurately drilling a plurality of blind bores into said mandibular jaw bone located between said spaced through-bores;
3. projecting a pair of spaced securing rods of a mandibular staple through said pair of spaced through-bores and projecting simultaneously the free ends of a plurality of locking pins of said mandibular staple into said blind bores provided in said jaw bone;
4. hammering said mandibular staple into place for full extension of said securing rods and said locking pins into said apertures;
5. threading fasteners over the free ends of said securing rods projecting from said jaw bone into cooperative retaining abutment with said jaw bone;
6. cutting off the excess lengths of said securing rods above said fasteners; and
7. mounting a preformed correspondingly apertured dental appliance upon said jaw bone to snugly nest said fasteners into said corresponding apertures of said dental appliance.

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