

[54] **BONE IMPLANT AND METHOD OF IMPLANTATION**

[76] Inventor: **Alfred E. Edelman**, 2723 Federal Street, Camden, N.J. 08105

[22] Filed: Mar. 1, 1971

[21] Appl. No.: 119,515

[52] U.S. Cl..... 32/10 A

[51] Int. Cl. A61c 13/00

[58] **Field of Search**..... 32/10 A, 2, 8

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Primary Examiner—Robert Peshock

Attorney—Munson H. Lane

[57] **ABSTRACT**

A bone implant having a thin elongated, flat, arcuate blade portion which is adapted to be implanted in a

bone so as to avoid unviolatable physiological landmarks having at least one integral neck portion projecting from the blade portion and lying within substantially the same plane as the blade portion but adapted to extend out of the bone when the blade portion is implanted and to which various attachments may be secured. The blade portion has at least one end remote from the neck portion which end is sharpened and is adapted to incise the bone upon the application of a force to the neck portion which force has a component acting in the direction of the one end. The implant is implanted by first cutting a starting slot of a width approximate the thickness of the implant and of a length substantially less than the length of the implant, positioning the implant in the slot with the one sharpened end against one end of the slot, forcing the implant in the direction of the one end so that the one end incises the bone in an arcuate path, forcing the other end of the implant down into the slot when the other end overlies the slot, and forcing the implant in the direction of the other end until a locking projection on the implant engages uncut bone.

24 Claims, 29 Drawing Figures

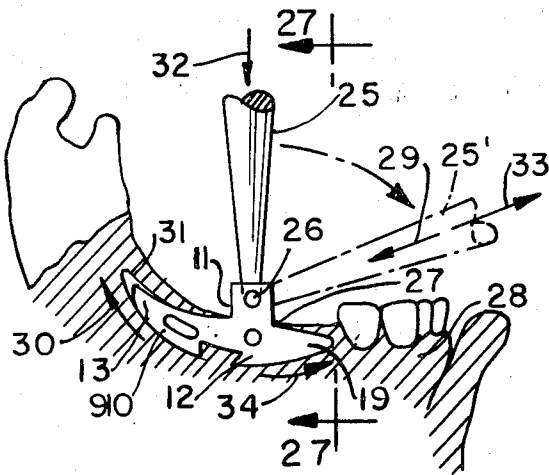


FIG. 1.

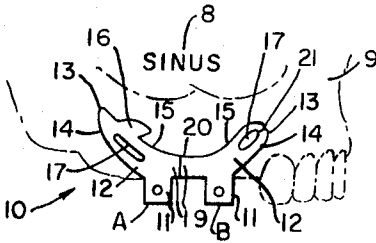


FIG. 4.

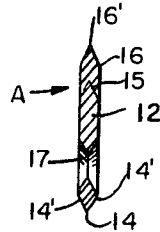


FIG.5.

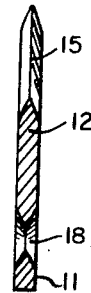


FIG. 2.

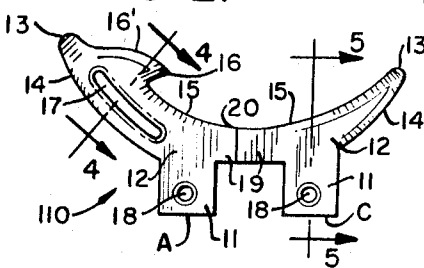


FIG. 3

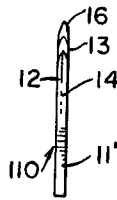


FIG. 10.

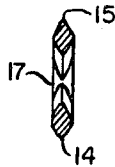


FIG. 13.

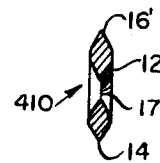


FIG.6.

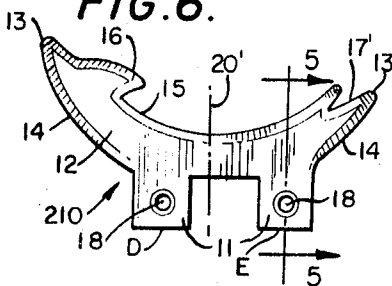


FIG. 7.

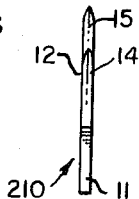


FIG.14.

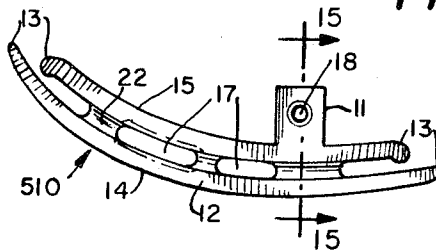


FIG. 15.



FIG. 8.

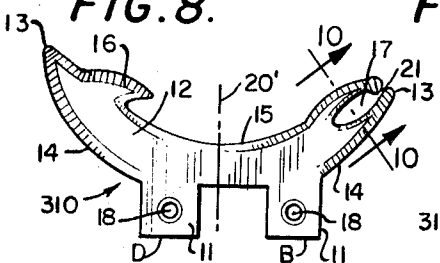


FIG.9.

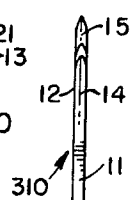


FIG. 16.

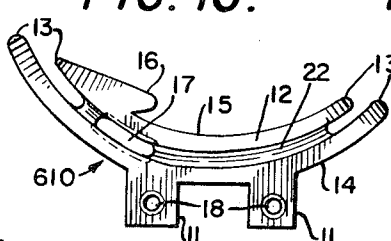


FIG. 17.



FIG. 11.

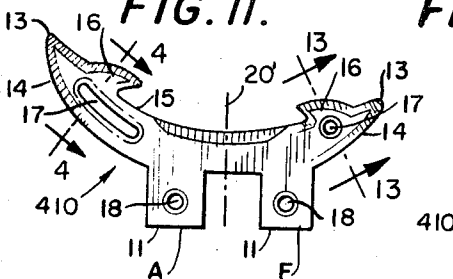
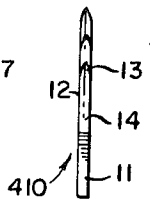


FIG. 12.



INVENTOR
ALFRED E. EDELMAN

BY Munson H. Lane

ATTORNEY

FIG. 18.

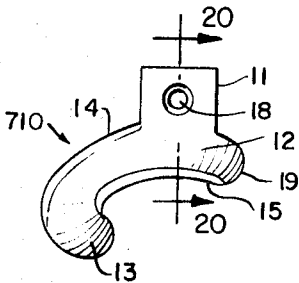


FIG. 19.

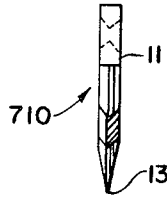


FIG. 20.

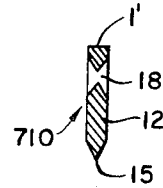


FIG. 21.

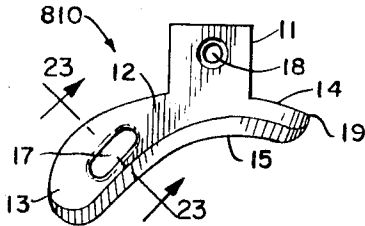


FIG. 22.

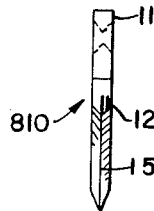


FIG. 23.

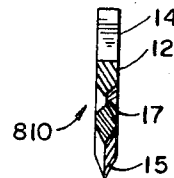


FIG. 24.

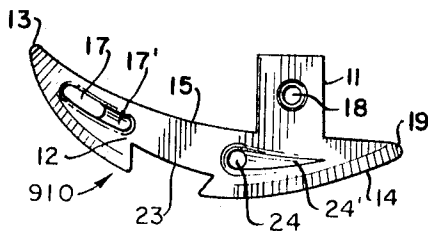


FIG. 25.

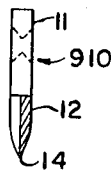


FIG. 28.

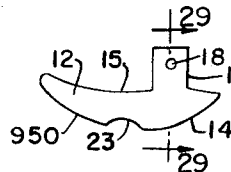


FIG. 29.

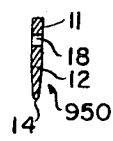


FIG. 26.

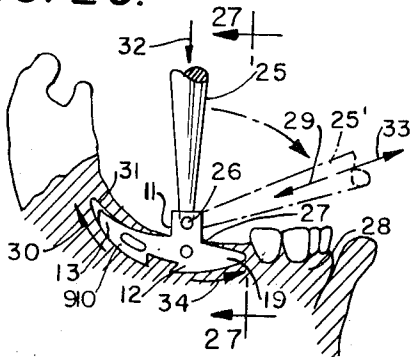
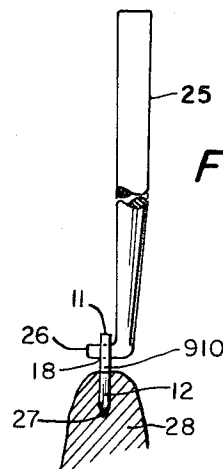


FIG. 27.



INVENTOR

ALFRED E. EDELMAN.

BY *Munson H. Lane*

ATTORNEY

BONE IMPLANT AND METHOD OF IMPLANTATION

This invention relates to a method of implanting flat bladed, arcuate shaped implants in bone structure in a manner to circumvent physiological landmarks which should not be violated such as the maxillary sinus, and to implants which are specifically adapted for use with the method of this invention.

While the implants of this invention and method for implanting them are particularly suited for use in the human jaw, the implants and method may be used in other bones where implants are required for various purposes. The human jaw, or maxilla, both upper and lower, contains certain physiological landmarks such as nerves and tuberosities such as the maxillary sinus which must not be violated by implants implanted in the bone. The maxillary sinus for example bulges downwardly into the maxilla so as to limit the depth to which an implant may be inserted in the maxilla without damaging the sinus. Recognizing that it is often necessary to place an implant in the maxilla in the area of the sinus, the implants of this invention have been developed which will circumvent the sinus and other physiological landmarks. Also a method has been devised for implanting the implants to circumvent the physiological landmarks, without doing damage to the landmarks.

The implants of this invention comprise a thin, elongated and arcuate shaped planar blade portion adapted to be implanted in the bone and at least one integral neck portion projecting from one longitudinal edge of the blade portion in approximately the same plane as the blade portion. Locking projections are provided on the blade portion which are adapted to be forced into the bone and interlocked therewith by sliding the blade portion longitudinally with respect to the bone to prevent the implant from being withdrawn from the bone directly by the application of an outward force substantially perpendicular to the longitudinal axis of the bone. The implants are further characterized by having apertures in the blade portion into which bone may grow and intermesh with the implant. An aperture provided in the neck portion of the implant permits a hooked end force applying tool to be inserted in the implant to maneuver the implant relative to the bone. At least one of the longitudinal ends of the blade portion of the implant is sharpened so that when a longitudinal force is applied to the implant in the direction of the sharpened end, the sharpened end can be forced into the bone to incise an opening.

In the various forms of the invention which will be described in the specification, the longitudinal ends of the implant blade portion are variously pointed, rectangular, bifurcated and curved. Various combinations of the aforesaid diverse end shapes may be included on the opposite ends of the implant blade portion. The arcuate shape of the implant blade portion permits the implant blade portion to be inserted in the bone to circumvent a tuberosity such as the maxilla sinus.

The materials from which the implants can be made are metals (preferably non-corrosive) synthetic resinous plastics, ceramics and metals coated with various materials including non-corrosive metals, ceramics and plastics.

The apertures formed in the implanted blade portion to permit the intermeshing of bone with the implant may be of various shapes including circular holes, elongated slots and other shapes. Relief areas may be

formed in the blade portion which do not extend all the way through the blade and yet will permit the bone to interlock with the blade edges of the relief areas and apertures may be rounded or beveled to eliminate sharp corners and the slots and relief areas may fade or taper to an edge or a narrow width. Relief areas in some forms are provided adjacent slots or circular apertures and the relief areas taper or narrow in a direction away from the apertures.

One specific form of the invention includes a complementary pair of arcuate implants which when implanted together in the bone forms a continuous arch equal to the combined length of the pair of implants.

The necks of the implants when properly implanted will extend outwardly from the bone to provide a support for various attachments and in the case of dental implants will commonly provide a post to which a dental crown may be affixed. For dental implants the shape of the implant will vary depending on whether the implant is to be used in the upper or lower jaw. In general an implant for the upper jaw will be characterized by having the ends of the arcuate blade directed upwardly and the neck extending downwardly from the outside arcuate curve, and an implant for the lower jaw will have the ends of the arcuate blade pointing upwardly and the neck extending upwardly from the inside arcuate curve.

The method of this invention includes the steps of first forming a starting opening in the bone in the area of the physiological landmark to receive a portion of a selected implant. Since the implants with which the invention is concerned include a thin, elongated, flat and longitudinally curved blade portion adapted to be implanted in the bone and an integral neck portion adapted to protrude from the bone when the implant is properly positioned the initial opening formed in the bone by cutting will be an elongated slot of approximately the thickness of the blade portion, of a depth approximately equal to the depth of the blade portion in the area of the neck portion which will underlay, or overlay, as the case may be, the physiological landmark, and of a length substantially less than the anterior-posterior length of the blade portion. The second step after forming the initial slot in the bone will be to place one sharpened end of the longitudinal curved blade portion in the slot against one end of the slot. The next step will be to force the blade to slide longitudinally in the bone in an arcuate path by application of a force to the neck portion in the direction of the sharpened end using a special tool which will be described subsequently. The sharpened end of the blade will incise the bone to enlarge the slot as the implant is forced to slide longitudinally. The sliding movement of the blade in the direction of the one sharpened end is discontinued after the initial opening plus the incised opening formed by sliding movement of the implant is equal in length to the anterior-posterior length of the implant. The implant is then forced toward the bottom of the slot until the leading edge of the implant is fully seated against the bottom of the slot. The implant is then forced to slide in an arcuate path in the opposite direction to the initial sliding movement until a locking projection on the implant interlocks with the bone. The locking projection may be a retro-hook projecting from the one sharpened end of the blade portion or it may be a second sharpened end of the blade portion extend-

ing on the opposite side of the neck portion from the one sharpened end. In either case retro-sliding movement of the implant causes the locking projection to penetrate a previously uncut portion of the bone.

With the foregoing objects and features in view and such other objects and features as may become apparent as this specification proceeds, the invention will be understood from the following description taken with the accompanying drawings, wherein like characters of reference are used to designate like parts, and wherein:

FIG. 1 is a diagrammatic view showing one form of the invention superimposed on the outline of an upper jaw to show the relative position of the implant to the jaw when properly implanted.

FIG. 2 is an elevational view of the implant shown in FIG. 1 on an enlarged scale.

FIG. 3 is a right hand elevational view of the implant shown in FIG. 2.

FIG. 4 is a vertical sectional view taken along line 4—4 of FIGS. 2 and 11.

FIG. 5 is a vertical sectional view taken along line 5—5 of FIGS. 2 and 6.

FIG. 6 is an elevational view of a modified form of the invention.

FIG. 7 is a right hand end elevational view of the modified form shown in FIG. 6.

FIG. 8 is an elevational view of another modified form of the invention.

FIG. 9 is a right hand end elevational view of the implant shown in FIG. 8.

FIG. 10 is a sectional view taken along line 10—10 of FIG. 8.

FIG. 11 is an elevational view of another modified form of the invention.

FIG. 12 is a right hand end elevational view of the implant form shown in FIG. 11.

FIG. 13 is a sectional view taken on line 13—13 of FIG. 12.

FIG. 14 is an elevational view of another modified form of the invention.

FIG. 15 is a vertical sectional view taken along line 15—15 of FIG. 14.

FIG. 16 is an elevational view of another form of the invention.

FIG. 17 is a right hand end elevational view of the implant shown in FIG. 16.

FIG. 18 is an elevational view of another modified form of the invention.

FIG. 19 is an end elevational view of the implant shown in FIG. 18.

FIG. 20 is a sectional view of the implant shown in FIG. 18 taken along line 20—20.

FIG. 21 is an elevational view of another form of the invention.

FIG. 22 is a right hand end view of the implant shown in FIG. 21.

FIG. 23 is a sectional view of the implant shown in FIG. 22 taken along line 23—23.

FIG. 24 is an elevational view of another modified form of the invention.

FIG. 25 is a right hand end view of the form of the invention shown in FIG. 24.

FIG. 26 is a sectional view through a portion of a lower jaw bone showing an implant positioned in the jaw and illustrating a tool used for moving the implant.

FIG. 27 is a vertical sectional view taken along line 27—27 in FIG. 26.

FIG. 28 is an elevational view of a temporary retro-molar implant.

FIG. 29 is a vertical cross-sectional view taken on line 28—28 in FIG. 28.

Referring now to the drawings and particularly to FIG. 1, one form of the invention 10 is shown comprising a pair of complementary implants A and B implanted in the maxilla 9 and circumventing the sinus area 8. The implants A and B each include a thin, elongated, flat arcuate blade portion 12 defined by an outside arcuate edge 14 and an inside arcuate edge 15, and an integral neck portion 11 projecting from the outside arcuate edge 14. The blade portions of each of the complementary implants A and B have longitudinal ends 13 which are remote from the neck 11 and which are sharpened and are adapted to incise bone upon the application of a force to the neck portion which has a component acting in the direction of the remote end. The blade portions A and B also have blunt, or flat near ends 19 which are adapted to abut each other along a radial line of separation 20 when implanted in the maxilla or other bone. Openings 17 are provided in the blade portions 12 of the implants A and B into which bone may grow and intermesh with the implant to secure it in the bone and apertures 18 are provided in the neck portions 11 to receive a force applying tool. The opening 17 in the implant A is shown to be an elongated slot, while the opening 17 in the implant B is elliptical in shape. The end 13 of the implant A is a sharpened point and the end 13 of the implant B is rounded and provided with a narrow slot 21 extending from the rounded end 13 into the aperture 17.

In the case of implant A a hooked projection 16 extends from the blade portion 12 in the region of the pointed end 13. The neck portions 11 of all the implants illustrated in the drawings are generally rectangular prisms but other neck forms may be adapted within the scope of this invention. With regard to all forms of the invention illustrated in the drawings it can be generally said that the arcuate edges 14 and 15 are sharpened by beveling opposite sides of the blade portion 12 along portions of the arcuate edges and particularly near the ends 13. Also the marginal edges defining the openings 17 and 18 will generally be beveled or rounded in a manner to reduce sharp corners.

FIGS. 1, 2, 6, 8 and 11 are provided to show implants which are either complementary as shown in FIGS. 1 and 2 or which are integral as shown in FIGS. 6, 8 and 11 but may be made complementary by cutting along a line of separation as indicated at 20'. These figures show that the implants may have diverse complementary sections selected from a plurality of complementary section forms A through F. The selection of the proper combination of section forms will depend to some extent on the physiological landmarks in the area of implantation which must be avoided, however, in many situations, the selected combination is not critical and one of various equally suitable combinations may be selected.

In FIG. 2 the implant 110 is shown to include complementary implants A and C in combination. Implant A has been described in conjunction with FIG. 1, however FIG. 4 shows a cross-section of implant A taken along line 4—4 of FIG. 2. As seen in FIG. 4 the outside arcuate edge 14 of the blade portion 14 is sharpened by beveling the blade portion on its opposite sides as at 14'. The edge 14 may be sharpened along its entire

length or it may be sharpened only in the region of the remote end 13. Similarly the projecting hook portion 16 has its humped edge 16' sharpened by beveling the opposite sides of the blade portion 12, and the arcuate edge 15 may be a sharpened beveled edge along all or a portion of its length. The marginal edges defining the slot 17 are also shown to be beveled.

The implant form C differs from form B in that the end 13 of form C is pointed rather than rounded and no openings are provided in the blade portion 12. FIG. 5, a sectional view of the implant form C taken along line 5-5 of FIG. 2, shows the inner arcuate edge 15 and the edge defining the opening 18 in the neck portion 12 to be beveled.

FIG. 6 shows a modified form of the invention 210 comprising an integral implant having half section forms D and E which may be divided by cutting along the division line 20'. Form D is like form A except that it does not have an opening 17. Form D differs from the previously described forms with respect to the remote end 13 which is bifurcated and sharpened and has no additional openings provided in the blade portion 12 except the opening 17' provided in the bifurcated end.

The modified implant 310 shown in FIGS. 8, 9 and 10 is an integral implant comprising half section forms D and B which may be divided by cutting along the division line 20'. FIG. 10, a cross-sectional view through the end 13 of implant section form B, shows the sharpened arcuate edges 14 and 15 and the beveled marginal edges surrounding the elliptical opening 17.

The modified implant 410 shown in FIG. 11 is an integral implant comprising half section forms A and F which may be divided by cutting along the division line 20' between the necks 11 of forms A and F. Form F, like form A, has a sharpened pointed end 13 and a hooked projection 16, but instead of a slotted opening 17 as in Form A it has a circular opening 17.

A cross-sectional view through the blade portion 12 of the implant form F in the region of the hooked projection 16 and the opening 17 is shown in FIG. 13 where the sharpened arcuate edge 14 and the sharpened humped edge 16' of the hooked projection 16 is apparent.

FIGS. 14 and 16 disclose modified implant forms 510 and 610 respectively which have arcuate grooves 22 extending the full length of their arcuate blade portions 12 and elongated openings 17 situated in the groove 22. The opposite ends 13 of the blade portion 12 are bifurcated and sharpened.

The implant form 510 is especially designed for use in the lower angle of the mandible or retromolar area and is provided with a single neck portion 11 extending radially inwardly from the inner arcuate edge 15. FIG. 15, a vertical cross-sectional view through the neck 11 and blade portion 12, shows the aperture 18 in the neck 11, grooves 22 on opposite sides of the blade portion 12 and the sharpened outer arcuate edge 14.

The implant form 610 is especially designed for use in the upper tuberosity area and is provided with two neck portions 11 each of which have an aperture 18 for receiving a force applying tool. The implant 610 has a projecting hook portion 16 extending inwardly from the inner arcuate edge 15. The hook 16 like similar hooks on other implants 10, 110, 210, 310 and 410 faces away from the end 13 near which it is located so that sliding movement of the implant in the direction the hook faces will cause the hook to lock into bone

formation and secure the implant. The arcuate grooves 22 with the openings 17 permit bone growth to enter the grooves and openings and lock the implant in place.

FIG. 18 shows an implant 710 for the anterior portion of the upper jaw. It has the usual neck 11 and blade portion 12 with outer arcuate edge 14 and sharpened inner arcuate edge 15 but is particularly characterized by having a sharpened end 13 which is curved inwardly in the manner of a hook. The neck 11 is located near the curved and sharpened proximate end 19.

FIG. 21 shows another implant 810 for the posterior portion of the upper jaw. It includes the usual neck 11 with aperture 18 and blade portion 12 with outer arcuate edge 14 and inner arcuate edge 15. The blade portion 12 is of substantially greater width on one side of the neck 11 in the area of the remote end 13 than on the other side of the neck in the area of the proximate end 19 and bone growth receiving slot 17 extends through the blade portion 12 in the enlarged area thereof. The arcuate edge 15 is beveled and sharpened throughout its entire length.

FIGS. 24 and 25 show another implant 910 having a neck 11 and a crescent shaped blade portion 12. The neck 11 extends upwardly from the inner arcuate edge 15 and has a tool receiving aperture 18. The outer arcuate edge 14 is sharpened throughout its length except where a notch 23 is formed in the edge. A slotted aperture 17 is formed in the blade portion 12 and grooves 17' of diminishing depth extend away from the slot 17 in the direction of the end 19 on opposite sides of the blade portion 12. A circular aperture 24 is also provided in the blade portion 12 and grooves 24' of diminishing depth and width extend away from the aperture 24 in the direction of the end 19. The implant 910 is adapted to be implanted in the lower jaw 28 in the retromolar position as shown in FIGS. 26 and 27.

FIGS. 26 and 27 are provided to illustrate the method of implanting an implant of this invention and it shows the retromolar implant 910 by way of example. The first step in the implanting method is to incise a starting slot 27 in the bone into which the implant will be implanted. The slot will normally be approximately the same depth as the blade portion 12 in the region of the neck 11 or slightly less if desired since the sharpened edge of the blade may be forced downward into the bone by pressure or impact applied to the neck. The length of the starting slot will normally be less than the overall length of the implant and the thickness of the slot will be slightly less than the thickness of the implant. After the initial slot is formed and cleared of any debris, the remote, or leading end, 13 of the implant will be placed in the slot as far forward as it can go. The trailing, or proximate, end 19 will not yet be pushed downwardly into the slot since the slot is not long enough to accept the full length of the implant 910. A tool having an elongated handle 25 and a hooked end 26 is applied to the implant by inserting the hooked end 26 through the aperture 18 in the neck 11 and tilting the handle to the dotted line position 25'. Force is now applied to the tool 25 in the direction of the arrow 29 so as to cause the implant to move or slide in the direction of the arrow 30. The sharpened point 13 incises the bone as it pushes in the direction of arrow 30. When the end 13 of the implant has been forced forward sufficiently to permit the proximate, i.e., trailing end, 19 to be forced downwardly into the preformed slot, forward movement of the implant in the direction

of arrow 30 is discontinued and the handle 25 is swung upwardly to the solid line position shown in FIG. 26 whereupon a downward force in the direction of arrow 32 is applied to the handle 25 to force the end 19 of the implant down into the slot. The handle is then swung downward to the dotted line position and a retroacting force in the direction of arrow 33 is applied to the handle 25 to move the implant in the direction of arrow 34 and force the end 19 into an area of previously uncut bone. Retraction of the implant in the direction of the arrow 34 will leave a cavity 31 in the bone 28 formed when the end 13 was pushed in the direction of arrow 30. The retraction of the implant is only sufficient to cause the end 19 to enter uncut bone and is not sufficient to cause the end 13 to be withdrawn from an area where there is overlying bone. Both ends of the implant will now be held in the jaw by bone structure overlying the ends 13 and 19.

When inserting the implants 10 and 110 having complementary sections, each section will be forced in the direction of their leading ends 13 into the bone through a starting slot initially cut into the bone. After the ends 13 of implants A and B (taking implant 10 as illustrative) have been forced forward along an arcuate path sufficient for the ends 19 to be forced into the starting slot with a gap therebetween other implants A and B are retracted toward each other until the ends 19 of implants A and B abut each other. In retracting implant A the hook portion 16 will be forced into previously uncut bone and interlock therewith.

It is not required that the complementary implants such as A and B of FIG. 1 be so implanted as to have their ends 19 abutting. They may be implanted as separate independent implants and may then serve as anchors for bridging links or fittings.

The one piece implants of this invention may all be implanted in the manner as described in reference to FIGS. 26 and 27. The arcuate grooves 22 of the implants 510 and 610 will facilitate the sliding movement of the implant in an arcuate path as the implants are being inserted according to the method described.

The apertures 18 in the necks of the various implants described herein are capable of receiving various dental fittings as well as hooked end 26 of the implant manipulating tool 25.

In some situations it may be desirable or necessary prior to permanently installing the implant to first form the opening for the implant by using a gauging type device, or temporary implant, which is known in the trade as a try-in. The temporary implant will be of substantially the same shape as the permanent implant but will be of slightly smaller dimensions so that the opening formed by use of the temporary implant will not be oversized for the permanent implant. A retromolar try-in 950 adapted to be used in locating and forming the opening or slot 27 for the retromolar implant 910 is shown in FIG. 28. The try-in 950 has a neck 11 with aperture 18 and crescent-shaped blade portion 12 defined by outer arcuate edge 14 and inner arcuate edge 15. The try-in blade is normally free of any openings or projections which will interlock with the bone and prevent removal of the try-in. While a notch 23 is provided in the edge 14 of the try-in the notch is rounded in contrast to the dove-tailed shape of the notch 23 in the retromolar implant 910.

The try-in 950 is adapted to be implanted by the method previously described with reference to FIGS.

26 and 27 and the retromolar implant 910. However after the try-in is thought to be implanted in the desired position avoiding any physiological landmarks as required, an X-ray of the jaw with the implanted implant is made. If the location is correct the try-in is removed and a permanent implant is substituted. If the location is incorrect the try-in is maneuvered to the correct position before removing the try-in and installing a permanent implant.

Implants may be made with the necks 11 inclined at various angles relative to the blade portion 12. It is also within the scope of this invention that the blade portion 12 of the implants have various vertical cross-sections other than those shown in the drawing such as a wedge-shape wherein the blade tapers in thickness from the juncture with the neck 11 to a sharp edge opposite the neck 11. Also the shoulders of the implant (that is, the edges of the blade portion merging with the neck 11) may be involuted or convoluted in such a manner that they would aid in bone growth across the width of the shoulder and also into some undercut perforations or configurations in the shoulder area.

While in the foregoing there have been described and shown several embodiments of the invention, various modifications may become apparent to those skilled in the art to which the invention relates. Accordingly, it is not desired to limit the invention to this disclosure and various modifications and equivalents may be resorted to falling within the spirit and scope of the invention as claimed.

What is claimed is:

1. A bone implant having a thin, elongated, flat arcuate blade portion adapted to be implanted in a bone and at least one integral neck portion angularly projecting from said blade portion and lying within substantially the same plane as said blade portion, said blade portion having at least one longitudinal end remote from said neck portion which end is sharpened and is adapted to incise the bone upon the application of a force to the neck portion which has a component acting in the direction of said one end, said neck portion having an aperture extending therethrough in a direction normal to said plane, for receiving the short angled end of a force applying tool which has an elongated shank portion extending at substantially a right angle with respect to said short angled end by means of which a force acting in a direction lying within said plane may be applied to said implant.

2. The bone implant set forth in claim 1 wherein said one end is pointed.

3. The bone implant set forth in claim 2 wherein the blade portion has a hooked projection adjacent said pointed end.

4. The bone implant set forth in claim 1 wherein said blade portion has at least one opening therein into which bone may grow.

5. The bone implant set forth in claim 1 wherein said blade portion has a pair of opposite longitudinal ends which are sharpened.

6. The bone implant set forth in claim 5 wherein one of said opposite terminal ends is pointed and the other of said opposite terminal ends is bifurcated.

7. The bone implant set forth in claim 6 wherein said blade portion has a hooked projection adjacent said pointed end.

8. The bone implant set forth in claim 5 wherein both of said opposite terminal ends are pointed and a

hooked projection extends from said blade portion adjacent each of said terminal ends.

9. The bone implant set forth in claim 8 wherein a circular hole extends through said blade portion in the region of one of said pointed ends and an elongated slot extends through said blade portion in the region of said other terminal end.

10. The bone implant set forth in claim 5 wherein each of said opposite terminal ends are bifucated and grooves extend longitudinally along opposite sides of said blade between said bifucated terminal ends.

11. The bone implant set forth in claim 10 wherein at least one aperture is provided in said blade portion along the length of said grooves.

12. The bone implant set forth in claim 10 wherein a hooked projection extends from said blade portion in the region of one of said bifucated ends.

13. The bone implant set forth in claim 1 wherein said blade portion has a curved shoulder edge on the same side of the blade portion as said neck portion and a curved leading edge opposite said shoulder edge, the curvature of said shoulder edge and of said leading edge facing in the same general direction.

14. The implant set forth in claim 13 wherein said leading edge is sharpened along its entire length and said shoulder edge is sharpened at least in the region of said one longitudinal end.

15. The implant set forth in claim 14 wherein said shoulder edge and said leading edge converge to a point at said one longitudinal end.

16. The implant set forth in claim 13 wherein said shoulder edge and said leading edge are curved away from said neck portion.

17. The implant set forth in claim 13 wherein said shoulder edge and said leading edge are curved toward said neck portion.

18. The implant set forth in claim 5 wherein said blade portion is crescent-shaped.

19. The implant set forth in claim 18 wherein a notch is provided along one edge of said crescent-shaped blade.

20. The implant set forth in claim 5 wherein both of said ends are curved.

21. The implant set forth in claim 20 wherein said blade portion has a curved hook formation on one end remote from said neck.

22. A bone implant comprising a pair of complementary implants adapted to be implanted in linear abutting relationship to form a continuous arch imbedded in the bone, each of said implants having a thin, elongated,

flat, arcuate blade portion forming a different segment of said arch, and at least one integral neck portion angularly projecting from said blade portion and lying within substantially the same plane as said blade portion, said blade portion having at least one longitudinal end remote from said neck portion which is sharpened and is adapted to incise the bone upon the application of a force to the neck portion which has a component acting in the direction of said one end, and a second end nearer said neck portion, said second end of one of said complementary pair of being complementary to the second end of the other of said implants so that when the implants are aligned in the same plane the second ends of the complementary implants will abut in contiguous relationship, and the remote ends will form the ends of said arch.

23. The bone implant set forth in claim 22 wherein the blade portion of one implant of said complementary pair has a hooked projection adjacent said remote end.

24. A method for implanting a bone implant of the type having a thin, elongated, flat, arcuate blade portion provided with at least one sharpened end, and a neck portion projecting from one arcuate edge of said blade portion so as to avoid violating physiological landmarks, said neck portion being a planar extension of said blade portion and having an aperture extending therethrough in a direction normal to a medial longitudinal plane common to said neck and said blade portion, comprising cutting a thin starting slot in the bone in the region of said landmark of a width approximate the width of said blade portion in the region of said neck and of a length substantially less than the length of said implant, inserting one end of said blade portion in said slot against one end thereof in a manner such that the arcuate blade portion arches toward said bone, inserting into said aperture the short angled end of a force applying tool which has an elongated shank portion extending at substantially a right angle with respect to said short angled end, manipulating said force applying tool for forcing said implant in a direction toward the one sharpened end so that the sharpened end incises the bone in an arcuate path sufficiently to permit the other end of the blade portion to be forced down into the starting slot, forcing said other end of the blade portion into the starting slot, and applying force to the implant in the direction of said other end to force said other end into uncut bone.

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