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ORAL SURGERY TOOL WITH INTERCHANGEABLE BLADES

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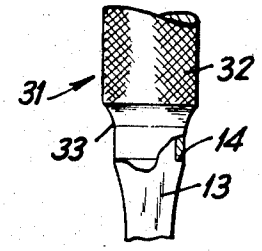


FIG. 4

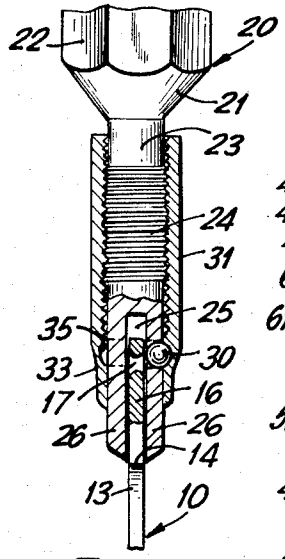


FIG. 2

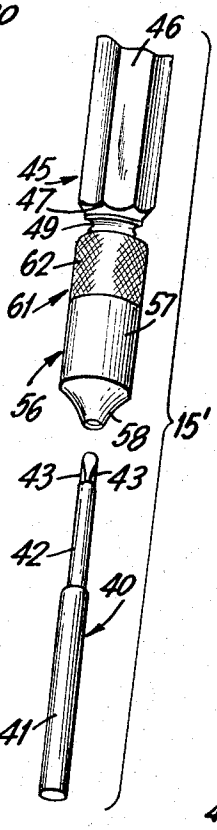


FIG. 5

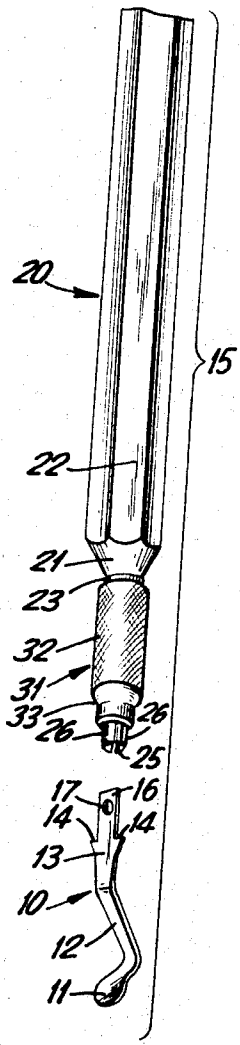


FIG. 1

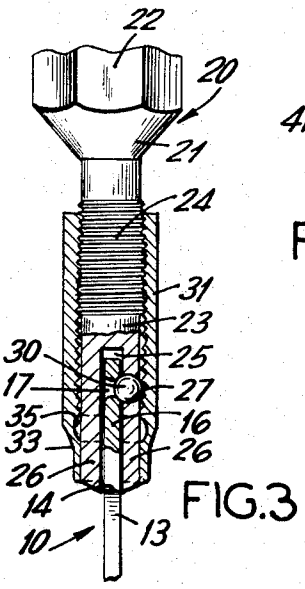


FIG. 3

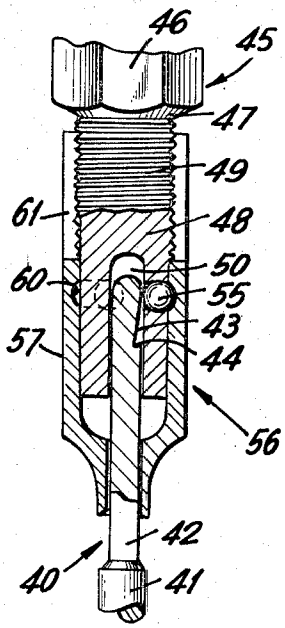


FIG. 6

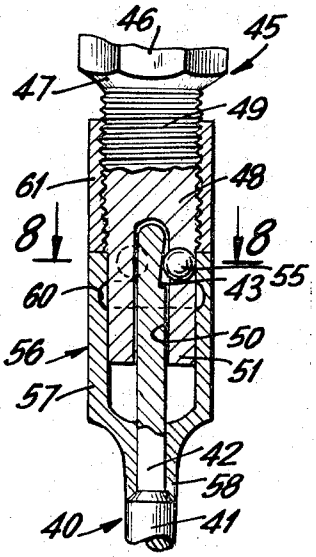


FIG. 7

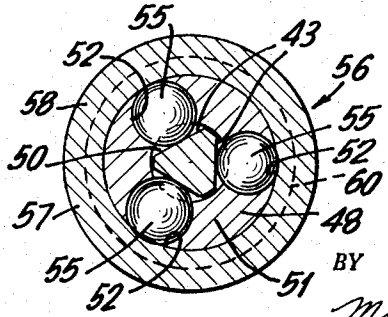


FIG. 8

INVENTORS
ABRAHAM W. WARD
RAYMOND T. WHIPPLE
BY
Moses, McGlew & Toren
ATTORNEYS.

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ORAL SURGERY TOOL WITH INTERCHANGEABLE BLADES

Abraham W. Ward, 1125 Greenwich St., San Francisco, Calif. 94109, and Raymond T. Whipple, 673 Bille Road, Paradise, Calif. 95969

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ABSTRACT OF THE DISCLOSURE

A tool for oral surgery is disclosed as including a handle having a longitudinally extending outwardly opening recess, a replaceable tool having a shank fitting the recess, and releasable detent means for anchoring the shank in the recess or permitting withdrawal of the shank from the recess. The recess has at least one aperture through its wall, receiving a ball detent whose diameter is greater than the thickness of the recess wall. A sleeve is reciprocable longitudinally of the handle and has an annular groove alignable with the recess or recesses. The combined depth of the annular groove and the thickness of the recess wall is at least equal to the diameter of the ball detent so that the ball detent may move outwardly into the annular groove to clear the recess when the annular groove is aligned with the recess. The tool shank may then be inserted into the recess and, by longitudinal displacement of the sleeve along the handle, the annular groove is moved out of alignment with the aperture in the recess wall so that the ball detent is forced inwardly to engage locking formations on the shank of the tool.

Background of the invention

This invention relates to surgical tools, particularly to knives designed for oral surgery as in operations on the gums for the treatment of pyorrhea or similar conditions. More particularly, the present invention is directed to a novel oral surgery tool in which interchangeable blades may be readily engaged into and disengaged from a common handle.

In a particular type of knife to which the present invention is directed, and which is particularly designed for oral surgery, the knife blade preferably is arranged in angular or oblique relation with respect to the longitudinal axis of its handle, thereby enabling the blade to be used most effectively for operations upon the gum. In its preferred form, the blade is provided with a single bevelled cutting edge, the inside surface of the blade being a planar surface, and the outer side of the blade being smoothly bevelled so that the cutting edge is coincident with the inner planar surface. This enables the blade to be sharpened very easily by applying the planar surface to a sharpening stone.

The cutting edges of these knives become worn during use, and also are sometimes broken or otherwise damaged. Consequently, in order not to interrupt an oral surgery, it is necessary that spare or extra knives be kept on hand, so that, in the event of excessive wear or damage of the knife being used, a freshly sharpened knife may be substituted. As a result, the dentist has a substantial investment tied up in spare knives.

Summary of the invention

To avoid this, the present invention comprises a novel oral surgery tool wherein knife blades may be readily interchanged in a common handle. Thereby, the only investment required, in addition to one handle, is that for a plurality of knife blades which can be readily and interchangeably used with the same handle. It is, of course, highly desirable that the interchange be effected as quickly as possible, particularly when the dentist is actually in the course of oral surgery. The present invention provies for such quick interchange by providing a novel, easily operable chuck or clutch by means of which one blade may be rapidly and simply disengaged from the handle and a new blade firmly locked therein without any loss of time.

To this end the handle has, at one end, a longitudinally extending outwardly opening recess, and each tool has a shank fitting in the recess. In a preferred embodiment of the invention, the shank is formed with at least one tapered indentation extending therealong, decreasing in depth toward the free end of the shank and terminating short of the free end thereof. An aperture is formed through the wall of the recess and is aligned with the indentation in the shank when the shank is operatively engaged in the recess, and a ball detent is displaceably mounted in the aperture and has a diameter greater than the thickness of the recess wall.

A sleeve closely embraces the outer surface of the recess wall and is displaceable longitudinally of the handle. This sleeve has an annular groove in its inner surface alignable with the aperture, and the thickness of the recess wall plus the depth of the annular groove is at least equal to the diameter of the ball detent. Thus, when the annular groove is aligned with the aperture, the shank may be inserted into and retracked from the recess with the ball detent retracted into the annular groove to clear the recess. Upon relative longitudinal displacement of the sleeve to displace the annular groove out of alignment with the aperture, the ball detent is displaced into the indentation in the shank to lock the shank in the recess.

A feature of the invention is that the shank has laterally projecting shoulders spaced from its free end and engageable with the sleeve, upon displacement of the sleeve in a shank locking direction towards the shank and outwardly of the recess, to effect relative movement of the ball detent toward the shallower portion of the ball detent and the indentation in the shank, with the net effect being what might be termed a "double camming" action.

Description of the drawings

For an understanding of the invention, reference is made to the following description of two embodiments thereof which are illustrated in the accompanying drawings, with FIGS. 1 through 4 illustrating one embodiment, and FIGS. 5 through 8 illustrating a second embodiment.

In the drawings:

FIG. 1 is an exploded partial perspective view of one form of oral surgery knife embodying the invention;

FIG. 2 is a part elevation and part longitudinal sectional view of the operative end of the knife in FIG. 1, showing the clutch parts in the release portion;

FIG. 3 is a view similar to FIG. 2, illustrating the clutch parts in the locking position;

FIG. 4 is a partial elevation view corresponding to FIG. 3;

FIG. 5 is a view, similar to FIG. 1, illustrating a second embodiment of oral surgery tool in accordance with the invention;

FIGS. 6 and 7 are views, corresponding respectively to FIGS. 2 and 3, of the second embodiment of the oral surgery tool; and,

FIG. 8 is a section taken on the line 8—8 of FIG. 7.

Description of the preferred embodiments

Referring first to that embodiment of the tool shown in FIGS. 1 through 4, tool **15** is illustrated as including a knife blade **10** and a relatively elongated and substantially rectilinear handle **20**. Blade **10** is preferably formed of sheet steel and is mounted so that the edged portion

extends at an angle of approximately 45° to the longitudinal axis of handle 20. Blade 10 has a somewhat widened edge portion 11 which extends at substantially a right angle to an intermediate portion 12 which, in turn, extends at an angle of approximately 45° to a shank portion generally indicated 13. Intermediate the ends of shank portion 13, the side edges of the latter are flared outwardly to form a pair of oppositely extending shoulders 14 which face toward the inner end of the shank portion. Inwardly of shoulders 14, shank portion 13 is substantially narrow and rectangular, as indicated at 16, and is formed with a preferably circular aperture 17 for a purpose to be described. This narrow shank 16, in cooperation with the shoulders 14, is arranged to form the operative interlocking connection between blade 10 and handle 20.

Handle 20 is preferably a solid piece of metal which is relatively rigid and relatively massive in order to provide for adequate control of the knife. To provide for easy gripping of the handle 20, the latter preferably has a polygonal cross section, such as the hexagonal cross section illustrated. One end of handle 20 is formed with wall means defining a longitudinally extending recess which receives the narrow shank 16 of blade 10. As illustrated, this end of handle 20 has a substantially conical transition section 21 connecting a grip portion 22 to a reduced diameter extension generally indicated at 23. For a purpose to be described, extension 23, over a relatively minor portion of its length, is formed with a thread 24. The aforementioned recess is formed by a substantially rectangular cross section slot 25 extending inwardly from the outer end of extension 23 and terminating somewhat outwardly of the outer end of thread 24. This slot is defined laterally by wall means 26, 26 having a preselected thickness.

Intermediate the inner and outer ends of recess 25, and preferably near the inner end thereof, one or both of the wall means 26 are formed with a preferably circular aperture 27 therethrough. The particular embodiment of the invention illustrated in the drawing, this aperture receives a detent member which is in the form of a ball 30. The diameter, or lateral dimension of ball 30, is somewhat greater than the thickness of wall means 26. The purpose of this will be made apparent as the description proceeds.

A relatively elongated and internally threaded sleeve 31 closely embraces the extension 23 and the wall means 26, and has a length only a little less than that of extension 23. The outer surface of sleeve 31 is knurled as at 32 (FIGS. 1 and 4) to provide for firm gripping thereof. Adjacent its outer end sleeve 31 is reduced in outer diameter in a smooth transitional manner, as indicated at 33. Adjacent this transition portion, the inner surface of sleeve 31 is formed with a relatively shallow arcuate cross section annular groove 35. The depth of groove 35 plus the thickness of a wall means 26 has a value at least equal to the diameter of ball detent member 30, and may slightly exceed this diameter.

The tool 15 shown in FIGS. 1 through 4 is operated in the following manner: In order to insert the narrow shank 16 of a blade 10 into the recess 25, sleeve 31 is screwed inwardly along thread 24 until arcuate groove 35 is aligned with aperture 27. When this alignment is effected, the shank 16 of the blade 10 may be readily inserted into recess 25, with ball detent member 30 being forced laterally or radially outwardly to engage in arcuate groove 35. Shank 16 is pushed inwardly into recess 25 sufficiently to align the aperture 17 in the shank with the aperture 27 in wall means 26, and preferably this occurs when the inner end of shank 16 is either at or closely adjacent the bottom end of recess 25. If sleeve 31 is now screwed outwardly along reduced diameter extension 23, from the position shown in FIG. 2 to the position shown in FIG. 3, ball detent member 30 will be forced inwardly to engage in aperture or recess 17. Preferably, such outward screwing of sleeve 31 along thread 24 is continued until the outer end of sleeve 31 abuts the shoulders 14 of blade 10, and thus these shoulders limit the outward displacement of sleeve 31. Blade 10 is now firmly locked in handle 20. To release blade 10 for interchange with another blade, sleeve 31 is screwed inwardly until arcuate groove 35 is again aligned with aperture 27. If a retracting force is then exerted on blade 10, the shank 16 of the latter may be readily withdrawn from recess 25, forcing ball detent member 30 to move into arcuate groove 35.

It should be appreciated that, instead of forming shank 16 with an aperture 17, the shank may have another type of formation which is cooperable with ball detent member 30 to lock the shank in recess 35. For example, shallow dimples or recesses may be formed in the wider surfaces of shank 16.

FIGS. 5 through 8 illustrate a second embodiment of tool in accordance with the invention, and the tool 15' shown in these figures includes a blade 40 having a circular or cylindrical shank and arranged to be releasably and interchangeably interlocked in a handle 45. The blade 40 may be either an oral surgery knife or any other type of tool, and is operated and may have the same construction as the operative end of the blade 10 of FIGS. 1 through 4. Blade 40 includes a cylindrical shank 41 with a reduced diameter extension 42. The end of extension 42 is formed as a latching portion. For this purpose, the inner end of extension 42 is formed with two or more planar bevelled surfaces 43, each terminating in a radial shoulder 44. In the particular embodiment shown, there are three of these bevelled surfaces 43, as best illustrated in FIG. 8. Thus, a diametrical section through the latching end of extension 42 has the shape of a triangle with rounded corners. Shoulders 44 face toward the inner end of extension 42, and bevelled surfaces 43 increase in depth outwardly from this inner end, as best seen in FIGS. 6 and 7. The major portion of handle 45 is identical with the corresponding major portion of handle 20 of FIGS. 1 through 4. Thus, handle 45 has a polygonal cross section and relatively elongated grip 46 which merges, through a transitional portion 47, with a reduced diameter extension 48. However, instead of being formed with a rectangular cross section slot or recess 25, as in the case of handle 20, the reduced diameter extension 48 of handle 45 is formed with a cylindrical recess 50. The external surface of extension 48 is formed with a thread 49 which extends from adjacent transition portion 47 to a point somewhat outwardly of the inner end of recess 50. Recess 50 is defined by tubular or annular wall means 51 which have a predetermined thickness, and wall means 51 is formed with a plurality of preferably circular apertures therethrough equal in number of the bevelled surfaces 43 and preferably spaced at equal angular distances circumferentially of wall means 51. Each of the apertures 52 receives a ball detent member 55 which has a diameter somewhat greater than the thickness of wall means 51. While ball detent members are illustrated by way of example, it should be appreciated that the detent members could have forms other than spherical, such as, for example, cylindrical cross section or rectangular cross section pin shapes. In such latter case, the dimensions of the detent members laterally of wall means 51 will be somewhat in excess of the thickness of wall means 51.

An outer sleeve 56 has a relatively large diameter portion 57 which closely embraces extension 48 of handle 45, and a relatively small diameter section 58 which is arranged to closely embrace extension 42 of shank 41 of blade or tool 40. A short distance from the inner end of sleeve 56, the inner surface of large diameter portion 57 is formed with an arcuate cross section annular groove 60.

An inner sleeve 61 is internally threaded for engagement with the thread 49 on handle extension 48, and the length of sleeve 61 is somewhat less than the axial length of thread 49. The outer surface of sleeve 61 is knurled,

as best seen at 62 in FIG. 5, to provide for sure gripping thereof.

The arrangement shown in FIGS. 5 through 8 operates substantially as follows: With the parts occupying the position shown in FIG. 6, the inner sleeve 61 has been screwed in inwardly along the thread 49 so that the outer sleeve 56 may be displaced inwardly to align arcuate annular groove 60 with aperture 62. This permits the ball detent members 55 to clear the recess 50. The extension 42 of shank 41 of blade 40 may then be inserted into the recess for the full depth. Outer sleeve 56 is then moved outwardly until its small diameter portion 58 abuts the shoulder at the intersection of extension 42 with the main portion of shank 41. As sleeve 56 is moved outwardly, the ball detent members 55 are forced into the bevelled surface recesses 43 to lock extension 42 against disengagement from recess 50. The inner sleeve 61 is threaded outwardly to abut the outer sleeve 56 and maintain the latter fully engaged with the shoulder between shank 41 and extension 42. Release of a blade or tool for interchange with another blade or tool for other purposes is effected by the reverse of these movements.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A tool for oral surgery comprising a handle having, at one end, wall means defining a longitudinally extending recess; a replaceable tool having a shank fitting in said recess; said shank being formed with a tapered indentation extending therealong, decreasing in depth toward the free end of said shank, and terminating short of said free end; an aperture formed laterally through said wall means and opening into said recess, said aperture being aligned with the deeper portion of said indentation when said shank is operatively engaged in said recess; a ball detent displaceably mounted in said aperture and having a diameter greater than the thickness of said wall means; and a sleeve closely embracing said wall means and relatively displaceable longitudinally of said handle, said sleeve having an annular groove in its inner surface alignable with said aperture by longitudinal displacement of said sleeve; the thickness of said wall means plus the depth of said groove being at least equal to the diameter of said ball detent; whereby, when said groove is aligned with said aperture, said shank may be inserted into and retracted from said recess with said ball detent retracted into said groove to clear said recess, said ball detent, upon relative longitudinal displacement of said sleeve to displace said groove from alignment with said aperture, being displaced into said indentation to grip said shank to lock the same against retraction from said recess; said shank having laterally projecting shoulders spaced from its free end and engageable with said sleeve, upon displacement of said sleeve in a shank locking direction to urge said shank outwardly of said recess to effect relative movement of said ball detent toward the shallower portion of said indentation, to exert a further gripping action between said ball detent and said indentation.

2. A tool for oral surgery comprising a handle having, at one end, wall means defining a longitudinally extending substantially circular cross section recess; a replaceable tool having a circular cross section shank fitting in said recess, the inner end of said shank being formed with plural tapered indentations extending longitudinally thereof, in the same zone and arranged at equal angular spacings around said shank, and decreasing in depth toward the free inner end of said shank and terminating short of said free inner end; at least one aperture formed laterally through said wall means and opening into said recess, said aperture being aligned with one of said indentations when said shank is operatively inserted in said recess; a detent ball displaceably mounted in said aperture and having a diameter greater than the thickness of said wall means; sleeve means closely embracing said wall means and relatively displaceable longitudinally of said handle, said sleeve means having an annular groove in its inner surface alignable with said aperture by longitudinal displacement of said sleeve means; the thickness of said wall means plus the depth of said groove being at least equal to the diameter of said detent ball; whereby, when said groove is aligned with said aperture, said shank may be inserted into and retracted from said recess with said ball detent retracted into said groove to clear said recess, said ball detent, upon relative longitudinal displacement of said sleeve to displace said groove from alignment with said aperture, being displaced into said recess to engage in one of said indentations to grip said shank to lock the same against retraction from said recess; said shank having a shoulder thereon facing toward said inner end and engageable with said sleeve means, upon such longitudinal displacement thereof in a direction to displace said groove from alignment with said aperture to urge said shank outwardly of said recess to effect relative movement of said ball detent toward the shallower portion of said indentation to exert a further gripping action between said ball detent and said indentation.

3. A tool for oral surgery, as claimed in claim 2, in which said wall means comprises a first sleeve reciprocable on said wall means for longitudinal displacement relative thereto; a second sleeve closely embracing said wall means and relatively displaceable longitudinally of said handle, said second sleeve having said annular groove; said second sleeve having an outer end engageable with said shoulder on said shank and having an inner end engageable with an end of said first sleeve for displacement of said second sleeve by movement of said first sleeve along said handle equal to the diameter of said ball detent; whereby, when said groove is aligned with said aperture, said shank may be inserted into and retracted from said recess, with said ball detent retracted into said groove to clear said recess; said ball detent, upon relative longitudinal displacement of said second sleeve by rotation of said first sleeve to displace said groove from alignment with said aperture, being displaced into said recess to engage one of said indentations to grip said shank to lock the same against retraction from said recess.

4. A tool for oral surgery as claimed in claim 2, in which said wall means is formed with a plurality of apertures opening into said recess, said apertures being arranged in the same zone and at equal angular spacing around said wall means and each aperture being aligned with a respective one of said indentations when said shank is operatively inserted in said recess; each aperture having a ball detent displaceably mounted therein.

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CARL W. TOMLIN, *Primary Examiner.*

WAYNE L. SHEDD, *Assistant Examiner.*