

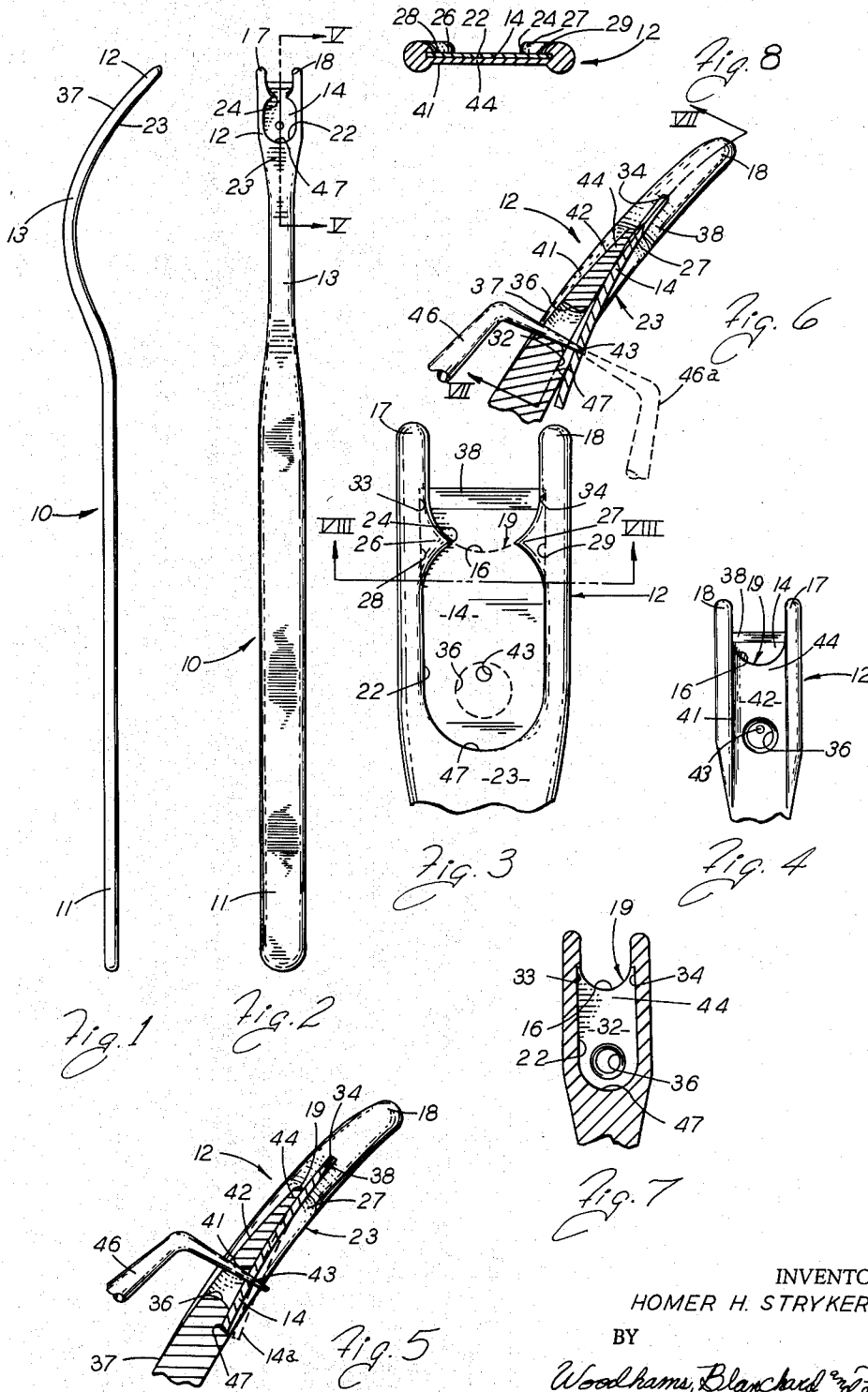
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SURGICAL KNIFE

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SURGICAL KNIFE

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This invention relates in general to a cutting instrument having a replaceable blade and, more particularly, to a surgical knife of this character which is particularly adapted for use in removing the semilunar cartilage from the knee.

An existing type of surgical knife, which is capable of removing the semilunar cartilages from the knee, is disclosed in Patent No. 2,029,495. Generally speaking this type of knife has been successfully and widely used. However, the nature of its use is such that its cutting edge soon becomes dull. Thus, the surgeon must determine, before using this type of knife, whether the cutting edge thereof is sharp enough to perform its cutting function or whether the knife should be replaced by another instrument. By virtue of their structure, the existing cartilage knives are very difficult and/or costly to sharpen. Accordingly, it has been common practice to dispose of and replace this type of instrument after its cutting edge has become dull, which has also been costly and wasteful.

Surgical instruments have a limited market and, therefore, they are usually relatively costly. This is largely due to the fact that the relatively high costs of developing, clinical testing and then marketing the instruments must be amortized in the selling price of a relatively few instruments. It follows, therefore, that the cost of performing the operation also reflects the instrument cost.

Accordingly, the objects of this invention have been to provide a surgical knife:

(1) Which is capable of completely satisfactory use in removing the semilunar cartilages from the knee through an incision of minimum size and which is less costly to use than existing instruments intended for the same or similar purposes.

(2) Which is relatively light in weight, sturdy in structure, easy to manipulate and extremely easy to clean and sterilize.

(3) Which has a relatively small, hence inexpensive, blade which can be easily and quickly removed from the handle structure of the instrument and replaced by any person capable of using or handling the instrument for its intended purposes.

(4) Which has a removable blade capable of being fabricated from materials especially designed for receiving and holding a very sharp cutting edge, so that it is unnecessary to fabricate the entire instrument from such material, thereby not only reducing the initial cost of such instrument but also greatly reducing the cost of replacing its cutting edge after an operation is performed so that the cutting edge of the instrument can be maintained in perfect cutting condition with a minimum of expense.

Other objects and purposes of this invention will become apparent to persons familiar with this type of instrument upon reading the following descriptive material and examining the accompanying drawings, in which:

FIGURE 1 is a side elevational view of an instrument embodying the invention.

FIGURE 2 is a top plan view of said instrument.

FIGURE 3 is an enlarged fragment of FIGURE 2.

FIGURE 4 is an enlarged fragment of the front end of said instrument as viewed from the rear side thereof.

FIGURE 5 is an enlarged sectional view taken along the line V—V in FIGURE 2.

FIGURE 6 is an enlarged sectional view similar to that

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shown in FIGURE 5 with the blade in a partially removed position.

FIGURE 7 is a sectional view taken along the line VII—VII in FIGURE 6.

FIGURE 8 is a sectional view taken along the line VIII—VIII in FIGURE 3.

For convenience in description, the terms "front" and "rear" will have reference to the upper and lower ends, respectively, of the surgical instrument and parts thereof as appearing in FIGURE 1. The terms "inner," "outer" and derivatives thereof will have reference to the geometric center of said instrument and parts thereof.

General construction

The objects and purposes of the invention, including those set forth above, have been met by providing a surgical knife having an elongated body member, the rear end of which serves as a handle. The body member has a curved cutting head near the front end thereof. A removable and replaceable cutting blade is firmly supported upon the cutting head so that its cutting edge extends toward the front end of the instrument and is disposed between a pair of spaced probes which also extend frontwardly from the cutting head. The instrument preferably has a substantially rigid and one-piece body member.

Detailed description

The surgical knife 10 (FIGURES 1 and 2), which has been selected to illustrate a preferred embodiment of the invention, includes an elongated, substantially flat handle 11 which is connected to a blade supporting or cutting head 12 by a curved and slender neck 13. The handle 11, neck 13 and head 12 are preferably fashioned from a single piece of rigid and corrosion resistant material, such as stainless steel. A blade 14 is removably mounted upon the head 12 in a manner discussed in detail herein-after.

The surgical knife 10 has been designed in this particular embodiment for use in performing a particular type of surgical operation, i.e., the removal of the semilunar cartilage from its location in the bed adjacent the concave surfaces of the tibia. However, since the shape of the tibia and the associated parts of the knee may vary substantially in two different patients, it may at least be described to provide several surgical knives embodying the invention but having different amounts of curvature in the neck 13. Moreover, it will be recognized that the substance of the invention is susceptible to a variety of minor variations of this character which will adapt its structure for use in performing other surgical operations. However, specific reference will be made herein to the use of the instrument as a cartilage knife because it is from this use that the invention was developed.

The blade supporting head 12 (FIGURES 1, 2 and 3) is preferably an integral and smooth extension of the neck 13 and it preferably, but not necessarily, maintains the general curvature of said neck. The head 12 is of approximately the same thickness as the neck 13 but is preferably slightly broader to accommodate the blade 14.

The front end of said head 12 (FIGURES 3 and 7) has a centrally disposed notch 16 which opens frontwardly and thereby defines on opposite sides thereof a pair of spaced and substantially parallel probes 17 and 18 which are rounded at their front ends. The inner end wall 19 of the notch 16 is concavely curved so that it blends into the opposing sides of the probes 17 and 18 at their inner ends.

A shallow recess 22 (FIGURE 3) is provided in the concave surface 23 of the head 12 adjacent the notch 16. Said recess 22 is preferably, but not necessarily, elongated lengthwise of the head 12 and its width is slightly

greater than the perpendicular distance between the probes 17 and 18 though the central portion of the notch 16. The front and rear ends of the recess 22 are advantageously curved to facilitate the forming thereof. The front end of the recess 22 is positioned so that the central portion thereof defines a passageway 24 which communicates with the rear or inner end of the notch 16.

The passageway 24 (FIGURE 3) is defined, due to the shape of the recess 22 and the notch 16, by a pair of pointed projections 26 and 27 which point and extend toward each other on opposite sides of the passageway 24 adjacent the concave surface 23. Substantially coplanar slots 28 and 29 are cut into the opposing ends of the projections 26 and 27 and into the adjacent portions of the probes 17 and 18 (FIGURES 3 and 7), said slots being substantially coplanar with the bottom wall 32 of the recess 22. The front ends 33 and 34 (FIGURE 7) of the slots 28 and 29, respectively, are disposed forwardly of the end wall 19 of the notch 16. Also, the concave surface 23 of the head 12 diverges frontwardly with respect to the bottom wall 32 of the recess 22 (FIGURE 6) and with respect to the slots 28 and 29. Said bottom wall 32 is preferably slightly concave in a direction substantially conforming with the concavity in the concave surface 23.

An access opening 36 (FIGURE 7) is provided through the head 12 so that it communicates with the recess 22 near the rearward end thereof.

The convex surface 37 of the head 12 has a lengthwise groove 41 (FIGURE 4) which preferably extends from rearwardly of the opening 36 to the notch 16. Said groove 41, which is approximately as wide as the perpendicular distance between the probes 17 and 18, has a flat bottom wall 42 which diverges with the convex surface 37 toward the front end thereof. Thus, the thickness of the web 44 in the head 12, between the bottom walls 32 and 42, decreases from the rearward end thereof toward the frontward end thereof. The resultant taper in said web 44 tends to minimize the interference of the wall 19 and web 44 with the material, such as cartilage or flesh, along which the web 44 must move during the cutting operation being performed by the blade 14.

The blade 14 (FIGURE 3) is relatively thin and flat, and it is shaped for snug, but removable, disposition within the recess 22 and within the extensions of said recess provided by the slots 28 and 29. The sharpened edge 38 of the blade 14 is of such length that its opposite ends engage the front end walls 33 and 34 of the slots 28 and 29 to prevent the removal of the blade 14 through the front end of the head 12. However, the major part of the edge 38 is unobstructed within the notch 16 between the probes 17 and 18.

When the blade 14 is disposed within the head 12, as shown in FIGURES 2, 3 and 5, the projections 26 and 27 hold the central portion of said blade against the concave surface of the bottom wall 32, so that the blade is arched out of its normal, flat condition. The natural resistance of the blade 14 to such arching combines with the side and end walls of the recess 22 to hold the blade 14 against accidental dislodgement from within the head 12. That is, when the blade 14 is disposed between the bottom wall 32 and the projections 26 and 27, said blade is held in an arched and slightly distorted position (FIGURE 5) within the recess 22. Thus, rearward movement of the blade 14 is opposed by the rear end wall 47 and forward movement of the blade is opposed by the front end walls 33 and 34 of the slots 28 and 29, respectively. This arrangement positively prevents accidental removal of said blade from said head.

The blade 14 has a small opening 43 (FIGURE 4) near its rearward end which is aligned with the access opening 36 near the front end thereof when the blade 14 is properly disposed within the recess 22. Removal of the blade 14 from within the recess 22 is effected by inserting the pointed tip of a tool 46 (FIGURE 5) through the access opening 36 and into the opening 43. The rearward end

of the blade 14 is then urged rightwardly by said tool out of the recess 22 and into the broken line position at 14a. Thereafter, the tool 46 is moved into its position of FIGURE 6, whereby the rearward end of the blade 14 moves over the concave surface 23 adjacent the rearward end of the recess 22. The blade 14 can now be manually removed from its FIGURE 6 position, or it can be removed by placing the tool in its broken line position of 46a (FIGURE 6) and then moving said tool downwardly.

The replacement of a new blade can be effected by inserting the cutting edge 38 thereof (FIGURE 6) beneath the projections 26 and 27, and thereafter moving the blade forwardly until it drops into the recess 22. The blade is thus lodged between the rear end wall 47 and the front end walls 33 and 34 where it is ready for immediate use. During the cutting operation, the rear end of the blade 14 bears against the rear end wall 47 so that the cutting edge 38 can not move rearwardly with respect to the head 12.

Although a particular preferred embodiment of the invention has been disclosed in detail above for illustrative purposes, it will be understood that variations or modifications of such disclosure, which come within the scope of the appended claims, are fully contemplated.

What is claimed is:

1. A cutting instrument, comprising:

an elongated, substantially rigid member having curved portion near the front end thereof;

a pair of spaced, rigid probes extending from said front end of said member, said probes being substantially parallel with the adjacent part of said portion and defining a frontwardly opening notch;

wall means defining a shallow recess in one side of said portion adjacent said notch, said recess being slightly wider adjacent said probes than the distance between said probes, said portion having an opening communicating between said recess and the reverse side of said member, said opening being spaced from the probes; projection means extending over said recess between said opening and said probes; and

a thin blade sharpened along the front edge thereof and removably disposed in said recess between said projection means and said wall means, said blade being snugly held within said recess completely between said one side and said reverse side by said projection means and the rearward edge of said blade abutting said wall means when said cutting edge extends between said probes, said blade having engagement means thereon accessible through said opening.

2. A surgical knife, comprising:

an elongated, substantially rigid member having a handle with a curved neck extending from the front end of the handle and having a blade supporting head on the front end of the neck;

a pair of spaced, elongated and substantially parallel probes extending from the front end of said head in a direction substantially parallel with the adjacent part of said neck, said probes defining a frontwardly opening notch;

means defining an elongated, shallow recess in the concave side of said head and the adjacent portions of said probes, said recess being somewhat wider adjacent said probes than the distance between said probes;

means defining an access opening communicating between said recess and the convex side of said head at a point in said recess spaced substantially from said notch;

a pair of similar projections integral with said head and extending toward each other over said recess and from opposite sides thereof adjacent said notch, said projections being spaced from the bottom wall of the recess;

an elongated, flat blade having a cutting edge at one end thereof, said blade being snugly and removably

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held in said recess by and beneath said projections and with said cutting edge extending across said notch and facing frontwardly; and

means defining an opening through said blade substantially smaller than said access opening, said smaller opening being aligned with the access opening when said blade is in said recess.

3. A knife according to claim 2 wherein said rigid member is one-piece;

wherein the bottom wall of the recess is concave in a lengthwise direction and diverges slightly with said concave side toward said notch; and

wherein said blade is normally planar and only slightly thinner than the distance between said projections and said bottom wall so that said blade is forced into a curved position when it is disposed within said recess.

4. A knife according to claim 2 wherein said head has a groove in the convex side thereof adjacent said notch, the bottom wall of said groove diverging with the convex side of said head toward said notch;

wherein the bottom wall of said recess diverges with the concave side of said head toward said notch; and

wherein the distance between the bottom walls of said recess and said groove adjacent said notch is relatively small.

5. A surgical instrument comprising:

an elongated handle having a curved front end portion and a pair of laterally spaced probes extending forwardly from the forward end of said curved portion and constituting extensions thereof;

means defining a longitudinal slot extending rearwardly along said curved portion and forwardly into said probes;

first abutment means adjacent the forward end of said slot and second abutment means at the rear end of said slot, said curved portion having a longitudinally elongated opening through the concave side thereof communicating with the rear-end of the slot and said second abutment means, said curved portion having an access opening extending from said slot through the convex side of said curved portion;

a thin, resilient blade received within said slot with its opposite ends abutting against said first and second abutment means, said blade having a cutting edge at its forward end extending laterally between said

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probes, said blade being capable of being flexed by a pressure applied thereto through said access opening whereby the rearward edge of said blade may be moved out of engagement with said second abutment means so that said blade can be removed by sliding it rearwardly through said elongated opening.

6. A knife according to claim 5 wherein said blade has a relatively small opening therethrough which is aligned with said access opening when said blade is received within said slot.

7. A surgical knife, comprising:

an elongated, substantially rigid member having a handle with a curved neck extending from the front end of the handle and having a blade supporting head on the front end of the neck;

a pair of spaced, elongated and substantially parallel probes extending from the front end of said head in a direction substantially parallel with the adjacent part of said neck, said probes defining a frontwardly opening notch;

wall means defining a shallow recess in the concave side of said head and the adjacent portions of said probes, said recess being somewhat wider adjacent said probes than the distance between said probes;

means defining an access opening communicating with said recess through said wall means at a point in said wall means spaced from said notch;

a pair of projections integral with said head and extending over a portion of said recess adjacent said notch, said projections being spaced from the bottom wall of the recess;

an elongated, flat blade having a cutting edge at one end thereof, said blade being snugly and removably held in said recess by and beneath said projections and with said cutting edge extending across said notch and facing frontwardly, the rearward edge of said blade abutting a portion of said wall means.

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