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[54] **BIOPSY NEEDLE**
5 Claims, 4 Drawing Figs.

[52] U.S. Cl. **128/2 B,**
 128/221, 128/310, 128/347

[51] Int. Cl. **A61b 10/00**

[50] Field of Search 128/2, 310,
 2 B, 347, 305, 221

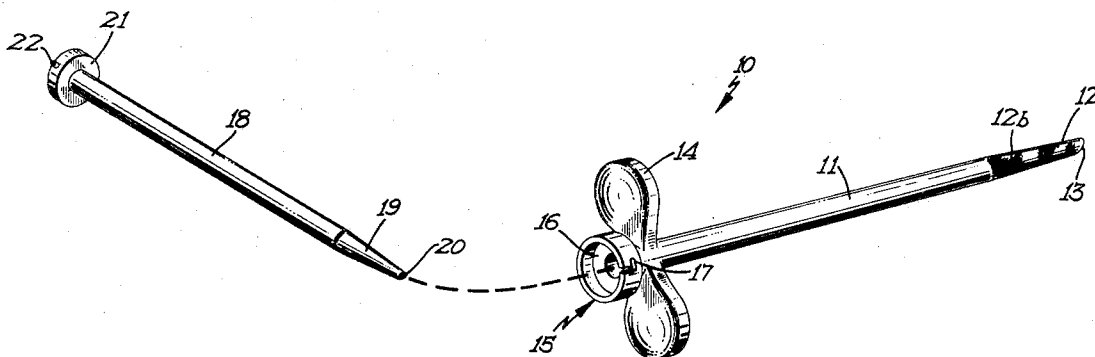
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ABSTRACT: A biopsy needle of uniform diameter throughout the major portion of its length includes a tapered distal end portion which terminates in a distal cutting edge. An elongate stylet is insertable into the needle and has a closed distal end which is positioned in close proximity to and cooperates with the distal cutting edge of the needle to present a symmetrical closed end to facilitate insertion of the needle into a patient and collection of a biopsy specimen. The stylet and needle are releasably interlocked together whereby upon removal of the stylet, a biopsy tissue will be collected in the tapered distal end portion of the needle. Because of the expanded tapered interior of the needle there is little, if any, compression of the tissue specimen within the needle and therefore little, if any, damage to the tissue specimen.



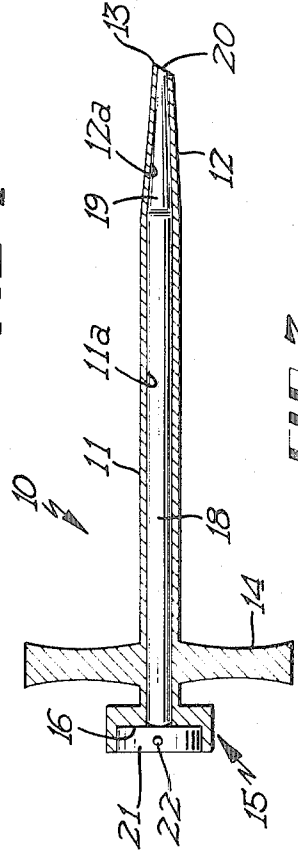
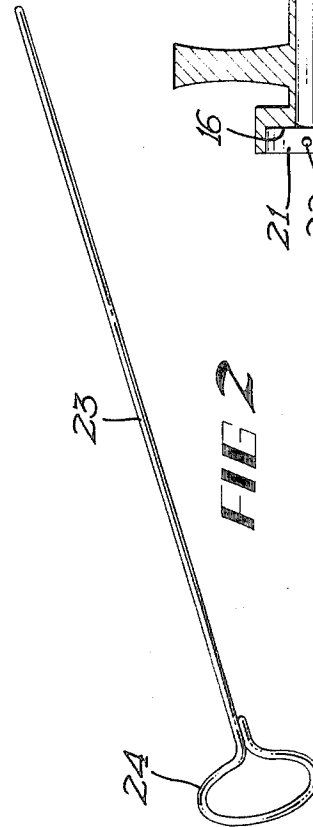
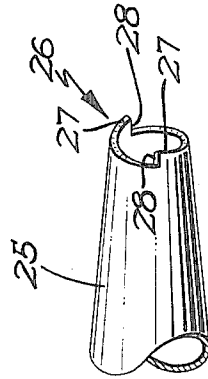
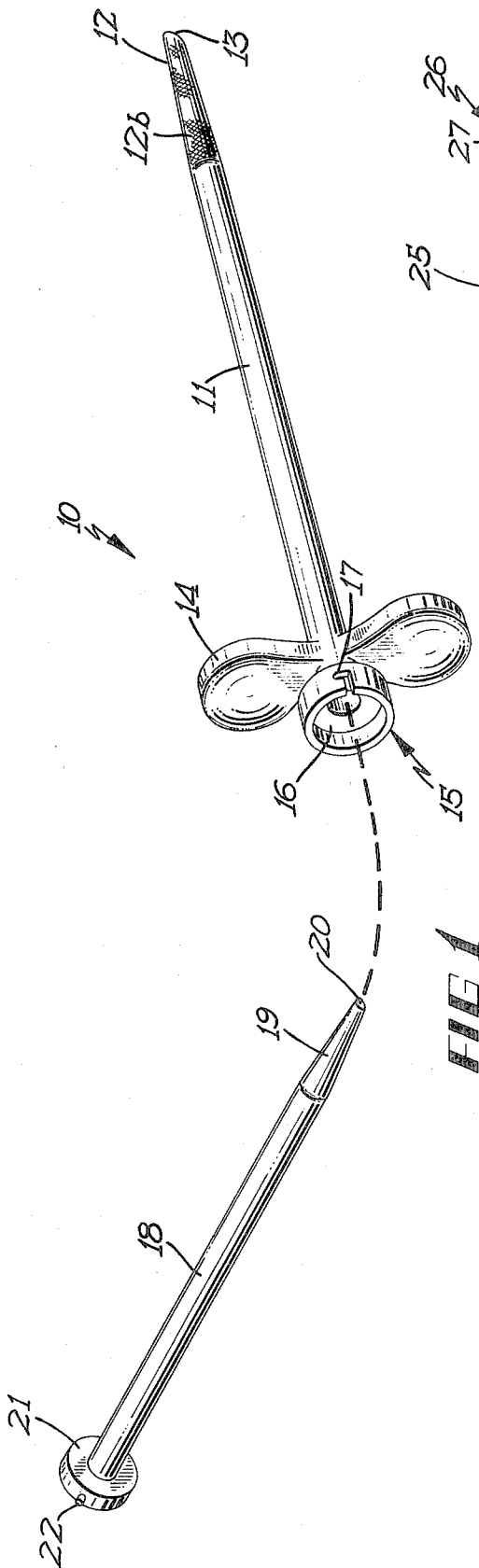


FIG 4

FIG 3

FIG 2

FIG 1

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BIOPSY NEEDLE

SUMMARY OF THE INVENTION

Heretofore, biopsy tissue has been obtained by means of a number of specialized biopsy instruments. One such instrument is a biopsy needle which is typically of elongate cylindrical construction and the tissue is collected interiorly of the needle. However, it has been found that biopsy tissue collected in such needles is compressed and often crushed so that the specimen is unusable. Biopsy needles of this type are used to obtain bone marrow biopsy specimens and when the specimen is unusable a new specimen must be obtained.

It is therefore a general object of this invention to provide a biopsy needle whose distal end portion has a uniformly tapered interior so that the specimen is allowed to expand as it is collected and will therefore not be crushed and damaged.

More specifically, it is an object of this invention to provide a biopsy needle having a tapered distal portion terminating in a cutting edge which is useful in not only obtaining bone marrow biopsy tissue but also biopsy specimens from the liver, kidney, spleen, skin, muscle and other tissues. One particular cutting edge which may be employed in a biopsy needle to great advantage is a double saw tooth cutting edge, the teeth being diametrically opposed and each presenting a cutting edge which is substantially parallel to the axis of the needle thereby permitting effective radial cutting as well as penetration by the needle.

These and other objects and advantages of this invention will more fully appear from the following description made in connection with the accompanying drawings wherein like reference characters refer to the same or similar parts throughout the several views.

BRIEF DESCRIPTION OF THE FIGURES OF THE DRAWING

FIG. 1 is an exploded perspective view of the biopsy needle and stylet associated therewith,

FIG. 2 is a perspective view of a smaller, narrower stylet which may be advantageously used to remove the tissue specimen from the needle,

FIG. 3 is a longitudinal cross-sectional view illustrating the stylet and needle of FIG. 1 in interlocked relation with respect to each other, and

FIG. 4 is a perspective view of the distal end portion of a needle illustrating the modified form of a cutting edge.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings and more specifically to FIG. 1, it will be seen that one embodiment of a novel biopsy needle designated generally by the reference numeral 10 is there shown. This biopsy needle is preferably constructed of metal and includes an elongate substantially cylindrical body 11 which terminates in a tapered distal end portion 12. Referring now to FIG. 3, it will be noted that the interior or lumen 12a of the distal end portion is uniformly tapered and very smoothly communicates with lumen or interior 11a of the major portion of the tubular body 11. The tapered end portion 12 terminates in a distal cutting edge 13 which, as shown, is oblique or bevelled relative to the longitudinal axis of the needle. The interior surface at the distal end of the distal end portion is bevelled or tapered outwardly to define the cutting edge 13.

The biopsy needle 11 is provided with a pair of outwardly projecting oppositely disposed finger grip elements 14 and terminates in a cylindrical slightly enlarged end member 15. The proximal end member 15 has a distal end wall 16 which has an aperture therein that communicates with the lumen 11a of the tubular body 11. The proximal end member 14 also has a notch 17 therein which extends from the proximal end thereof and terminates in an offset portion.

An elongate stylet 18 is provided and is similar in shape and length to the needle 11 and is also formed of a suitable metallic material. The stylet is of substantially cylindrical configuration but includes a tapered distal end portion 19 which ter-

minates in a bevelled or oblique distal end 20. The major portion of the stylet 18 corresponds in length to the length of the tubular body 11 but is of slightly smaller diameter and the tapered end portion 19 corresponds in length to the length of the tapered end portion 12 of the needle 10. Thus the stylet is adapted to be inserted into the needle in snug-fitting relation therein as best seen in FIG. 3.

The stylet 18 includes a proximal end member 21 which is of cylindrical configuration and which is adapted to be positioned within the proximal end member 15 of the needle 10. A locking pin 22 is affixed to the proximal end member 21 and projects radially outwardly therefrom. This locking pin 22 is adapted to be inserted into the notch 17 to be seated in the offset portion thereof when the stylet is inserted into the needle 10 to releasably interlock the stylet and needle together. This locking notch and pin on the stylet and needle also positions the bevelled distal end 20 in a congruent relationship with respect to the distal end 13 of the needle 11. By positioning the stylet and needle in this predetermined relation, the distal end of the assembly presents a closed end surface which is disposed in substantially a single oblique plane.

The tapered end portion 12 of the needle 10 has a rasplike exterior surface 12b to facilitate penetration of bone when a bone or bone marrow specimen is to be obtained. It is also pointed out that the stylet illustrated in FIG. 2 and designated generally 23 is used in the removal of the tissue specimen from the needle 10. This stylet 23 is of cylindrical configuration and is formed of a suitable metallic material and includes a looped end portion 24 which defines a handle. It is pointed out that this stylet has a substantially smaller diameter than the diameter defined by the opened distal end of the needle 10. The stylet is inserted into the distal end to gently urge the specimen towards the proximal end of the needle.

In use, the stylet 18 will be inserted into the needle 10 and will be interlocked therewith so that the tapered distal end 20 is positioned in predetermined relation with respect to the distal cutting edge 13 whereby a closed symmetrical end surface disposed substantially in a single plane is presented. The needle may be inserted into the patient until the tissue to be removed is engaged by the distal end of the needle. In the event that a bone matter sample is to be obtained, the rasplike surface 12b will facilitate penetration of a bone such as the iliac crest. Rotating the needle about its longitudinal axis, the rasplike surface serves to produce a boring effect upon the bone and facilitates entry into the marrow. When the distal end of the needle has reached the tissue from which the specimen is to be removed, the stylet 18 will be removed from the needle and the needle may again be revolved about its longitudinal axis while urging the same forwardly. This movement of the needle produces a cutting action of the tissue and allows the specimen to be collected interiorly of the needle. Because of the expanded configuration of the interior of the tapered portion 12, the biopsy specimen will not be crushed. After the specimen has been collected, the needle 10 may be removed from the biopsy tract and the stylet 23 may be inserted into the distal end to urge to specimen gently toward the proximal end of the needle and outwardly thereof. Alternatively, a conventional syringe may be attached to the proximal end of the needle to allow the specimen to be aspirated from the needle.

Referring now to FIG. 4, it will be seen that a slightly different embodiment of the cutting edge of the needle is there shown. The needle is identical in construction to that shown in FIG. 1 and includes a tubular body (not shown) and a uniformly tapered distal end portion 25. The interior of the tapered end portion terminates in a distal end which defines a cutting edge 26. The cutting edge 26 is provided with a pair of diametrically opposed teeth 27 which projects axially of the needle. Each tooth 27 defines an axial cutting edge 28 which is disposed substantially parallel to the longitudinal axis of the needle. These axial cutting edges 28 are of substantially the same length and the point of each tooth is disposed in substantially coplanar relation. The cutting edge surface defined between each axial cutting edge 28 is generally of spiral con-

figuration and facilitates cutting of a tissue as the needle is urged forwardly in an axial direction. However, the axial cutting edges 28 permit radial cutting when the needle is revolved about its longitudinal axis. The needle illustrated in FIG. 4 will also be provided with a stylet having a distal end configuration which will present a closed end surface disposed in a single plane.

It has therefore been found that a needle having a cutting edge such as that shown in FIG. 4 is specifically adaptable for use in obtaining a biopsy specimen from softer tissues such as the liver, kidney, skin and muscle tissue. The tissue sample will enter the expanding tapered distal end portion 25 and be moved axially of the needle without the attendant compression effect normally associated with conventional biopsy needles. With respect to muscle tissue, it is preferred that because of the striations, characteristic of muscle tissue, the needle will be of elliptical cross-sectional configuration rather than circular cross-sectional configuration. The distal end portion thereof will be tapered and the distal end will terminate in a cutting edge. The stylet associated with such needle will also have similar configuration to permit accurate telescoping of the stylet within the needle and proper positioning of the end of the stylet with respect to the distal end of the needle.

It has been found that through the use of the biopsy needle described hereinabove, specimens may be obtained without damage through crushing of the specimen and thus preserves the spatial relationships of the cellular elements and organelles of the tissue biopsied. This obviates the necessity of repeating the tissue removing technique for a biopsy specimen and thus minimizes anxiety problems associated with patients when obtaining biopsy specimens. It also will permit a more accurate assessment of the relationship of the various components of the tissue biopsied. It has also been found that the present biopsy needle which uses a uniformly tapered distal end portion is adaptable for obtaining biopsy specimens from various kinds of tissues and organs and thereby eliminates the need for specialized instruments.

As pointed out above, the cutting edge of the biopsy needle may be changed slightly in design from the oblique or bevelled cutting edge to the design illustrated in FIG. 4 wherein a pair of diametrically opposed teeth are utilized for cutting soft tissue. The use of a rasplike exterior surface may be employed in biopsy needles used in the obtaining of bone and/or bone marrow biopsy specimens. Thus present concept contemplates the use of biopsy needles for the purpose of acquiring biopsy specimens regardless of the tissue specimen to be taken.

There it will be seen, from the preceding paragraphs, that we have provided a biopsy needle which is not only of simple and inexpensive construction, but one which functions in a more efficient manner than any heretofore known comparable needle.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the various parts without departing from the scope of my invention.

What is claimed is:

1. An elongate hollow biopsy needle having opened distal and proximal ends, said distal end defining a cutting edge, said needle being of uniform hollow cylindrical configuration throughout the major portion of its length, and having an external distal end surface portion tapered generally uniformly, uninterrupted, toward the tip of the distal end, and an internal end surface defining an inner biopsy tissue receiving and retaining bore immediately adjacent the distal end and with the needle converging from a first circular diameter which extends along the major portion of the length of the needle toward and to a second and significantly smaller circular diameter at the distal end, an elongate stylet positioned within said needle and corresponding generally in length and shape to the bore formed in said needle, said stylet being of uniformly cylindrical configuration throughout a major portion of its length, and having a uniformly uninterrupted tapered distal end portion converging to a closed distal end tip; means arranged on said needle and stylet to position the stylet within said needle so that the distal ends of the needle and stylet cooperate with each other to present a symmetrical closed tip end whereby said needle and stylet may be inserted as a unit into a tissue, and when said stylet is removed from the needle after insertion into a tissue, and upon manipulation of the needle, the distal cutting end of the needle will cut a tissue sample and the tissue sample will be collected in the expanded distal end portion of the bore of the needle to thereby minimize damage to the tissue.
2. The biopsy needle as defined in claim 1 wherein said distal cutting edge of the needle is obliquely disposed relative to the longitudinal axis of said needle.
3. The biopsy needle as defined in claim 1 wherein said distal cutting edge of the needle has a plurality of teeth thereon extending along an axis disposed generally parallel to the longitudinal axis of the needle.
4. The biopsy needle as defined in claim 1 wherein said distal cutting edge of the needle has a pair of diametrically opposed teeth extending therefrom along an axis generally parallel to the longitudinal axis of the needle and each tooth defining a cutting edge extending substantially parallel to said longitudinal axis of said needle.
5. The biopsy needle as defined in claim 1 wherein the tapered portion of said needle adjacent the tip edge of said distal end portion has a rasplike circumferential exterior surface to facilitate cutting through hard tissues such as a bone.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,628,524

Dated December 21, 1971

Inventor(s) Khosrow Jamshidi

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 69, "14" should read -- 15 --.

Column 2, line 58, "to" (second occurrence) should read -- the --. Line 67, after "portion" insert -- 25 is also uniformly tapered and this tapered end portion --.

Column 4, Claim 1, line 12, after "surface" insert -- portion tapered generally uniformly, uninterrupted, toward the tip of the distal end, --.

Signed and sealed this 30th day of May 1972.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents