April 12, 1955 I. SILVERMAN 2,705,949

BIOPSY NEEDLE

Filed Aug. 25, 1953

FIG. 1

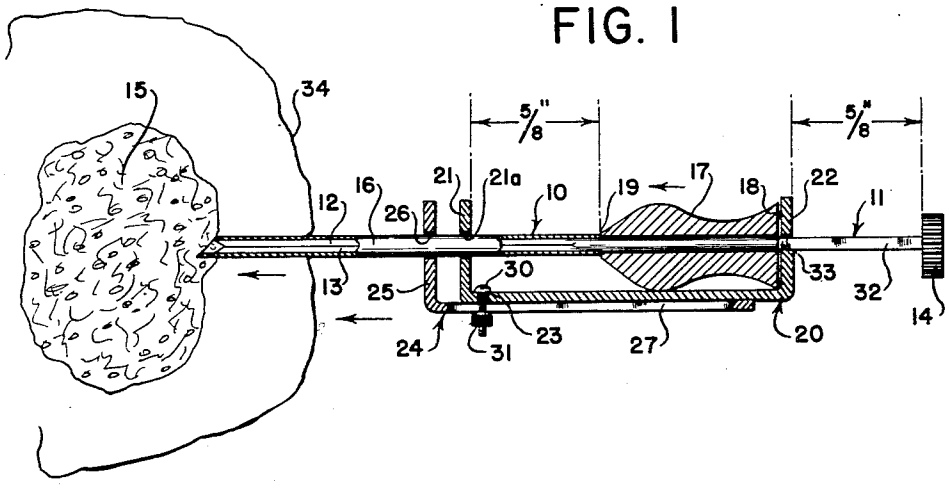


FIG. 2

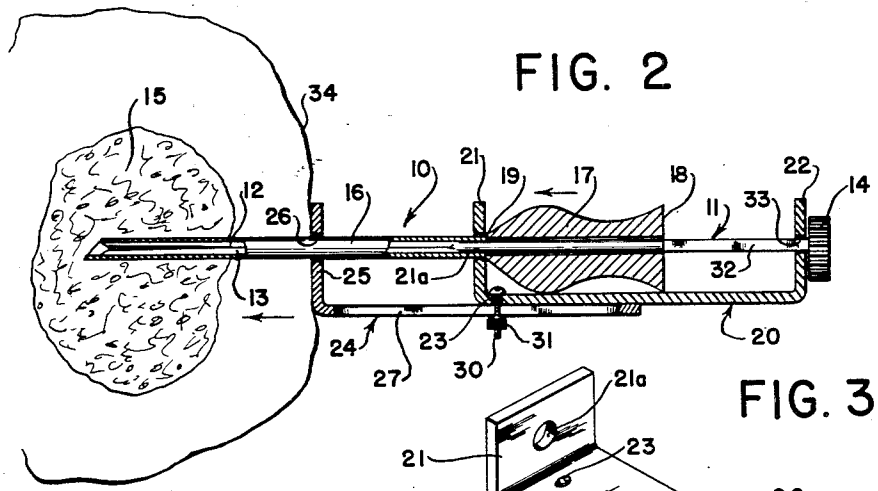


FIG. 3

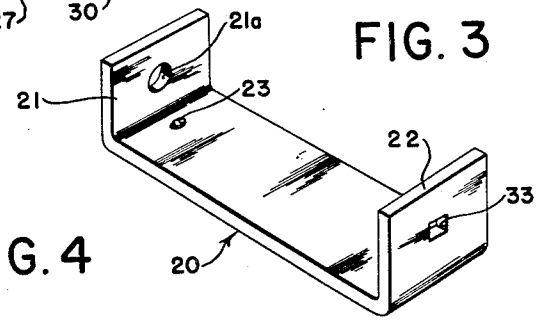
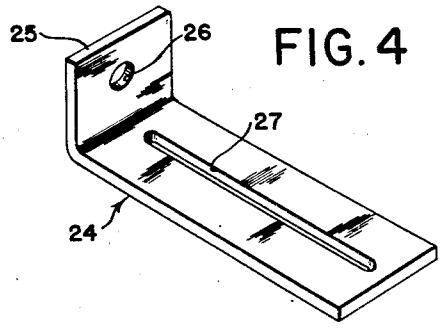


FIG. 4



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2,705,949

BIOPSY NEEDLE

Irving Silverman, Brooklyn, N. Y.

Application August 25, 1953, Serial No. 376,303

8 Claims. (Cl. 128—2)

This invention relates to an improvement in my United States Patent No. 2,198,319 for a Biopsy Needle, issued April 23, 1940.

While my biopsy needle as disclosed in the above mentioned patent has satisfactorily met the need which it was conceived to meet, viz., to provide a means for removing samples of tissue from tumors, experience has indicated that improvements therein are possible which will make the needle an even greater aid to the surgeon. It will be recalled that the operational parts of the biopsy needle are in an inner split needle for grasping the tissue desired to be removed, and an outer tube within which the split needle can slide. The mode of operation is to first insert the split needle into the tissue, then insert the outer tube to enclose and compress the portions of the split needle together with the specimen of tissue therebetween, and remove the biopsy needle assembly, whereupon the specimens of tissue will be removed as well.

It will be apparent from an examination of the original patent that the operator of the device has no absolute way of knowing when the outer tube has been inserted to a point at which it covers the inner needle completely, but must rely on his good judgment. Should the outer tube not be introduced far enough, the result may be an inadequate grasp on the specimen to be removed by the inner needle and consequent failure to remove the specimen when the device is withdrawn. Furthermore, if the tumor of which a specimen is desired is a dense one, the split portions of the inner needle may engage a large specimen, and when the outer tube is advanced for the purpose of covering the inner needle, the latter may not remain stationary but will advance further. Unnecessary trauma may result and the specimen may even slip out from between the split portions of the inner needle.

Accordingly, I have made an improvement in my biopsy needle by which these difficulties may be overcome, and it may be said that the primary object of this invention is to overcome these difficulties.

One object of this improvement is to provide the operator with a means of knowing precisely when the outer needle has been advanced to a point where it covers the points of the inner needle.

Another object is to limit the range of movement of the inner needle so that once it has been inserted to the desired depth it can advance no further. This object especially encompasses the notion that the inner needle once having been inserted to the desired depth, may not be driven further by the action of the outer tube when it is subsequently inserted.

Still another object is to limit the range of movement of the outer tube so that it cannot be advanced further than a point just sufficient to be coextensive with the inner needle in its inserted position.

A further object is to provide a means for preventing rotation of the split needle after it has been inserted into the tumor and before the outer tube has been also inserted into the tumor. This object arises because instances have been known to occur where the device has been rotated after insertion of the inner needle, but before insertion of the outer tube, with the result that the split portions of the inner needle have been twisted beyond any hope of repair.

A still further object is to utilize the surface of the patient's body in the vicinity of the tumor as a guide to

control the extent of movement of the respective parts of the biopsy needle assembly.

Another object is to provide a means for aiding the operator to properly position and support the device in relation to the tumor before the specimen is taken.

Still another object is to keep at a minimum, trauma on the part of the patient by obviating unnecessary penetration of the inner split needle into the tumor, and by assuring that in most cases a specimen will be secured in a single attempt.

A final object is to accomplish all of the foregoing in as simple, efficient and economical a manner as possible.

How these and many other objects are to be implemented will become apparent through consideration of the accompanying drawings wherein:

Fig. 1 is a side view of a biopsy needle and improvement thereon, in position before a specimen is taken,

Fig. 2 is a side view as in Fig. 1, after a specimen has been secured, but before the needle has been withdrawn,

Fig. 3 is a perspective view of one part in the present improvement, and

Fig. 4 is a perspective view of another part of the present improvement.

In the drawings there is shown a biopsy needle assembly **10** having an inner needle, **11**. The penetrating part of needle **11** is comprised of two split portions **12** and **13**. The other end of needle **11** is capped by the base **14** upon which pressure may be exerted to urge needle **11** into the tumor **15** of which a specimen is desired. Inner needle **11** passes through outer tube **16**, the outer tube terminating at one end in hub **17** to which it is attached, hub **17** having a top **18** and bottom **19**, outer tube **16** being beveled and pointed at its other end to facilitate insertion.

The outer tube **16** rests in carriage **20** having flanges **21** and **22** at either end, in such a manner that hub **17** has its top **18** in contact with flange **22**, while tube **16** extends through an aperture **21***a* in flange **21**. It should be noted particularly that the overall length of needle **11**, exclusive of base **14**, exceeds the length of tube **16** and hub **17** by an amount equal to the depth of penetration into the tumor desired, this desired depth being ⅝" in the embodiment shown in the drawings. The longitudinal dimension of carriage **20** is such that the distance from the bottom **19** of hub **17** to flange **21** is also equal to the depth of penetration into the tumor desired, the distance mentioned being measured when top **18** of hub **17** is in contact with flange **22**. There is a hole **23** in carriage **20**.

Lying exteriorly with respect to carriage **20** is the rack **24** having a single flange **25** at one end thereof in which there is an aperture **26**, through which outer tube **16** may pass. Both carriage **20** and rack **24** are of rigid material. There is a slot **27** in rack **24**.

A small bolt **30** passes through hole **23** in carriage **20** and slot **27** in rack **24**. Nut **31** engages bolt **30** and may be tightened or loosened to render the mutual relationship between the carriage **20** and the rack **24** either fixed or movable. The portion of bolt **30** which passes through slot **27** is flat, on two sides so that bolt **30** will not turn when nut **31** is tightened down on it.

In order to prevent the operator from inadvertently rotating needle **11** independently of the remainder of the assembly, a portion **32** of the needle shaft adjacent to base **14** is square in cross section in the embodiment shown, and passes through a square aperture **33** in flange **22** of carriage **20**.

In the actual operation of the assembly the outer tube **16** and associated hub **17** are placed in the carriage **20** with the tube passing through apertures **21***a* and **26** in carriage **20** and rack **24** respectively. Hub **17** rests in carriage **20** with the top **18** of the hub in contact with flange **22**. The inner needle **11** is then inserted through aperture **33** and thence through the passage in the interior of outer tube **16** until the ends of split portions **12** and **13** just coincide with the beveled and pointed end of outer tube **16**. The length of inner needle **11** is of such length that in this position the distance from base **14** to flange **22** will be equal to the depth of penetration into the tumor desired shown as ⅝" in the drawings, and will be the same distance as that between the bottom

19 of hub 17 and flange 21, also 5/8" in the drawings of the embodiment shown.

The skin 34 of the patient is then prepared, anaesthetized and an incision made. The biopsy needle assembly in the position just described is inserted through the incision and just far enough to reach the surface of the tumor. The rack 24 is then moved with respect to the carriage 20 until its flange 25 comes into contact with the skin 34 of the patient. The function of rack 24 is thus to aid the operator in positioning the device preparatory to taking a specimen, the flange 25 acting as a stop plate when it abuts against the skin of the patient. Nut 31 is tightened to make the mutual relationship between rack 24 and carriage 20 fixed.

The inner needle 11 is then pushed into the tumor by exerting pressure on base 14 until the base comes into contact with the flange 22. Further progress of needle 11 is prevented by flange 25 abutting against the patient's skin, as well as by base 14 coming into contact with flange 22. Outer tube 16 is then inserted until its further insertion is prevented when hub 17 comes into contact with flange 21. The operation is then complete; the assembly may be withdrawn together with the specimen of tissue there engaged.

While I have described a specific embodiment of my improvement it is obvious that modifications may be made therein without departing from the spirit of the invention.

I claim:

1. In a biopsy instrument for taking a specimen of tissue, having an outer tube and an inner split needle passing therethrough, said tube and said needle being capable of independent advancement, means for limiting the permitted distance of advancement of said tube to the same distance of advancement permitted for said needle, and means for positioning the ends of said tube and said needle at the surface of said tissue prior to advancement of said tube and said needle.

2. In a biopsy instrument having an outer tube and inner split needle passing therethrough, said tube and said needle being capable of independent advancement, means for limiting the permitted distance of advancement of said tube to the same distance of advancement permitted for said needle, and means for preventing rotation of said needle within said tube.

3. In a biopsy instrument for taking a specimen of tissue, having an outer tube and an inner split needle passing therethrough, said tube and said needle being capable of independent advancement, means for limiting the permitted distance of advancement of said tube to the same distance of advancement permitted for said needle, means for positioning the ends of said tube and said needle at the surface of said tissue prior to advancement of said tube and needle, and means for preventing rotation of said needle within said tube.

4. In a biopsy instrument having an outer tube attached to a hollow hub and an inner split needle passing interiorly through said tube and hub, with said tube and said needle being capable of independent advancement, means for limiting the permitted distance of advancement of said tube to the same distance of advancement permitted for said needle, said means comprising a rigid strip of material, having a flange at either end, for accommodating said tube and associated hub, an aperture in one of said flanges, said tube passing through said aperture, an aperture in the other of said flanges, said needle passing through said last named aperture.

5. In a biopsy instrument for taking a specimen from a mass of tissue lying beneath the surface of a body, said instrument having an outer tube attached to a hollow hub and an inner split needle passing interiorly through said tube and hub, said tube and said needle being capable of independent advancement, means for limiting the permitted distance of advancement of said tube to the same distance permitted for said needle, said means comprising a rigid strip of material having a flange at either end, for accommodating said tube and hub, an aperture in the first of said flanges, said tube passing through said aperture, an aperture in the second of said flanges, said needle passing through said last named aperture; said needle being greater in length than the combined length of said tube and hub by an amount equal to the depth of penetration into said tissue desired, and the distance from one end of said hub to the aperture in said first mentioned flange when the other end of said hub is in contact with said second mentioned flange being also equal to the depth of penetration into said tissue desired.

6. In a biopsy instrument for taking a specimen of tissue from a mass of tissue lying beneath the surface of a body, said instrument having an outer tube attached to a hollow hub and an inner split needle passing interiorly through said tube and hub, said tube and said needle being capable of independent advancement, means for limiting the permitted distance of advancement of said tube to the same distance of advancement permitted for said needle, said means having a strip of material with a flange at each end for accommodating said tube and hub, said strip having a hole therein, and a second means for positioning the ends of said tube and said needle at the surface of said tissue prior to advancement of said tube and said needle, said second means comprising a second strip of rigid material having a slot therein and a flange at one end thereof, an aperture in said flange, said tube passing through said aperture, a bolt passing through said hole in said first-mentioned strip and said slot in said second strip, and a nut engaging said bolt, whereby said second strip may be releasably fixed in varying position with respect to said first-mentioned strip.

7. In a biopsy instrument having an outer tube attached to a hollow hub and an inner split needle passing interiorly through said tube and hub, said tube and said needle being capable of independent advancement, means for limiting the permitted distance of advancement of said tube to the same distance of advancement permitted for said needle, said means comprising a rigid strip of material having a flange at either end, for accommodating said tube and hub, an aperture in one of said flanges, said tube passing through said aperture, a second aperture in the other of said flanges, said needle passing through said second aperture, said needle for a portion thereof having a cross-sectional shape other than circular, said last named aperture having the same shape.

8. In a biopsy instrument for taking a specimen from a mass of tissue lying beneath the surface of a body, said instrument having an outer tube attached to a hollow hub and an inner split needle passing interiorly through said tube and hub, said tube and said needle being capable of independent advancement; means for limiting the permitted distance of advancement of said tube to the same distance permitted for said needle, said means comprising a rigid strip of material having a flange at either end, for accommodating said tube and hub, said strip having a hole therein, an aperture in the first of said flanges, said tube passing through said aperture, an aperture in the second of said flanges, said needle passing through said last named aperture, said needle being greater in length than the combined lengths of said tube and hub by an amount equal to the depth of penetration into said tissue desired, and the distance from one end of said hub to the aperture in said first mentioned flange when the other end of said hub is in contact with said second mentioned flange being also equal to the depth of penetration into said tissue desired; adjustable means for positioning the ends of said tube and said needle at the surface of said tissue prior to advancement of said tube and said needle, said means comprising a second strip of rigid material having a slot therein and a flange at one end thereof, an aperture in said flange, said tube passing through said aperture, a bolt passing through said hole in said first-mentioned strip and said slot in said second strip, and a nut engaging said bolt, whereby said second strip may be releasably fixed in varying position with respect to said first mentioned strip; said needle for a portion thereof having a cross sectional shape other than circular, said aperture through which said needle passes having the same shape.

References Cited in the file of this patent

UNITED STATES PATENTS

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2,198,319	Silverman	Apr. 23, 1940
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