Sept. 26, 1961 I. SILVERMAN 3,001,522

BIOPSY DEVICE

Filed Dec. 26, 1957 2 Sheets-Sheet 1

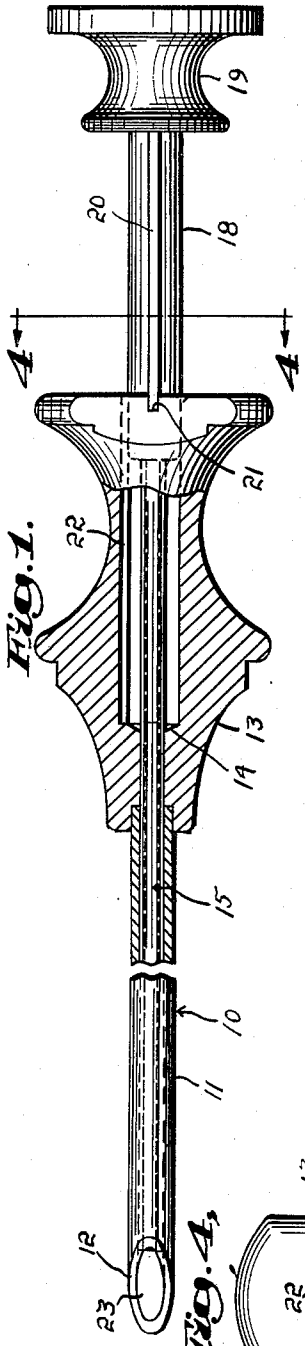

Fig. 1.

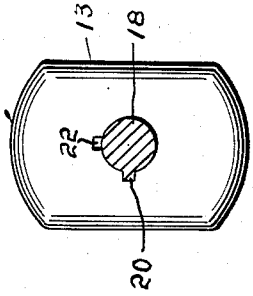

Fig. 4.

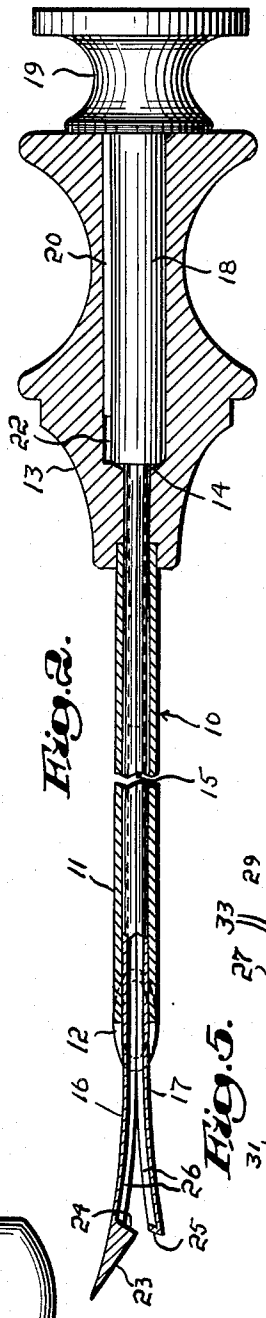

Fig. 2.

Fig. 5.

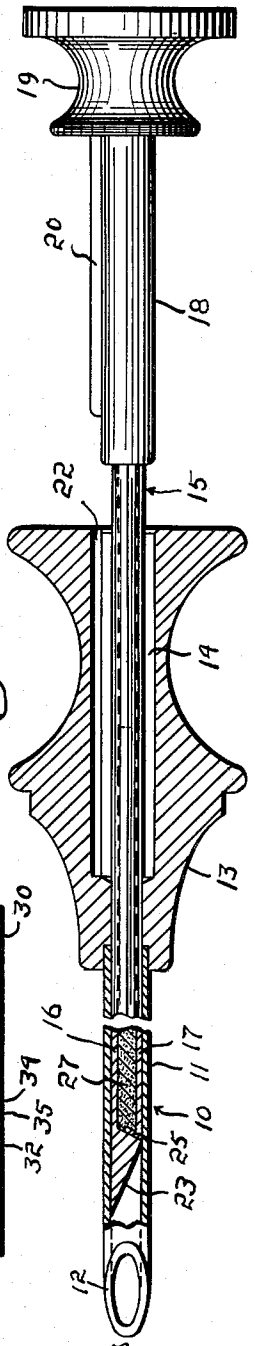

Fig. 3.

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BIOPSY DEVICE

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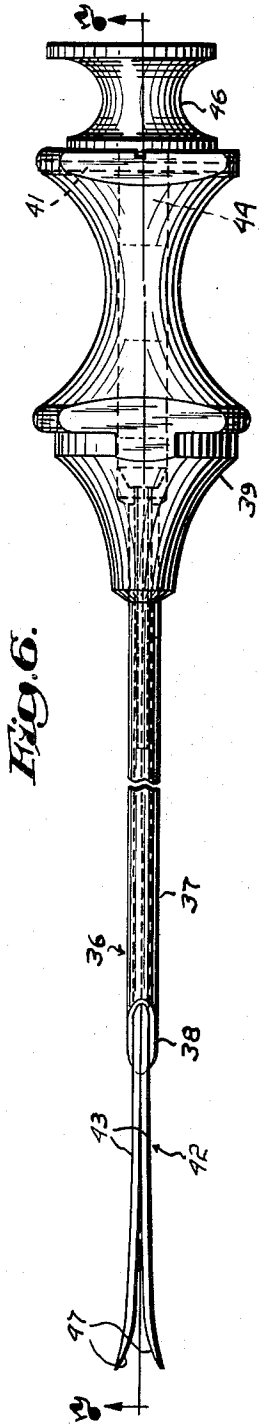

Fig. 6.

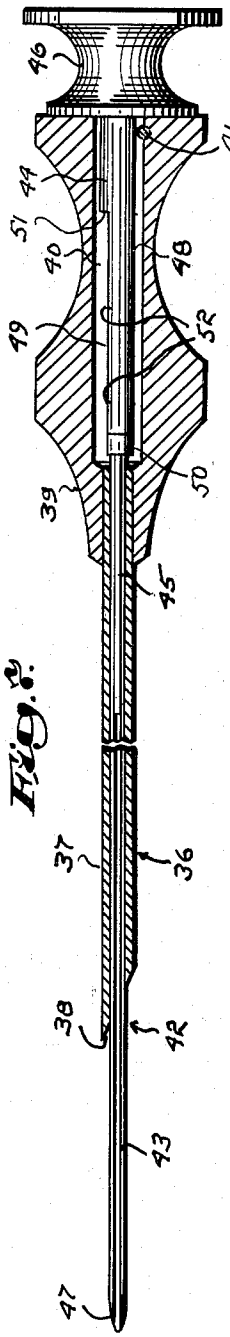

Fig. 7.

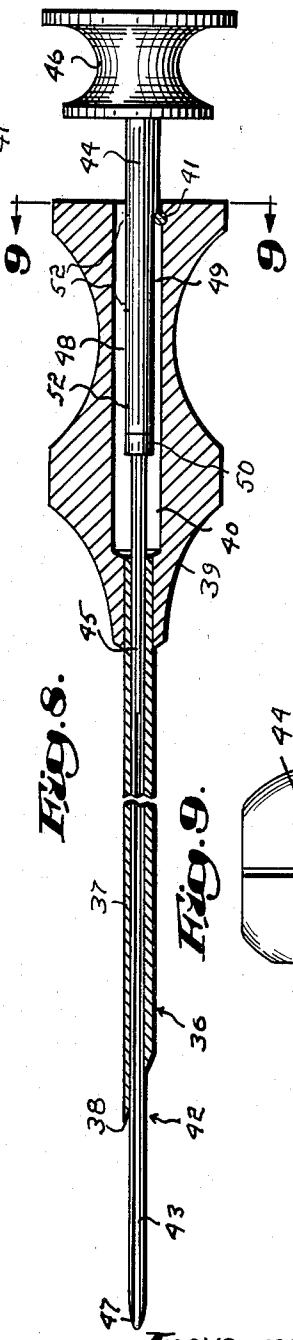

Fig. 8.

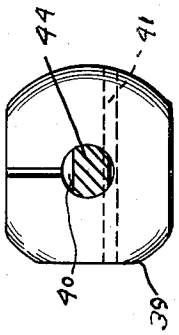

Fig. 9.

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BIOPSY DEVICE

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9 Claims. (Cl. 128—2)

The present invention relates to biopsy devices and particularly to the tissue holding and retaining member thereof and its position relative to the biopsy needle. This application is a continuation-in-part of my co-pending application, Serial No. 593,094, filed June 22, 1956 and now abandoned.

In order to secure a specimen of suspected tissue for biopsy purposes, needles are employed that may be inserted into the suspected area to receive a mass of tissue. The problem has been to retain sufficient of the received tissue, when the needle is withdrawn, to meet requirements of the examination and for this purpose, tissue gripping members in accordance with United States Letters Patent No. 2,198,319 have been employed. The principal objective of the present invention is to render members of that general type sufficiently positive in their operation to ensure that adequate specimens are obtained.

In accordance with the invention, a tissue holding member is dimensioned for slidable entry into a tissue piercing and receiving needle. The tissue holding member includes a pair of resilient arms joined at one end and having their free ends beveled to be urged apart when the member is so advanced relative to the needle as to enter the free ends of the arms into tissue beyond the end of the needle. The proximate faces of the arms have tissue receiving channels commencing adjacent and extending rearwardly from said beveled ends and portions of those ends may constitute coactive elements gripping and preferably cutting the tissue when the arms are brought together as by advancing the outer needle to cover both elements of the tissue holding member.

In accordance with the invention, it is preferred that it be possible to slide the tissue retaining needle forwardly relative to the biopsy needle only when the apex of the beveled ends of the tissue holding needle is diametrically alined with the apex of the tissue piercing point of the biopsy needle for this relationship of the needles ensures the most effective tissue cutting action. Additionally, provision is made so that the relative position of the beveled or free ends of the tissue holding needle and the apex of the biopsy needle can be readily measured and, preferably, means are provided to permit a different maximum movement of the tissue retaining needle relative to the biopsy needle in the case of a soft tumor than is possible where a biopsy is to be made of a hard tumor.

In the accompanying drawings, there are shown illustrative embodiments of the invention from which these and other of its objectives, novel features and advantages will be readily apparent.

In the drawings:

FIG. 1 is a partly sectioned side view illustrating the insertion of the device into tissue with the tissue holding member positioned to function as an obturator,

FIG. 2 is a somewhat similar view illustrating the advance of the holding member relative to the needle into the tissue,

FIG. 3 is also a similar view illustrating the advancement of the outer needle to bring the elements of the tissue holding member into coactive engagement,

FIG. 4 is a section taken along the indicated lines 4—4 of FIG. 1,

FIG. 5 is a fragmentary and partly sectioned view illustrating another embodiment of the invention,

FIG. 6 is a side elevation illustrating a further embodiment of the invention,

FIG. 7 is a section taken along the indicated lines 7—7 of FIG. 6,

FIG. 8 is a similar section but with the tissue retaining needle turned through 180°, and

FIG. 9 is a section taken along the indicated lines 9—9 of FIG. 8.

A typical needle used in biopsy devices is indicated generally at 10 and is shown as comprising a cannula 11 having one end beveled to form a tissue entering point 12 and its other end secured to a hub 13 having a bore 14 in axial communication with the cannula 11.

The tissue holding needle is generally indicated at 15 and is shown as having a pair of arms 16 and 17 of resilient stock of semi-circular section united and carried as by a cylindrical mount 18 provided with a finger grip 19 and a radially disposed key 20 dimensioned to enter either the seat 21, as shown in FIG. 1, or the keyway 22 to enable the member 15 to be reciprocated between the positions illustrated by FIGS. 2 and 3.

The member arm 16 terminates in a beveled point 23 adapted to lie flush with the point 12 of the cannula, in the manner of an obturator, when the key 20 is in the seat 21 as shown in FIG. 1. The beveled point 23 has a gripping and shearing surface 24 while the arm 17 has a beveled end 25 constituting a second gripping and shearing surface coactively engaging the surface 24 when the arms 16 and 17 are closed together. It will be noted that these arms have their mutually opposed faces channeled as at 26 for the reception of tissue, suggested at 27.

When the member 15 is positioned to function within the needle 10 as an obturator, the assembled device may be inserted into the tissue in the suspected area. The member 15 may be then turned to bring the key 20 into registry with the keyway 22 and advanced relative to the needle 10 into the suspected tissue. Because of the beveled end 23, the arm 16 is forced laterally to expose the beveled end 24 with the result that the arm 17 is forced laterally in an opposite direction. When the needle 10 is advanced towards the beveled end 23, tissue is positively gripped and cut as the surfaces 24 and 25 are forced together into the position illustrated by FIG. 3. Movement of the tissue specimen may then be initiated with assurance that it will be adequate for the purposes of the examination.

In the embodiment of the invention shown in FIG. 5, the tissue retaining member is indicated generally at 28 and is shown as having resilient arms 29 and 30 provided with barbs 31 and 32, respectively. Rearwardly of the barbs 31 and 32, the arms 29 and 30 are channelled as at 33 to receive tissue 27. The barbs 31 and 32 are oppositely beveled and have gripping and shearing portions 34 and 35 respectively operable to grip and shear the contained tissue 27 in the manner of the device illustrated by FIGS. 1–4.

In the embodiment of the invention illustrated by FIGS. 6–9, the biopsy needle is generally indicated at 36 and comprises a cannula 37 provided with a tissue entering point 38 and has its other end anchored in a hub 39 having an axial bore 40 in communication with the bore of the cannula 37. At one side of the bore 40, there is a shoulder or stop established by the transversely disposed pin 41.

The tissue holding needle is generally indicated at 42 and, like the member 15, it has a pair of resilient arms 43 of arcuate section, the arms 43 are seated against the axially disposed pin 45 and they and the pin 45 are carried by a mount 44. The mount 44 has a finger grip 46 and the free ends of the arms 43 are bevelled as at 47.

It will be noted that the mount 44 has diametrically opposed flat portions 48 and 49 extending rearwardly from the hub entering end 50 thereof with the flat portion

48 being materially longer than the flat portion 49 which has a stop shoulder 51. The proximate face of the finger grip 46 serves as a stop for the flat portion 48.

It will be noted from FIG. 9, that entry of the mount 44 into the hub 39 is prevented by the stop 41 unless either one of the flat portions 48, 49 is disposed in parallel therewith and then the apex defined by the beveled ends 47 of the arms 43 and the apex of the point 38 are diametrically alined as will be apparent from FIG. 6.

When the hub entering end 50 of the mount 44 is in engagement with the stop 41, the apex of each beveled end 47 is located closely adjacent but rearwardly of the apex of the point 38. With the flat portion 48 in parallel with the stop 41, as illustrated by FIG. 7, the tissue piercing needle 42 may be advanced until stopped by the finger grip 46 and in this position, the instrument is best adapted for sampling soft tumors. In the sampling of hard tumors, the flat portion 49 is disposed in parallel with the stop 41 permitting axial movement of the tissue holding needle 42 relative to the biopsy needle 36 until the stop shoulder 51 engages the stop 41 as is illustrated by FIG. 8.

In order that the relation between the two needles can be accurately determined, each of the flat portions is provided with measuring indicia 52 readable with reference to a position of the needles in which the apices of all points are transversely alined.

What I therefore claim and desire to secure by Letters Patent is:

1. In a biopsy instrument, a biopsy needle including a cannula beveled at one end providing a tissue piercing point, an elongated needle for slidable entry into the cannula, said elongated needle including a pair of resilient arms of unequal length and joined at one end, the free ends of said arms being oppositely beveled to be urged apart on entry into tissue, the beveled end of the longer arm being of such area and being so disposed as to close said cannula in the manner of an obturator, and the beveled end of the shorter arm being wholly shielded by the beveled end of the longer arm when the arms are brought together.

2. In a biopsy instrument, a biopsy needle including a cannula beveled at one end to provide a tissue piercing point and provide at its other end with a hub having a bore axially in communication with said cannula, a tissue holding needle slidable within said biopsy needle and including a pair of resilient arms of unequal length and joined at one end, the free ends of said arms being oppositely beveled to be urged apart on entry into tissue, the beveled end of the longer arm being of such area as to close said cannula in the manner of an obturator, the beveled end of the shorter arm being shielded by the beveled end of the longer arm when the arms are within said cannula, the proximate faces of said members having tissue receiving channels commencing adjacent and extending rearwardly from said beveled ends, and portions of said beveled ends being coacting cutting elements operatively engageable when said arms are brought together.

3. In a biopsy instrument, a biopsy needle including a cannula beveled at one end to provide a tissue percing point and provided at its other end with a hub having a bore axially communicating with said cannula and provided with a keyway and a seat angularly spaced therefrom, and a tissue holding needle slidable within said biopsy needle and including a key and a pair of resilient arms of unequal length joined at one end, the free ends of said arms being oppositely beveled to be urged apart on entry into tissue, the beveled end of the longer arm being of such area and being so disposed as to close said cannula in the manner of an obturator and to lie flush with the tissue piercing point, the beveled end of the shorter arm being shielded by the beveled end of the longer arm when the arms are within said cannula, said needle being proportioned to bring the beveled point of the tissue holding needle flush with the beveled point of the cannula when the key is within the seat, said tissue holding needle being slidable relative to said biopsy needle when said key is within said keyway to advance it into tissue.

4. In a biopsy instrument, a biopsy needle including a cannula beveled at one end to provide a tissue piercing point and provided at its other end with a hub having a bore axially communicating with said cannula and provided with a keyway and a seat angularly spaced therefrom, and a tissue holding needle slidable within said biopsy needle and including a key and a pair of resilient arms joined at one end, the proximate faces of said arms being forwardly and outwardly inclined relative to each other at their free ends, said key and keyway providing that the free ends of the needle are on opposite sides of a diameter of the cannula that includes its point when said tissue holding needle is slidable relative to said biopsy needle when said key is within said keyway to advance it into tissue.

5. In a biopsy instrument, a biopsy needle including a cannula beveled at one end to establish a tissue piercing point and provided at its other end with a hub having a bore axially communicating with said cannula, and a tissue holding needle slidable within said biopsy needle and including a pair of resilient arms, the proximate faces of said arms at their free ends being forwardly and outwardly inclined relative to each other, said tissue holding needle and said hub including complemental portions arranged and disposed to hold said tissue holding needle against turning and to enable said tissue holding needle to be slid relative to said biopsy needle with the free arm ends disposed on opposite sides of a diameter through the cannula that includes said point.

6. In a biopsy instrument, a biopsy needle including a cannula beveled at one end to establish a tissue piercing point and provided at its other end with a hub having a bore axially communicating with said cannula, and a tissue holding needle slidable within said biopsy needle and including a pair of resilient arms, the proximate faces of said arms at their free ends being forwardly and outwardly inclined relative to each other, said tissue holding needle and said hub including complemental portions arranged and disposed to enable said tissue holding needle to be slid relative to said biopsy needle in either one of two positions spaced 180° apart in which the apex of the angle defined by said faces and the apex of said point are diametrically alined, said portions also being so arranged that maximum axial movement in one position is greater than it is in the other of said positions.

7. In a biopsy instrument, a biopsy needle including a cannula beveled at one end to establish a tissue piercing point and provided at its other end with a hub having a bore axially communicating with said cannula, and a tissue holding needle slidable within said biopsy needle and including a pair of resilient arms, the proximate faces of said arms at their free ends being forwardly and outwardly inclined relative to each other, said tissue holding needle and said hub including complemental portions arranged and disposed to enable said tissue holding needle to be slid relative to said biopsy needle in either one of two positions spaced 180° apart in which the apex of the angle defined by said faces and the apex of said point are diametrically alined, said portions also being so arranged that maximum axial movement in one position is greater than it is in the other of said positions, and said tissue holding needle having indicia readable in either of said positions for measuring the advance of the free ends beyond the tissue piercing point.

8. In a biopsy instrument, a biopsy needle including a cannula beveled at one end to establish a tissue piercing point and provided at its other end with a hub having a bore axially communicating with said cannula, and a tissue holding needle slidable within said biopsy needle and including a hub entering mount and a pair of resilient arms, the proximate faces of said arms at their free ends

being forwardly and outwardly inclined relative to each other, said mount being provided with diametrically opposed parallel flat surfaced portions extending rearwardly different distances from the hub entering end thereof, said hub bore having a stop preventing entry of said mount therein except when either one of said portions is positioned to pass said stop thereby providing two positions in which said mount can be entered into said hub to advance said tissue holding needle relative to said cannula, said flat surfaced portions being located relative to the apex of the angle defined by said faces to maintain said apex and the apex of said cannula point in a longitudinal plane inclusive of the axis of said cannula in either of said positions.

9. In a biopsy instrument, a biopsy needle including a cannula beveled at one end to establish a tissue piercing point and provided at its other end with a hub having a bore axially communicating with said cannula, and a tissue holding needle slidable within said biopsy needle

and including a hub entering mount and a pair of resilient arms, the proximate faces of said arms at their free ends being forwardly and outwardly inclined relative to each other, said mount being provided with diametrically opposed parallel flat surfaced portions extending rearwardly different distances from the hub entering end thereof, said hub bore having a stop preventing entry of said mount therein except when either one of said portions is positioned to pass said stop, and each flat portion bearing indicia readable with reference to the hub measuring the movement of said free ends beyond said point.

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