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[54] **CONTROLLABLE TIP BRUSH FOR MEDICAL USE**
3 Claims, 3 Drawing Figs.

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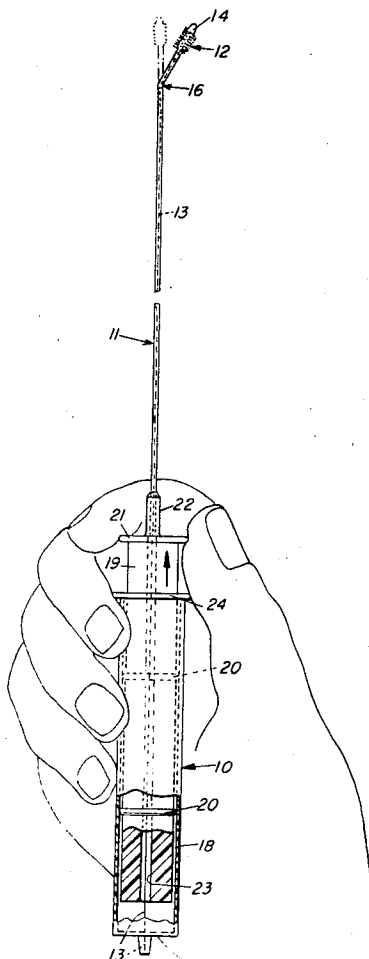
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ABSTRACT: A flexible probe including a series of bristles at its extremity for exploring and collecting specimens from the labyrinthine passages of internal organs is formed by attaching a series of bristles to the extremity of a tightly wound coil of fine wire, a section of wire coil near the bristles having adjacent turns whose cross sections are reduced at one side of the coil so that when the coil is put under tension by a core wire extending from one end to the other of the coil the extremity including the bristles will be turned in the direction of the reduced cross section, one element of a two-piece handle being attached to the other end of the coil, the other element of the handle being attached to the core wire and the two elements being in frictional engagement so that any degree of inclination of the bristles can be accomplished and maintained with one hand.



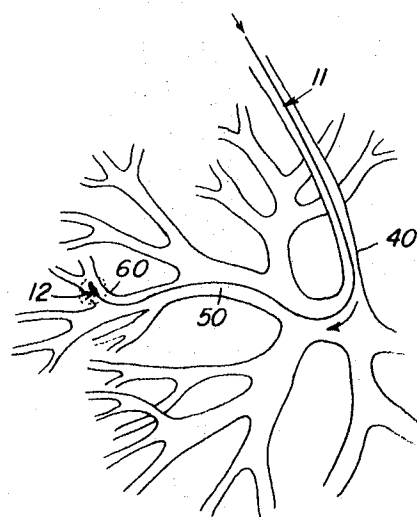
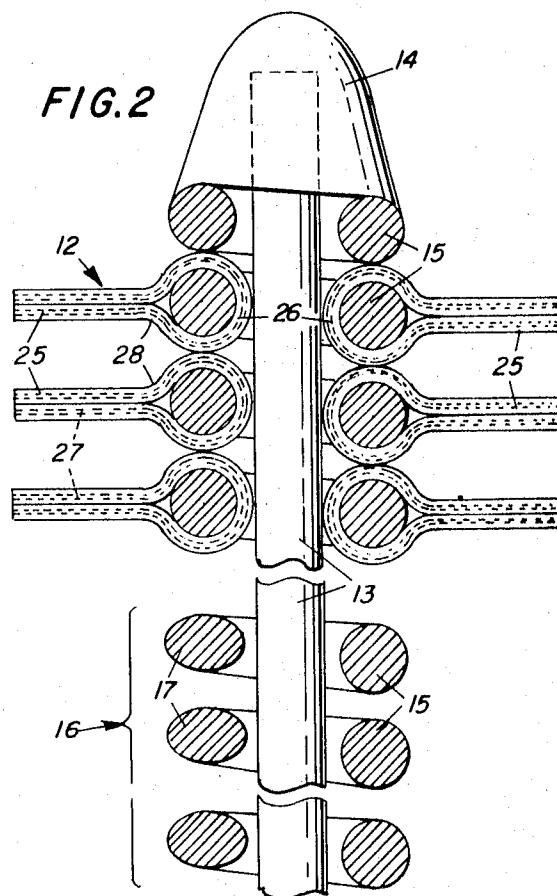
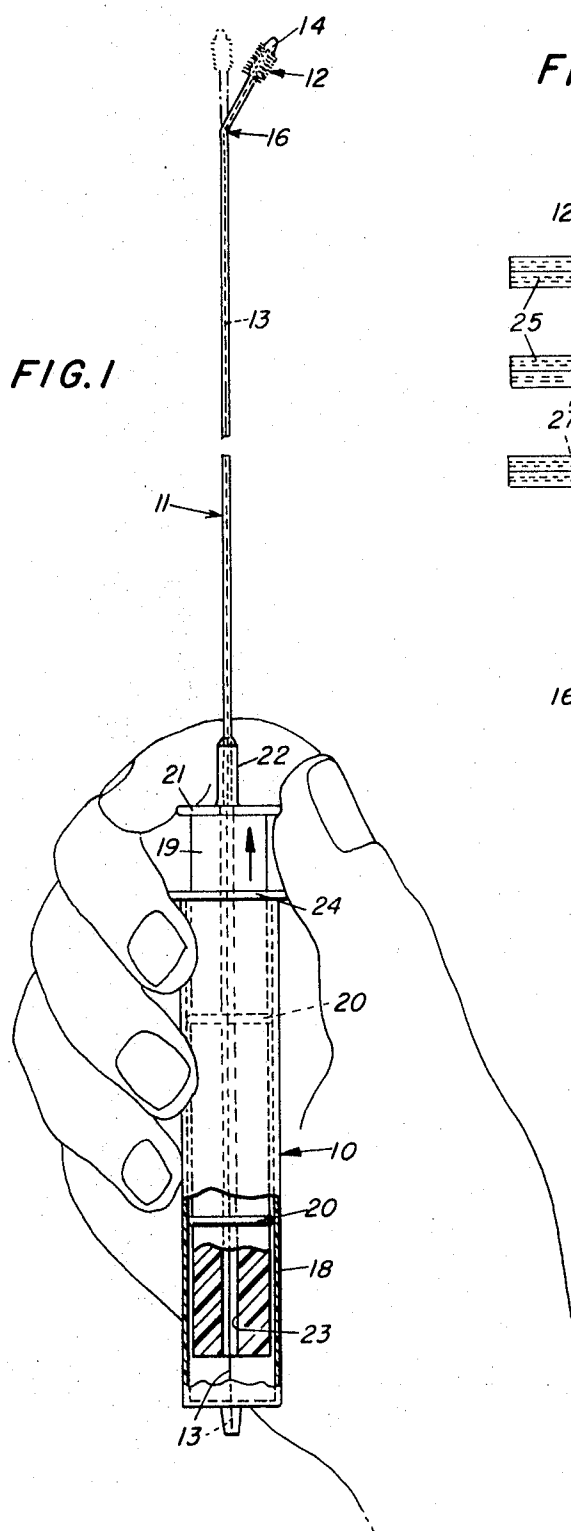


FIG. 3

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CONTROLLABLE TIP BRUSH FOR MEDICAL USE

This invention relates to instruments for exploring the internal passages of living bodies and the collecting and retrieving of specimens therefrom.

In particular, in exploring passages such as the bronchial tree, it is essential to be able to direct the instrument into any desired branch thereof. In the present instance, a small brush is placed at the extremity of a long flexible probe, and suitable means is provided for flexing the extremity at an angle, as well as to revolve the entire probe so that the brush can be manipulated remotely to explore in any desired direction. A positive control of the angle of inclination and direction can be maintained at all times regardless of the intermediate curvature of the main portion of the probe. Often, the sum of the angles of the various curve may be 360°, or more, but the direction of the brush remains under positive control. In addition, it is not necessary to use a bronchoscope to insert the brush into the lung.

In the drawings

FIG. 1 is a view in elevation of a preferred form of controllable tip brush made in accordance with this invention;

FIG. 2 is a side view, on an enlarged scale, of the bristles of the brush portion; and

FIG. 3 is a diagrammatic representation of the path which the brush might take in exploration of the tracheal passages.

In FIG. 1, the numeral 10 indicates generally an operating handle to which is attached the elongated probe means, indicated generally by numeral 11, having a brush, indicated generally by numeral 12, at its extremity. The probe means comprises a central core wire 13 of flexible inextensible metal wire which is joined at its free end 14 with a helically wound guide wire 15, over substantially its entire length, the turns of which lie closely adjacent each other except for a portion of its length next to the end, as indicated generally by numeral 16. In order to accomplish bending of the guide wire it has its cross section reduced over somewhat more than half of the diameter of its turn for about 10 turns more or less, as shown in FIG. 2, the reduced portion of each turn being indicated by numeral 17.

The handle 10 comprises a cylindrical outer shell 18 containing an axially slidable plunger 19 therein. The plunger is provided with several resilient O-rings 20, seated in suitable annular grooves to provide a frictional fit with the inner wall of the shell 18 and thereby prevent unwanted displacement of the plunger. The forward end of the plunger is provided with a flanged portion 21, and the forward end of the shell has a flange 24 to enable the operator to move the plunger with the fingers, as shown in FIG. 1. At the upper end of the plunger the lower end of the coiled wire is attached while the lower end of the core wire continues down into a central passage 23 in the plunger and secured thereto as by means of a socket 13. Thus, when the plunger is in a position whereby no force is applied to the core wire the probe means extends in a straight line as indicated in solid lines in FIG. 1. However, movement of the plunger in an upward direction, by exerting tension on the core wire, causes the guide wire coiled about it to bend at the area 16 in a direction toward the side where the turns of wire 17 are of reduced cross section, because the turns of wire on that side in that area are drawn closer to each other.

The bristles of the brush may be formed of fine metal wire, solid synthetic plastic, or even plastic covered wire. Each of the bristles is preferably individually put in place, as shown in FIG. 2, by taking a short length, or filament 25, of the material chosen and bending it around a turn of the guide wire 15 to

form a closely fitting bight 26 completely encircling the wire where it will normally remain in place due to the presence of the adjacent closely fitting turns of the guide wire. If the filament is metal, or contains a metal core, such as is indicated at 27; the metal may be pressed together at the throat 28 to hold it in place. On the other hand, if the filament is solid plastic, or plastic coated, it may be bonded together, either by heat or suitable adhesive at that point.

FIG. 3 illustrates one example of how the instrument may be used to insert the brush into a lung tumor or other diseased area through the air passages. It will be observed that when the brush is in passage 40, there were three possible choices when it reached the branch 50, so that by moving the plunger 19 forwardly to flex the area 16 of the probe, the brush was tilted to one side; in addition, by rotation of the entire assembly, by turning the shell 18, the brush was directed into passage 50 and moved further to the vicinity of passage 60 where there were two possible choices. Again, by suitable rotation of the assembly and by proper angulation of the tip of the probe, the brush could have been directed into any one of the available passages.

We claim:

1. A controllable tip brush for insertion into selected passages of the human body comprising a flexible probe means having an operating handle means connected to the proximal end of said probe means, said handle means including an outer cylindrical shell and a plunger axially slidably received therein, said plunger having a longitudinal passage provided therein, said probe means including a substantially inextensible fine metal core wire connected at one end with one end of said cylindrical shell and extending axially outwardly of the handle means through said longitudinal passage provided in the interior of the plunger, the other end of the core wire being joined with one end of a guide wire wound helically about the core wire along the entire length thereof, the other end of the guide wire being connected with said plunger, the adjacent turns of said guide wire being in contact with each other over substantially the entire length thereof except for a manipulative section near the end of the probe, the cross section of each turn of the guide wire in said manipulative section being reduced in size along at least one-half of the periphery thereof at one side of the probe means, whereby retraction of said core wire will cause the probe means to bend in the direction of said one side, the other end of said guide wire beyond said manipulative section having a plurality of bristles incorporated therein, said bristles comprising a short length of filamentary material wrapped around said wire with the free ends thereof extending radially outwardly from the probe means, said handle means also including resilient friction material disposed between and in frictional contact with said plunger and the inner wall of the shell whereby the plunger will be maintained in any given position to maintain the angle of inclination of the remote extremity of the guide wire containing said bristles, one end of said plunger projecting outwardly beyond one end of said shell and adapted to enable the plunger and shell to be held in one hand and the position of the plunger relative to said shell to be changed by the fingers of said one hand.

2. The invention defined in claim 1, wherein said plunger on the periphery thereof is provided with a plurality of annular recesses, and said friction material comprises a resilient O-ring member seated within said annular recesses.

3. The invention defined in claim 1, wherein said plunger is provided with an outwardly projecting flanged portion on the portion of said plunger projecting outwardly beyond said shell.