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K. S. MacLEAN
ABRASIVE CYTOLOGIC BRUSH

2,839,049

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2 Sheets-Sheet 1

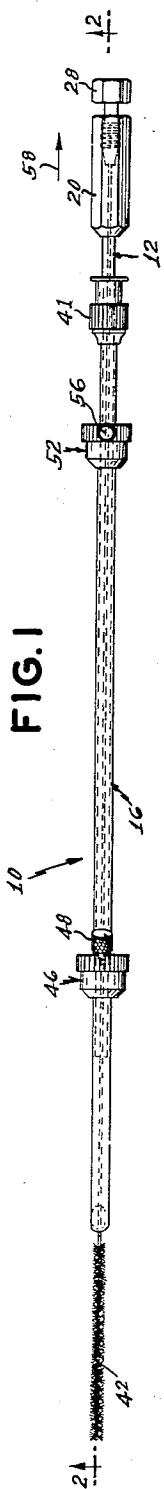


FIG. 1

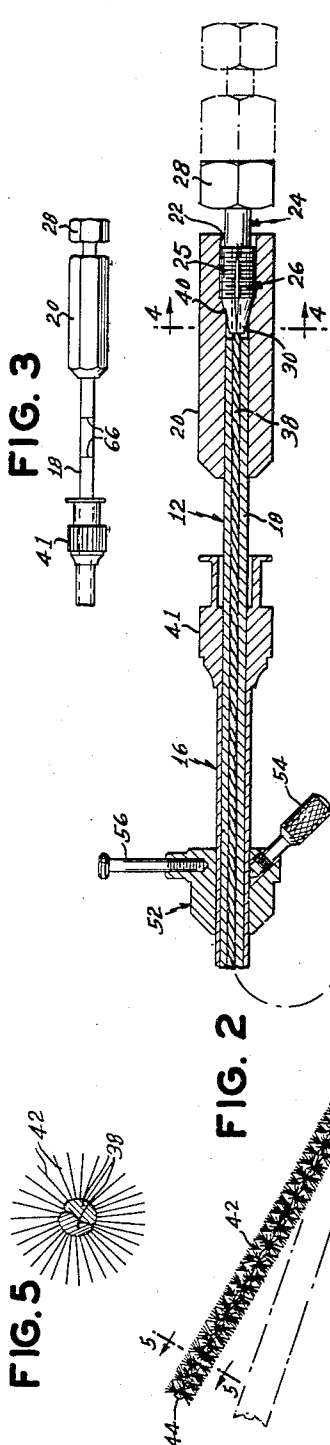


FIG. 2

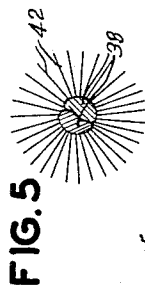


FIG. 3

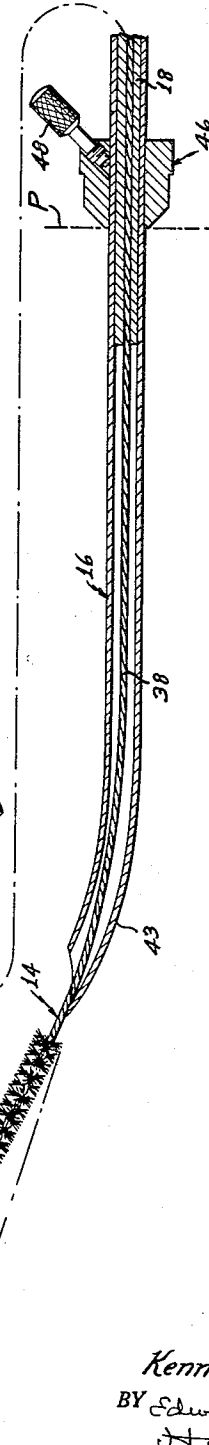


FIG. 4

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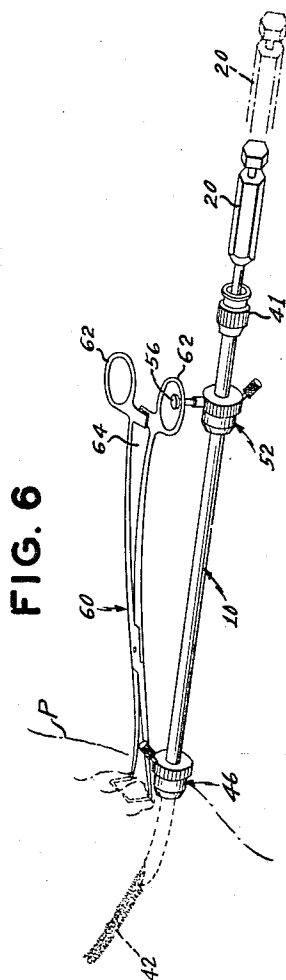
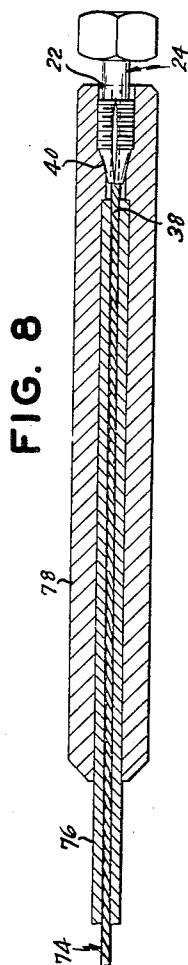
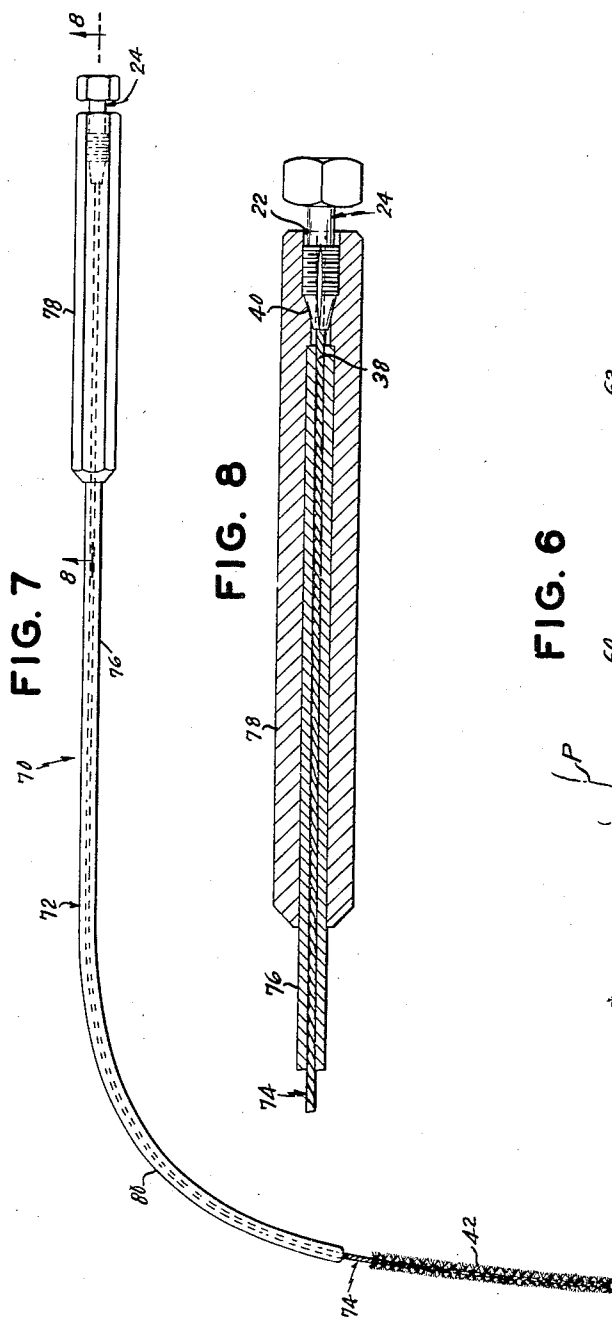
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ABRASIVE CYTOLOGIC BRUSH

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2 Sheets-Sheet 2



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ABRASIVE CYTOLOGIC BRUSH

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14 Claims. (Cl. 128—2)

The present invention relates, in general, to cytology, and, in particular, to an instrument for removing cells by abrasion from various parts of a patient's body.

In attempting to diagnose a patient for the presence of cancer, it is a well known practice to use a curette to obtain a tissue specimen of the suspected part of the patient's body for study and examination. However, this procedure could be quite dangerous in that if cancer is present, the cancerous tissue may be cut into and, as a result thereof, cancer cells may enter the blood and/or lymphatic circulations and spread throughout the body. According to the procedure of exfoliative cytology developed by Papanicolou, this danger may be avoided. In the practice of the latter procedure, cells are removed by aspiration for laboratory study and examination for determining whether or not they are cancerous. However, the Papanicolou procedure does not provide for a positive removal of the cells since it depends upon the existence of surface cells which have exfoliated from a part of the body and can be removed by aspiration from the body. In view of the foregoing, the primary object of the present invention is to provide a means for obtaining for examination cells from a suspected part of the patient's body which means provides for a positive removal of the cells from the body tissue while obviating the danger of cutting into cancerous tissue.

Another object is to provide a cytologic instrument for the removal, by an abrasive procedure, of surface cells from an internal part of the patient's body.

Another object is the provision of an abrasive cytologic instrument whereby the cells which have been removed from an internal body part, are prevented from being lost or rubbed off by contact with the patient's body during their removal from the patient's body.

A further object is the provision of an abrasive cytologic brush wherein the brush member is expendable so that a new brush can be provided for each patient, or separate brushes can be provided for obtaining cell specimens from different parts of the patient's body.

A still further object is the provision of an arrangement to facilitate the manipulation of a cytologic instrument within the patient's body.

The above and other objects, features and advantages of the present invention will be more fully understood from the following description considered in connection with the accompanying illustrative drawings.

In the drawings, which illustrate the best mode presently contemplated by me of carrying out the invention:

Fig. 1 is a side view of an abrasive cytologic brush, pursuant to the present invention, for obtaining cell specimens from a patient's uterus or womb, the brush member thereof being illustrated in its operative disposition after insertion of the instrument into the patient's body;

Fig. 2 is a longitudinal sectional view, on an enlarged scale, taken on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary view, similar to Fig. 1, of the

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handle end of the abrasive cytologic brush, the handle being illustrated in a retracted position thereof;

Fig. 4 is a cross-sectional view, on an enlarged scale, taken on the line 4—4 of Fig. 2;

Fig. 5 is a sectional view on an enlarged scale taken on the line 5—5 of Fig. 2;

Fig. 6 illustrates the abrasive cytologic brush in an operative disposition thereof relative to the patient's body which is illustrated more or less diagrammatically;

Fig. 7 is a side view of a laryngeal abrasive cytology brush pursuant to the present invention; and

Fig. 8 is a longitudinal sectional view, on an enlarged scale, taken on the line 8—8 of Fig. 7.

Referring now to Figs. 1—6 in detail, there is illustrated an abrasive cytologic brush or cytologic instrument 10 for obtaining cell specimens from a patient's womb or uterus. Briefly described, the instrument 10 comprises a brush holder 12, a brush member 14 releasably secured to the brush holder, and a shield 16 within which the brush holder 12 is disposed for relative movement.

As here shown, the brush holder 12 is constituted by an elongated tubular member 18 preferably formed of stainless steel or other suitable material and provided at one end thereof with a handle 20 which is preferably force-fit about said member at one extremity thereof. It will be noted that the handle extends outwardly beyond the adjacent end of the tubular member 18 and is provided with a bore 22 which communicates with the hollow center of the tube 18.

In order to releasably secure the brush member 14 within the tubular holder 12, provision is made for a brush retaining means, here constituted by the chuck 24. As here shown, the chuck 24 is constituted by a split collet 26 which is provided with a head or finger piece 28. The collet 26 is provided with an externally threaded portion 25 for threaded engagement within the internally threaded bore 22 of the handle 20. The collet is also provided with a tapering portion 30 constituted by the split segments 32 which are defined by the splits 34. An opening or bore 36 (Fig. 4) is provided in the chuck for the insertion of one end of the stem 38 of the brush member 14. The bore 22, in the handle 20, is provided with an unthreaded tapering portion or clamping surface 40 which is complementary to the split segments 32.

From the foregoing, it will be understood that the head 28 of the chuck 24 may be rotated in a counter-clockwise direction, viewing Fig. 6 to retract the chuck from the full line position thereof illustrated in Fig. 2 for withdrawing the split segments 32 from the brush clamping disposition thereof to release the stem 38 of the brush member 14. Actually only a few turns of the head 28 are required for the release of the brush stem 38. With the chuck 24 in said partially retracted position thereof, the stem 38 of another brush 14 may be inserted into the opening 36, which is in registry with the bore in the tubular member 18, and the head 28 may then be rotated in a clockwise direction for urging the chuck 24 into the handle 20, the split segments 30 being forced together by the tapering bore portion 40 resulting in the clamping of the brush stem 38 in the chuck 24, to releasably secure the brush member 14 to the brush holder 12.

As here shown, the brush member 14 is provided with the previously mentioned elongated stem 38 which is preferably formed of twisted zinc coated steel wires. At the end thereof opposite the end which is releasably secured in the chuck 24, the stem 38 is provided with the brush bristles 42 which may be formed of either natural or synthetic material. The bristles extend in all directions from the stem. At the bristled end thereof, the stem 38 is capped with a cap 44 preferably formed from a suitable smooth plastic material. It will be understood that the brush

member 14 is expendable, serving for only a single patient-use after which it is discarded.

The shield 16 is an elongated tubular member preferably formed of stainless steel. At one end thereof, the shield 16 is provided with a knurled head or finger portion 41, and at the other end thereof the shield is provided with a slight curvature or arcuate portion, as indicated at 43, to facilitate the passage thereof through the vaginal canal into the uterus or womb of the patient. The shield 16 is provided with an adjustable collar or detent member 46 which is slidably movable longitudinally thereof and which is provided with a knurled set screw 48 to releasably secure the detent in adjusted position longitudinally of the shield 16. The detent 46 serves to limit the extent of entry of the instrument 10 into the patient's body, which is indicated at P in Figs. 2 and 6. Provision is also made on the tubular shield 16 for an additional adjustable collar 52 which is slidably movable longitudinally thereof and which is provided also with a knurled set screw 54 for adjustably securing the collar 52 in position longitudinally of the shield. The collar 52 is additionally provided with an extending arm or element 56, the function of which will presently appear.

As previously indicated, with the chuck 24 partially retracted from its full-line position in Fig. 2, the brush 14 may be readily secured to the tubular brush holder 12 by inserting the stem 38 through the curved end 43 of the shield into the holder 12 and through the latter into the chuck opening 36 defined by split segments 32. The chuck is then rotated in a direction for axial movement thereof into the handle 20 to clamp the end of the stem into the holder through the cooperating action of the tapered bore portion 40 in the handle and the split segments 32. The head 41 of the shield 16 may then be grasped in one hand and the handle 20 of the brush holder 12 may be grasped in the other hand for pulling the handle 20 outwardly of the shield, as indicated by the arrow 58 in Fig. 1, to withdraw the bristles 42 into the shield so as not to project therefrom. The detent 46 is then adjusted longitudinally of the shield 16 to accommodate the particular patient. It will be understood that the handle 20 will now be retracted from the finger piece 42 to expose a substantial length of holder tube 18. The latter may be suitably graduated or indexed as indicated by the spaced lines or markings 66 (Fig. 3) which are preferably calibrated in centimeters.

In order to facilitate the insertion of the abrasive cytologic brush 10 into the uterus or womb, a forcep or body-grasping instrument 60 (Fig. 6) may first be inserted through the vaginal canal to grasp the cervix, as illustrated more or less diagrammatically in Figure 6. While retaining the hold on the cervix, the abrasive cytologic brush 10 is then inserted through the vaginal canal into the uterus or womb, the insertion thereof being limited by the abutment of the detent 46 against the patient's body P. The previously mentioned collar 52 is then adjusted until the arm 56 thereof is in position to engage into either of the finger-openings 62 of the forcep, or within the opening 64 thereof. This interengagement of both instruments will serve to steady and support the instrument 10 during the use thereof. The doctor may now grasp both the instrument 10 and the forcep 60 in the same hand, and with the other hand he may grasp the handle 20 and urge the latter inwardly of the instrument 10, as from the broken line position thereof illustrated in Fig. 6 to the full line position thereof resulting in the movement of the bristles 42 to a position outwardly of the shield 16 and within the womb, as in Fig. 6. The graduations 66 will indicate the extent of penetration of the bristles 42 into the womb or uterus. It will be noted that during said movement of the brush member 14 into the womb, outwardly of the shield 16, the substantially rigid holder 12 serves the function of constituting a guide for the comparatively more flexible wire stem 38 as well as serving as a holder for the brush. The brush member may be manipulated within the womb

by rotation of the holder handle 20 in opposite directions to rotate the brush bristles to and from the full line and broken line positions thereof illustrated in Figure 2. This causes the bristles to rub against the surfaces of the womb so as to effect a positive removal by abrasion, of cells from the womb tissue on to the bristles.

An important feature of the present invention resides in the fact that the cells, which have been removed from the body tissue by the bristles 42, can be removed from the patient's body without being rubbed off the bristles by contact with the patient's body during removal of the instrument 10. In this connection, the handle 20 of the brush holder 12 is now moved in the opposite direction, namely from the full line to the broken line position thereof, as in Fig. 6, to withdraw or retract the bristles 42 completely into the shield 16. The arm 56 of the collar 52 is now disengaged from the forcep 60 and the entire instrument 10 is withdrawn from the patient's body. The brush 14, provided with the cell specimens which have been removed from the body, may now be readily removed from the instrument 10 by returning the handle 20 to the full line position thereof, to a point where an unbristled portion of the stem 38 projects from the shield 16, as in Fig. 2. This unbristled portion of the stem may then be grasped and the chuck head 28 rotated a few turns to partially retract the chuck for releasing the stem from the holder.

While the shielded abrasive cytologic brush 10 has been illustrated and described in connection with its use for removing cells or specimens from the uterus or womb, it will be understood that the present invention is not limited for use in the specifically described body part or cavity. It is within the scope of the present invention to provide a shielded abrasive cytologic brush for other body passages or cavities. For example and not by way of limitation, a shielded abrasive cytologic brush can be used for insertion into the nasal passages, urinary bladder, rectum, sigmoid colon, bronchus, oesophagus, stomach, peritoneal cavity, etc., it being understood that the shield 16 would be provided, in each case, with the proper curvature or shape to accommodate the specific passage, and that the instrument would be dimensioned to accommodate the specific passage. In any case, the shield 16 would facilitate the entry of the instrument into the particular body passage and would serve to prevent the loss of the cells or specimens, by body contact, during the withdrawal of the instrument from the body.

Referring now to Figs. 7 and 8 in detail, there is illustrated an embodiment of the present invention for use in a body passage or opening of such size as to obviate the necessity for the previously described shield in view of the fact that the size of the body opening is large enough to permit the withdrawal of the brush therefrom without contacting adjacent parts of the body. More specifically, the present embodiment illustrates a laryngeal abrasive cytologic brush 70. As here shown, the cytologic instrument 70 is constituted by a brush holder 72, which is substantially similar to the previously described brush holder 12, and by a brush member 74, which is substantially similar to the previously described brush member 14. The brush holder 72 is constituted by an elongated tubular member 76 preferably formed of stainless steel, and provided at one end with a handle 78 which is preferably force fit thereon. The handle 78 is provided with the previously mentioned chuck 24, which cooperates in the previously described manner with a handle bore 22 having a tapering portion 40, to releasably secure the stem 38 of the brush member 74 in the brush holder 72. While in the previously described embodiment, the brush holder 12 was a straight or linear member, with substantially no curvature therein, the brush holder 72 is specifically designed for insertion through the larynx into the trachea, and for this purpose is provided with the arcuate portion 80 from which the bristles 42 of the brush 74 project.

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While grasping the handle 78, the laryngeal cytology brush 70 may be readily inserted into the larynx and trachea of the patient and manipulated therein so that the bristles 42 will rub or abrade the adjacent tissue surfaces to remove surface cell specimens therefrom. The instrument 70 is then withdrawn from the patient's throat and, due to the relative diameters of the instrument 70 and the laryngeal and tracheal openings, there is no danger of the bristles 42 rubbing against adjacent body tissues during the removal of the instrument 70. As in the previously described embodiment 10, the brush 74 of the present embodiment is also expendable, a new brush member being used with each patient. The brush may be readily removed from the instrument, as previously described, by a partial retraction of the chuck 24, only two or three turns thereof being necessary, and a new brush may then be inserted into the holder 72, the stem 38 thereof being in automatic registry with the opening in the chuck 24 when inserted into the shield 72. The chuck is then tightened to securely retain the brush in the holder 72. It will be noted that in the present embodiment, the holder 72, in addition to its function in holding the brush for the insertion thereof into the patient's body, also serves as a guide for the brush, since, as previously indicated, the holder is substantially rigid and the stem 38 is comparatively flexible, relative thereto.

The shield 16 of the cytologic instrument 10 can be used as a cannula or catheter for injecting carbon dioxide or radio opaque substances into body cavities. For example, and not by way of limitation, the shield 16 above can be inserted into the uterus and the head 41 thereof connected by a tube to a tank of carbon dioxide for determining whether body passages leading to and from the uterus are blocked. Similarly, with the shield inserted in the uterus, radio opaque substances can be inserted through the open head 41 thereof into the uterus for taking X-rays.

While I have shown and described the preferred embodiments of my invention, it will be understood that various changes may be made in the present invention without departing from the underlying idea or principles of the invention within the scope of the appended claims.

Having thus described my invention, what I claim and desired to secure by Letters Patent, is:

1. A cytologic instrument comprising a device having a holder which is provided with means for removing cells by abrasion from a part of a patient's body, said holder having provision to guide said abrasive means during the insertion thereof into and the removal thereof from the patient's body, and means for releasably securing said abrasive means to said holder, whereby to provide said instrument with a new abrasive means for each patient-use thereof, said securing means comprising a chuck provided on said holder for releasably holding said brasive means in operative disposition thereof.

2. An abrasive cytologic instrument comprising a device having a holder provided with an abrasive brush for removing cells by abrasion from a part of a patient's body, and said holder being substantially rigid for guiding the brush into and out of an opening in a patient's body, and a chuck provided on said holder for releasably retaining said brush in operative disposition.

3. A cytologic instrument comprising a device having a holder which is provided with means for removing cells by abrasion from a part of a patient's body, said holder for said abrasive means, and a shield for said abrasive means, said holder being movable relative to said shield for moving said abrasive means into a shielded disposition thereof to prevent contact of said abrasive means with the patient's body during withdrawal of the instrument therefrom.

4. A cytologic instrument comprising a device having a holder which is provided with means for removing cells by abrasion from a part of a patient's body, said

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holder for said abrasive means and a shield for said abrasive means, said holder being movable relative to said shield for moving said abrasive means into a shielded disposition thereof to prevent contact of said abrasive means with the patient's body during withdrawal of the instrument therefrom, and adjustable detent means provided on said shield for limiting the insertion of said instrument into the patient's body.

5. A cytologic instrument comprising means for removing cells by abrasion from a part of a patient's body, and a holder for said abrasive means having provision to guide the latter during the insertion thereof into and the removal thereof from the patient's body, and a member provided on said instrument for releasable inter-engagement with a body-grasping instrument, whereby to facilitate the operation of said cytological instrument.

6. A laryngeal abrasive cytologic instrument comprising a tubular holder member, a brush provided with a stem extending into said holder and having bristles disposed outwardly of one end of said holder member, said holder member being provided with an arcuate portion adjacent said one end to facilitate the entry of said instrument into a patient's larynx for operatively disposing said brush in the larynx or trachea, and a handle provided on said holder at the other end thereof, said handle having provision to secure said brush stem in said holder.

7. A laryngeal abrasive cytologic instrument comprising a tubular holder member, a brush provided with a stem extending into said holder and having bristles disposed outwardly of one end of said holder member, said holder member being provided with an arcuate portion adjacent said one end to facilitate the entry of said instrument into a patient's larynx for operatively disposing said brush in the larynx or trachea, and a handle provided on said holder at the other end thereof, and a chuck provided in said handle for releasably securing said stem in said holder.

8. A holder for a cytologic brush comprising an elongated tubular member adapted to receive a brush stem therein, a handle provided on said tubular member, and a releasable chuck provided in said handle for releasably securing the brush stem in said tubular member.

9. A holder for a cytologic brush comprising an elongated tubular member adapted to receive a brush stem therein, a handle provided on said tubular member, and a chuck provided in said handle for releasably securing the brush stem in said tubular member, said member being curved to facilitate the entry thereof into a body opening.

10. An abrasive cytologic instrument comprising an elongated tubular member adapted to receive a brush stem therein, means on said member for releasably securing the brush stem thereto, and a tubular shield for entry into a patient's body, said tubular member being mounted within said shield for relative movement, whereby the brush can be withdrawn into the shield after an abrading operation thereof on a body part to prevent contact between the brush and the patient's body as the instrument is withdrawn therefrom.

11. An abrasive cytologic instrument comprising an elongated tubular member adapted to receive a brush stem therein, means on said member for releasably securing the brush stem thereto, and a tubular shield for entry into a patient's body, said tubular member being mounted within said shield for relative movement, whereby the brush can be withdrawn into the shield after an abrading operation thereof on a body part to prevent contact between the brush and the patient's body as the instrument is withdrawn therefrom, a handle provided on said tubular member, and a chuck provided in said handle for releasably securing the brush stem in said tubular member.

12. An abrasive cytologic instrument comprising an elongated tubular member adapted to receive a brush

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stem therein, means on said member for releasably securing the brush stem thereto, and a tubular shield for entry into a patient's body said tubular member being mounted within said shield for relative movement, whereby the brush can be withdrawn into the shield after an abrading operation thereof on a body part to prevent contact between the brush and the patient's body as the instrument is withdrawn therefrom, and a part provided on said shield for inter-engagement with a body-grasping instrument, whereby to facilitate the operation of said cytological instrument.

13. An abrasive cytologic instrument comprising an elongated tubular member adapted to receive a brush stem therein, means on said member for releasably securing the brush stem thereto, and a tubular shield for entry into a patient's body, said tubular member being mounted within said shield for relative movement, whereby the brush can be withdrawn into the shield after an abrading operation thereof on a body part to prevent contact between the brush and the patient's body as the instrument is withdrawn therefrom, and adjustable de-

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tent means provided on said shield for limiting the insertion of said instrument into the patient's body.

14. An abrasive cytologic instrument comprising a brush provided with an elongated stem, an elongated tubular brush holder into which said stem extends, a part provided on said holder for releasably securing said stem thereto, and a tubular shield within which said holder is mounted for relative movement, the bristles of said brush normally extending outwardly of said shield during an abrading operation of said instrument within the patient's body, and said holder being operable to withdraw said bristles into said shield to prevent contact of said bristles and the patient's body during removal of the instrument.

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