

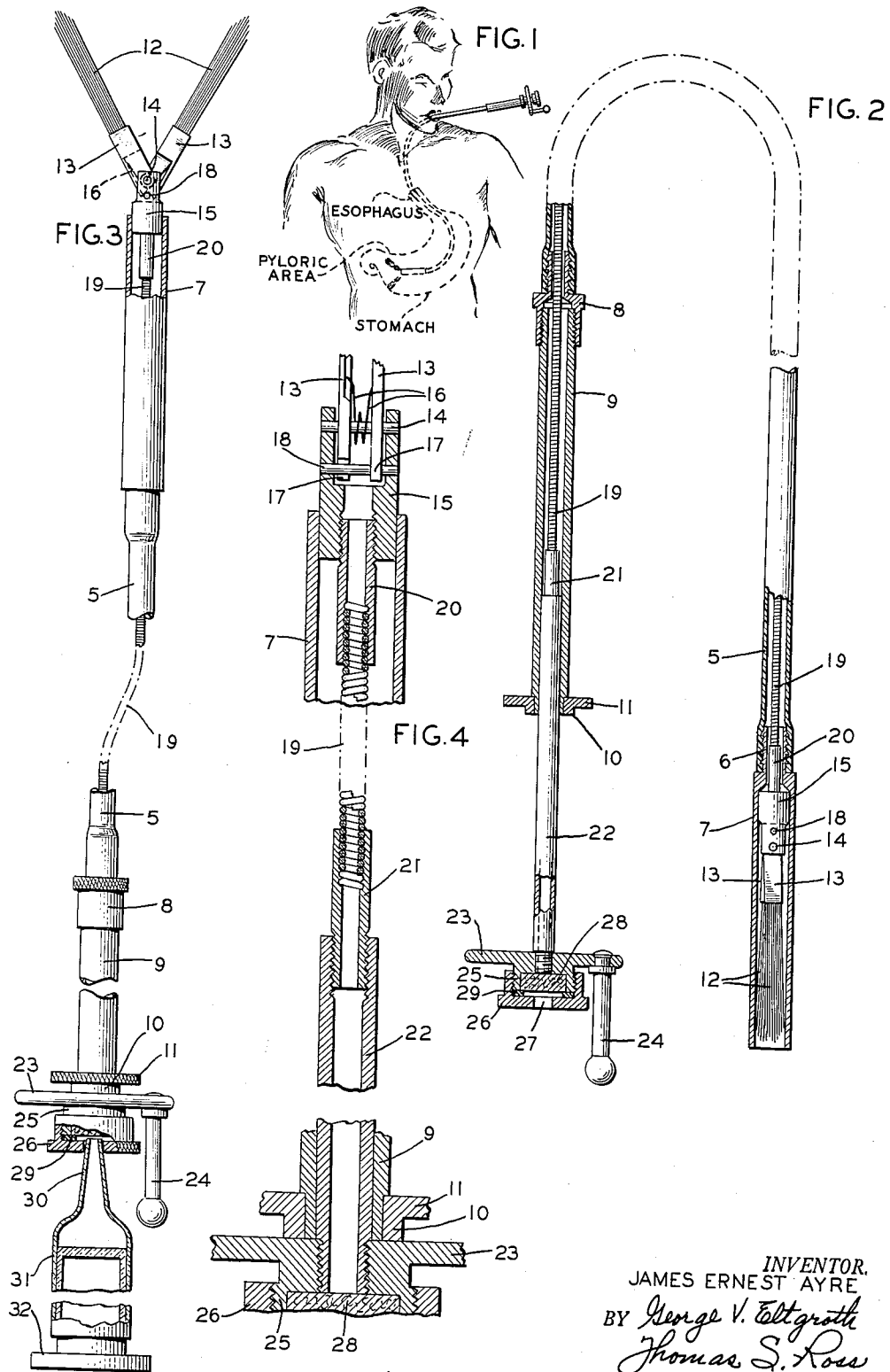
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INSTRUMENT FOR OBTAINING CELLS FOR CYTODIAGNOSIS

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INSTRUMENT FOR OBTAINING CELLS FOR CYTODIAGNOSIS

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This invention relates to a new instrument for the medical profession and more particularly to an instrument for use in diagnosing the stomach for diseased conditions affecting the structure of the stomach tissue cells.

As a result of the observations by Papanicolou it is known that tissue cell structure changes in readily recognizable ways at the site of cancer incidence. Very small specimens of cells, sloughed off the tissue in its normal process of regeneration, obtained from the site of cancer incidence give positive evidence of the developing neoplasm long before a lesion is visually detectable even in exposed areas.

The present invention therefore contemplates the provision of an instrument designed to obtain tissue cell specimens from the stomach for subsequent examination by established methods of microscopy.

More specifically the invention provides means for introducing into the stomach a brush device, the bristles of which may be controllably moved over the interior surface of the stomach to collect, in the bristles, specimen cells of the stomach tissue. Upon withdrawing the brush from the stomach the collected cells are transferred to a glass microscope slide and processed for diagnosis in the conventional manner.

It is believed that the detailed description of the present invention will be more readily understood if it is preceded by a brief general description of the instrument and method of operating same in the performance of collecting cell tissue specimens for accurately diagnosing diseased conditions affecting the stomach.

The principle covered by this invention includes a means of introducing a brush device, in a shielding tube suitable for convenient passage through the esophagus, into the stomach, then by mechanical means, at the tube and extruding from the oral or nasal cavity, causing the brush to be ejected from its shielded position in the tube so the bristles will spread and cover an area larger than the end of the shielding tube and be moved in a predetermined manner, over the interior surface of the stomach thereby collecting specimens of stomach tissue cells. After the cell collection is complete the mechanical means previously used for ejecting the brush from the shielding tube is reversely operated to cause the expanded brush device to collapse and be retracted into the shielding tube which is then withdrawn from the patient's esophagus and the cell specimens transferred to slides for processing and diagnosis.

Further objects of the invention are to provide means for shielding the brush device for convenient passage through the esophagus into the stomach; means to cause the brush or specimen collecting elements, to be moved from such shielded position to an open or spread position within the stomach and then moved into contact with the interior surface of the stomach to cause specimens of stomach cells to adhere to the brush or collecting elements; and means for protecting the stomach tissue cell specimens from coming into contact with or being con-

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taminated by other tissue surfaces during removal of the specimen laden brushes from the esophagus and oral cavity of the patient.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawing, which discloses, by way of example only, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawing:

Fig. 1 shows the instrument in the operative position within the stomach of a patient and with the brushes spread for collecting specimens of stomach cell tissue;

Fig. 2 is an elevational view partly in section of the instrument shown in actual scale with a portion of the flexible tube and flexible driving shaft removed due to lack of space and with the specimen collecting elements or brushes collapsed within the shielding tube for convenient passage through the esophagus;

Fig. 3 is a view similar to Fig. 2 but showing the specimen collecting brushes pushed from their shielding tube and spread into a V-relation relative to one another and with a negative pressure device inserted into the filter pad receptacle for use in drawing additional cell specimens from the patient's stomach, and,

Fig. 4 is an enlarged fragmentary longitudinal section illustrating constructional details of the instrument.

Referring now to the drawing wherein one embodiment of the invention is illustrated, reference numeral 5 designates a flexible tube approximately thirty-six inches long and one quarter inch outside diameter which may be made of a suitable plastic material. As shown in Fig. 2 one end of flexible tube 5 is attached to the reduced end 6 of a shielding tube or sleeve 7 and the opposite end is attached to one end of a reducing coupling 8. A metal tube 9, approximately three and one half inches long and five-sixteenths of an inch outside diameter, has one end threadedly secured to coupling 8 and its opposite end reduced to frictionally receive hub 10 of a knurled disc 11.

Inside the tube assembly above described is a second assembly which comprises a pair of brushes 12 dimensioned for complete enclosure within shielding tube 7 as clearly illustrated in Fig. 2. The ferrules 13 of brushes 12 are pivoted upon a pin 14 mounted within a clevis 15, as shown at Fig. 4, and a spring 16, encircling the pin 14 and having its ends anchored to the ferrules 13 respectively, acts to spread the brushes 12 into a V-relation relative to one another when they are pushed or ejected from the shielding tube 7 to the position illustrated in Fig. 3. Spreading movement of brushes 12, under the influence of spring 16, is limited when the angular ends 17 of ferrules 13 engage pin 18 (Fig. 4) which pin is also mounted in the clevis 15.

One end of a flexible drive shaft 19, such as the well-known Bowden wire (a hollow, flexible tube), is screwed into one end of a short tubular union 20 and the other end of this union is threadedly attached to clevis 15 as best illustrated in Fig. 4. The other end of drive shaft 19 is screwed into a second tubular union 21 which in turn is threadedly secured within one end of a metal tube 22. Tube 22 is telescopically received for axial sliding movement within tube 9 and its outer end is externally threaded to receive a disc 23 near the periphery of which is attached a small rod or rotor handle 24. Formed integral with the handle side of disc 23 is an open ended receptacle 25 externally threaded to receive a hollow nut 26 provided with a centrally disposed orifice 27 for reasons presently made clear. A filter pad 28 fits within the receptacle 25 and a gasket 29 is inserted between the outer edge of receptacle 25 and hollow nut 26 as clearly illustrated in Fig. 2.

Besides the cell tissue specimens collected by the bristles of brushes 12, additional cell tissue specimens may be drawn to filter pad 28 during the time the brushes are still in the patient's stomach by a means that will establish a negative pressure throughout the tube system above described. One form of such negative pressure means (partial vacuum) may be obtained by inserting the nose end 30 of any conventional glass syringe, of the type used with hypodermic needles as indicated at 31, into the orifice 27 of hollow nut 26 and drawing outwardly upon the plunger end 32.

Although use of the instrument will be apparent from the foregoing description and from the drawing, it may be supplemented briefly for the sake of clarity. When the brushes 12 are enclosed within the shielding tube or sleeve 7 (Fig. 2), the instrument becomes for a substantial portion of its length a flexible tube which may be introduced into the stomach with ease. Control of the instrument is maintained through the rotatable handle 24, knurled disc 11 and metal tube 9. Before inserting the brush end of the instrument into the patient's stomach it is advisable, with each individual, to measure the distance from the mouth to the approximate pyloric region or area. The tubing 5 may then be marked at the point opposite the teeth to which the instrument will be passed to reach the important pyloric area. An appropriate jelly or an equivalent lubricant may be applied to the metal tip or shielding tube 7 prior to insertion, but it is important to keep the bristles of the brush 12 dry.

To insert the brushes 12 into the stomach, the patient is instructed to open the mouth and the operator places two fingers far back onto the tongue, which causes slight gagging. This is the signal to pass the shielding tube 7 through the glottis using gentle pressure. It is, therefore, not actually necessary for the patient to swallow the metal shielding tube 7 volitionally. The patient is not aware that the tube 7 has been passed into the esophagus, but is only conscious of the discomfort of gagging. Once the shielding tube 7 is passed, the patient is instructed to breathe deeply and regularly, and the flexible tube 5 may then be quickly passed down to the region of the pylorus as shown in Fig. 1. This entire procedure usually requires very few minutes.

When the shielding tube 7 and flexible tube 5 are fully inserted, they are withdrawn about one inch as the brushes 12 are gently forced out of the tube 7 by pushing metal tube 22 into the outer metal tube 9. Rotation of the brushes 12 may now begin by rotating the handle 24, and the instrument is slowly withdrawn the length of the stomach before drawing the brushes back into the shielding tube 7. Rotation of the brushes 12 is continued through the entire length of the stomach so that fundal lesions may be reached as well as pyloric. As soon as the brushes 12 have been retracted within the shielding tube 7, by drawing outward upon handle 24 or disc 23 tubes 5 and 7 may then be gently withdrawn from the stomach without further discomfort.

The length of shielding tube 7 is such that when clevis 15 is drawn into contact with the reduced end of tube 7, the brushes 12 are fully enclosed within tube 7 thus limiting the outward movement of tube 22 relative to tube 9.

The embodiment of the present invention illustrated and described herein is by way of example only, and the scope of the present invention is not limited to the same or to the particular details thereof. Accordingly the appended claims are to be construed as defining the invention within the full spirit and scope thereof.

The invention claimed is:

1. Apparatus for obtaining specimens for cytodiagnosis comprising in combination, a pair of longitudinally extending hollow flexible members, one housed within the other, specimen collecting elements attached to one end of the inner flexible member aforesaid, a housing attached to one end of the outer flexible member aforesaid, the collecting elements being normally contained in said hous-

ing, means attached to the other end of the inner flexible member aforesaid for effecting rotation of the same and moving the aforesaid inner flexible member axially relative to the outer flexible member to displace said elements from said housing, and means acting to spread said elements as they are displaced from said housing.

2. Apparatus for collecting specimens for cytodiagnosis comprising in combination, a pair of longitudinally extending hollow flexible members, one housed within the other, specimen collecting elements pivotally connected to one end of the inner flexible member aforesaid, a housing attached to one end of the outer flexible member aforesaid, the collecting elements being normally contained in said housing, means attached to the other end of the inner flexible member aforesaid for imparting simultaneous rotation of said inner flexible member and said elements, said last named means also acting to move the said flexible members axially relative to one another to displace said elements from the said housing, and spring means serving to spread said elements into V-formation, as they are displaced from said housing.

3. Apparatus for collecting specimens for cytodiagnosis comprising: a pair of longitudinally extending hollow flexible members, one housed within the other, a pair of brushes pivotally connected to one end of the inner flexible member aforesaid, said pivotal connection including a clevis and a pivot pin, a housing attached to one end of the outer flexible member aforesaid, the brushes being normally contained in said housing, means attached to the other end of said inner flexible member for simultaneously rotating said member and brushes and projecting said brushes from said housing, and spring means acting to move said brushes into V-relation relative to one another as they are pushed from said housing by said inner flexible member.

4. Apparatus for collecting specimens for cytodiagnosis comprising: a pair of longitudinally extending hollow flexible members, one telescoped within the other for axial sliding movement, a shielding tube attached to one end of the outer of said pair of flexible members, a non-flexible tube secured to the other end of said outer flexible member, a pair of brushes pivotally connected to one end of the inner of said flexible members the brushes being normally housed in said shielding tube, a non-flexible tube connected to the opposite end of said inner flexible member, a disc secured, at one side, to the free end of the last named non-flexible tube, a rotor handle carried by said disc, and spring means acting to spread said brushes when they are ejected from said shielding tube upon axial displacement of said inner member relative to said outer member.

5. Apparatus as claimed in claim 4 wherein an open-ended receptacle is formed upon the other side of said disc and externally threaded to receive a hollow nut having a centrally disposed orifice; and a filter pad housed within said receptacle.

6. Apparatus according to claim 4 wherein the pair of brushes are pivotally mounted upon a pin mounted in a clevis, the clevis being attached to one end of the inner member; and a second pin mounted in the clevis acting to limit spreading movement of said brushes when they are ejected from said shielding tube.

7. Apparatus for collecting specimens for cytodiagnosis comprising: a flexible tube, a hollow flexible shaft housed within said tube, specimen collecting elements attached to one end of said shaft, a housing attached to one end of said flexible tube for normally containing said collecting elements, means attached to the other end of said shaft for effecting rotation of the same and said elements and moving the shaft axially relative to said flexible tube to displace said elements from said housing, and means acting to spread said elements as they are displaced from said housing.

8. Apparatus for collecting specimens for cytodiagnosis comprising: a flexible tube, a hollow flexible shaft housed

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within said tube, specimen collecting elements pivotally connected to one end of said shaft, a housing attached to one end of said flexible tube for normally containing said collecting elements, means attached to the other end of said shaft for imparting simultaneous rotation of said shaft and said elements, said last named means also acting to move the shaft to displace said elements from said housing, and spring means serving to spread said elements into V-formation as they are displaced from said housing.

9. Apparatus for collecting specimens for cytodiagnosis comprising: a flexible tube, a flexible hollow shaft slidably housed within said tube, a pair of brushes pivotally connected to one end of said shaft, a housing attached to one end of said tube for normally containing said brushes, means attached to the other end of said shaft for simultaneously rotating said shaft and brushes and projecting said brushes from said housing, and spring means acting to move said brushes into V-relation relative to one another as they are pushed out from said housing by said shaft.

10. Apparatus as in claim 9 wherein the pair of brushes are pivotally mounted upon a pin mounted in a clevis, the clevis being attached to one end of the shaft, and a second pin mounted in the clevis acting to limit spreading movement of said brushes when they are ejected from said housing.

11. Apparatus for obtaining specimens for cytodiagnosis comprising in combination, a pair of longitudinally extending hollow flexible members, one housed within the other, a specimen collecting element attached to one end of the inner flexible member aforesaid, a housing attached to one end of the outer flexible member aforesaid, the

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collecting element being normally contained in said housing, means attached to the other end of the inner flexible member aforesaid for effecting rotation of the same and moving the aforesaid inner flexible member axially relative to the outer flexible member to displace said element from said housing.

12. Apparatus for obtaining specimens for cytodiagnosis comprising in combination, a longitudinally extending hollow flexible member, a longitudinally extending flexible member housed within said hollow flexible member, a specimen collecting element attached to one end of the inner flexible member aforesaid, a housing attached to one end of the outer flexible member aforesaid, the collecting element being normally contained in said housing, means attached to the other end of the inner flexible member aforesaid for effecting rotation of the same and moving the aforesaid inner flexible member axially relative to the outer flexible member to displace said element from said housing.

References Cited in the file of this patent

UNITED STATES PATENTS

1,711,352	Jeffreys	Apr. 30, 1929
2,655,154	Richter	Oct. 13, 1953

FOREIGN PATENTS

96,035	Germany	Feb. 3, 1898
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OTHER REFERENCES

Journal of the American Medical Association, August 12, 1950; pp. 1308, 1309. (A copy of this publication is available at the Scientific Library of the Patent Office.)