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RECTAL SCRAPER

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Fig. 1.

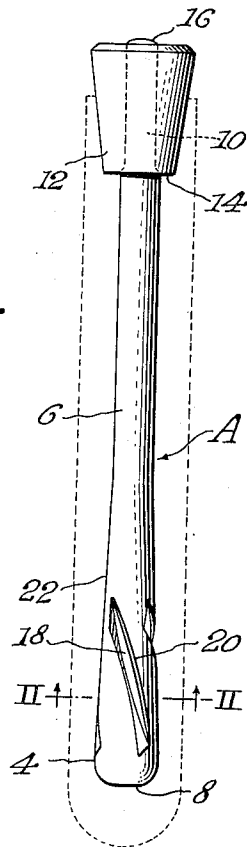
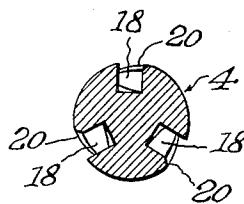


Fig. 2.



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RECTAL SCRAPER

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without payment to me of any royalty thereon.

The present invention provides a device for facilitating the identification of certain intestinal parasites causing pathological conditions, and the invention provides an improved device for collecting material for examination for eggs and spores of such organisms, and for the organisms themselves.

Parasitic intestinal infections occur very frequently, and are especially widespread in tropical climates. However, in many instances, the positive detection and identification of the invading organism are difficult and uncertain owing, for example, to non-uniform distribution of eggs, spores, or the organism themselves.

Thus, for example, in cases of intestinal schistosomiasis, it has been found that the eggs of *Schistosoma mansoni* are not distributed uniformly throughout formed stools, but are most numerous in the mucous adhering to the surface of the rectum.

In view of the fact that examination of formed stools may result in missing evidences of particular infections of the above-indicated character, there has been introduced the so-called "rectal swab" method of diagnosis of intestinal schistosomiasis, which method consists in the microscopic examination of mucous adhering to a gloved finger following digital rectal examination.

The amount of material collectable in this manner is small; and it is desirable not only to collect a larger sample of mucous than will adhere to a gloved finger, but to collect such a sample which can be placed in a tube for transportation from the field or clinic to the laboratory.

The present invention provides an instrument which may be called a rectal scraper, that is designed to be introduced into the rectum of a patient or subject being examined for collecting larger samples of material for examination not only for the diagnosis of *S. mansoni* infections, but of other intestinal infections caused by an invading organism, the eggs, or spores of which, or the organism itself, may be present in the rectum.

The accompanying drawings represent one form of a rectal scraper constructed in accordance with the present invention, wherein:

Figure 1 represents either an elevation or plan view of a rectal scraper of the present invention,

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the view showing the scraper mounted in a rubber stopper for insertion in a test tube for transportation to a laboratory for examination; and

Figure 2 is a transverse sectional elevation taken on the line II—II of Figure 1, looking in the direction of the arrows.

Referring more particularly to the drawings, the improved instrument of the present invention comprises a body A having an enlarged head portion 4 that gradually and evenly tapers into a stem portion 6. The head portion 4 terminates in a rounded distal end 8. The stem portion 6 may terminate in a restricted proximal end section 10, which is adapted to be inserted in a stopper 12, the junction between the stem portion 6 and the restricted proximal end section 10 being defined by a shoulder 14, which in the illustrated form of the invention defines an abutment stop for the stopper 12. The proximal end section 10 fits tightly in a hole provided therefor in the stopper, this stopper being preferably a one-hole rubber stopper of a standard size suitable for closing the mouth of a given test tube for transporting the collected specimen of material to a laboratory where the specimen can be examined.

The body A is substantially circular in cross section throughout and it is composed of suitable moldable material such as the so-called "plastics," for example the material well known to the trade as "Bakelite"; or the body A may be composed of hard rubber or similar familiar material. The edges of the proximal end 16 preferably are rounded for obviating possibility of cutting the rubber body of the stopper 12.

The head portion 4 of the instrument has one or more spiral specimen-collection grooves 18 therein, the illustrated embodiment showing three such grooves as being preferable, although not critical. These grooves are adapted to collect specimens of material to be examined, and it is found in practice that these grooves will collect larger and more uniform samples of material than does a single groove. Where three grooves are used, they are spaced at 120 degree intervals around the body of the scraper as shown.

The grooves 18 are formed with the floor of each groove curving sharply to the surface at the distal end of each groove, but otherwise the floors are flat throughout the length of each groove. The lead wall of the grooves as viewed in Figure 1 is beveled smoothly as indicated at 20, this beveled wall therefore having its edge slightly below that on the scraper, the beveled

wall being the leader wall when the instrument is used, and the scraper wall being the follower wall, which scrapes off the mucous from the intestinal wall and deposits the resulting specimen in the collecting grooves.

The following specific example illustrates more definitely the construction of a typical instrument of this invention. It will be understood that the following example is illustrative only in character, that the indicated dimensions are not critical, that many of the structural details may be omitted or changed in a manner that will be suggested readily to one skilled in the art.

In production quantities, the instrument of the present invention is made by molding it from a suitable plastic material. However, the original test specimens of the instrument were machined from $5\frac{3}{4}$ inch lengths of "Bakelite" rod having a diameter of one-half inch. The distal end 8 was rounded off and the instrument was tapered uniformly as shown at 22 from its maximum diameter of one-half inch, the taper starting at a point three-sixteenths inch from the distal end 8 to a diameter of five-sixteenths of an inch, which is the diameter of the stem portion 6 between the tapered portion 22 and the shoulder 14, where the stem portion 6 was reduced to a diameter of one-fourth of an inch, thereby forming the shoulder 14 and the proximal end section 10. This one-fourth inch diameter of the proximal end section causes the end section 10 to fit snugly into a standard hole in a No. 1 one-hole rubber stopper adapted to close a test tube for carrying the instrument after use to a laboratory for examination of the collected material.

Following shaping, a spiral groove 18, one and one-eighth inches long, was milled diagonally across the rod, starting at a point one-eighth inch behind the greatest diameter of the scraper and running approximately to the right-hand margin of the scraper as viewed in Figure 1. The floor of the groove was curved sharply to the surface at the distal end of the rod, but was otherwise flat throughout its length. The left-hand wall of the groove, as viewed in Figure 1, was beveled smoothly as indicated at 20, so that the edge was approximately one-thirty-second inch below that on the right side, which is the scraping side of the instrument when in use.

Originally, the instrument was made with one groove, but subsequently, two additional grooves as shown were milled into the head portion of the scraper so that identical grooves were spaced at 120° intervals around the head portion 4.

The foregoing specifically enumerated dimensions obviously are not critical and are intended to be illustrative only in character. The important features are that the instrument is insertable readily into the rectum and that mucous and fecal material will be scraped from the rectum walls and guided into the retaining groove or grooves responsively to rotation of the instrument, which, together with the collected material, may be inserted in a sterile test tube that is closed by the stopper 12, and thus transported to a laboratory for examination. The only critical dimensions of the instrument are that it must not have a diameter so large as to preclude ready insertion into the rectum of a patient and ready manipulation therein without discomfort to the patient. To this end, the distal end 8 of the instrument is smoothly rounded, and the grooves 18 are disposed spirally adjacent to the distal end so that material scraped from the rectal walls will

be guided into the grooves and retained therein, until these grooves contain substantial amounts of material. The use of three of the material-collecting grooves increases the likelihood of obtaining a representative mucous sample with a minimum of fecal material.

In using the instrument of the present invention, the patients are examined in a standing position with the trunk bent forward at a 90° angle. The scraper lubricated with green soap solution is passed through the rectal sphincter and introduced carefully into the rectum for a distance of three to three and one-half inches. Then with a gentle circular movement, the instrument is swung laterally around the bowel wall and at the same time rotated in a counter-clockwise direction four to six times before being withdrawn. If at any time after passage through the sphincter a definite sense of resistance was felt, the angle of introduction was changed and forceful insertion carefully avoided.

Tests show that mucous and fecal material collected in the groove could be examined several hours after collection if the scrapers were fitted by their attached rubber stoppers into moist test tubes for transportation.

Specimens can be obtained rapidly with this instrument. For example, a team of four, consisting of a doctor, two microscopists, and an assistant, can collect and examine preparations from 125 individuals in the course of a six-hour period.

The instrument of the present invention is straight axially and is substantially circular in cross section throughout for ease of insertion.

The specifically illustrated details of the embodiment of this invention shown on the drawings are not critical. Thus, the designated size and dimensions may be varied within limits that will be apparent to one familiar with the use of instruments of this general type. The slope of the grooves may be varied from that shown, and the grooves may be pitched in the opposite direction to that shown; also there may be one groove, or three as shown, or more. The dimensions of the grooves are such as to permit more than three in the enlarged head portion of the instrument.

While the scraper of the invention has been described in connection with the collection of specimens of material for examination for *Schistosoma mansoni*, it will be understood that this is not the only use for the instrument of the invention, and that it will collect the mucous material from the rectum and intestinal walls independently of the particular organism that is to be detected including intestinal protozoa.

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

1. A rectal scraper comprising a rod-like body including a proximal end, a distal end, a stem portion including the proximal end, and an enlarged head portion including the distal end, the body being of circular cross-section throughout and having its maximum diameter in the head portion, the stem portion gradually tapering to the head portion, scraping means in the head portion for scraping material to be examined from a rectal wall, and collecting means for collecting scraped-off material.

2. A rectal scraper comprising a rod-like body including a proximal end, a distal end, a stem portion including the proximal end, and an enlarged head portion including the distal end, the said rod-like body being of circular cross-section

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throughout and having its maximum diameter in the head portion, the stem portion gradually enlarging to the head portion, means in the head portion for collecting material to be examined responsively to rotation of the body, and a scraper wall on the means for scraping material to be examined from a rectal wall.

3. A rectal scraper comprising a rod-like body including a proximal end, a distal end, a stem portion including the proximal end, and an enlarged head portion including the distal end, the said rod-like body being of circular cross-section throughout having its maximum diameter in the head portion, the said stem portion gradually enlarging to the head portion, a spiral collecting groove in the head portion for collecting material to be examined, and a scraper wall on the collecting groove for scraping material to be examined from a rectal wall responsively to insertion of a scraper in a rectum and rotation thereof in a direction adapted to bring the scraper wall of the collecting groove into scraping engagement with the rectum wall, the distal end of the scraper body being rounded for facilitating insertion of the scraper into the rectum.

4. A rectal scraper comprising a rod-like body including a proximal end, a distal end, a stem portion including the proximal end, and an enlarged head portion, the said rod-like body being of circular cross-section throughout and having its maximum diameter in the head portion, the stem portion enlarging uniformly into the head portion, thereby obviating any sharp junction edge, and spirally disposed scraping and collecting means in the head portion for scraping and collecting material from a rectum wall responsively to insertion of the scraper into a rectum and rotation of the inserted scraper, the distal end of the scraper being rounded for facilitating insertion of the scraper body into the rectum.

5. A rectal scraper comprising a rod-like body including a proximal end, a distal end, a stem portion including the proximal end, and an enlarged head portion, the said rod-like body being of substantially circular cross-section throughout and having its maximum diameter in the head portion, the stem portion enlarging uniformly into the head portion, and spirally disposed scraping and collecting grooves in the head portion for scraping and collecting material from a rectum wall responsively to insertion of the scraper into a rectum and rotation of the inserted scraper.

6. A rectal scraper comprising a rod-like body including a proximal end, a distal end, a stem portion including the proximal end, and an enlarged head portion, the said rod-like body being of substantially circular cross-section throughout and having its maximum diameter in the head portion, the said head portion being adjacent to the distal end, the stem portion enlarging into the head portion, and spirally disposed scraping and

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collecting grooves in the head portion disposed substantially 120° apart for scraping and collecting material from a rectum wall responsively to insertion of the scraper into a rectum and rotation of the inserted scraper.

7. A rectal scraper comprising a rod-like body of circular cross-section throughout including a proximal end, a distal end, a stem portion including the proximal end, and an enlarged head portion, the said head portion being adjacent to the distal end, the stem portion enlarging into the head portion, and spirally disposed scraping and collecting grooves in the head portion, each of the said grooves having a beveled-edge side wall and a scraper-edge side wall, the beveled-edge side wall being the leader wall and the scraper-edge side wall being the follower wall responsively to insertion of the scraper into a rectum and operative rotation of the inserted scraper, the scraper-edge of each groove being adapted to scrape material to be examined from the rectum wall and to deliver the scraped-off material into the spiral collecting grooves.

8. A rectal scraper comprising a rod-like body including a proximal end, a distal end, a stem portion including the proximal end, and an enlarged head portion, the said head portion being adjacent to the distal end, the rod-like body of substantially circular cross-section throughout and having its maximum diameter in the head portion, scraping and collecting means in the head portion for material to be examined, the stem portion gradually and smoothly enlarging into the head portion thereby avoiding sharp junction edges, the stem portion having a restricted portion towards the proximal end and defining an abutment shoulder at the juncture with the restricted portion, and carrying means on the restricted portion adapted to form a closure for a carrying tube for the scraper and collected material, the said carrying means abutting against the abutment shoulder, the distal end being rounded for facilitating insertion of the scraper into a rectum.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
58,631	Gates	Oct. 9, 1866
547,047	Thornton	Oct. 1, 1895
605,052	Cook	May 31, 1898
839,641	Reavley	Dec. 25, 1906
1,867,624	Hoffman	July 19, 1932

FOREIGN PATENTS

Number	Country	Date
528,422	Germany	June 29, 1931