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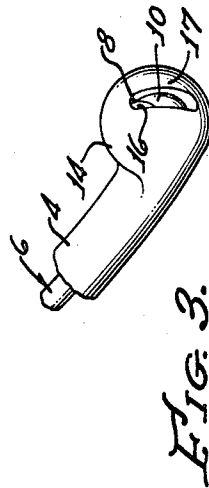
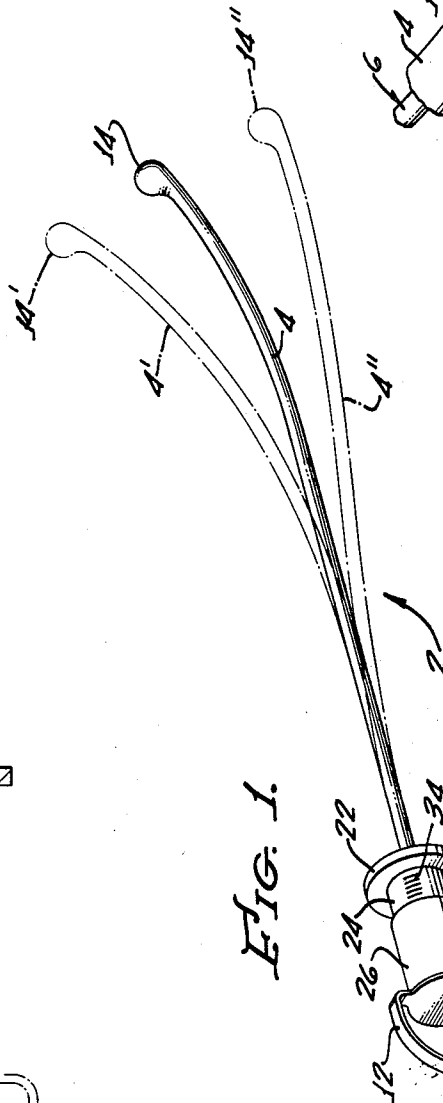
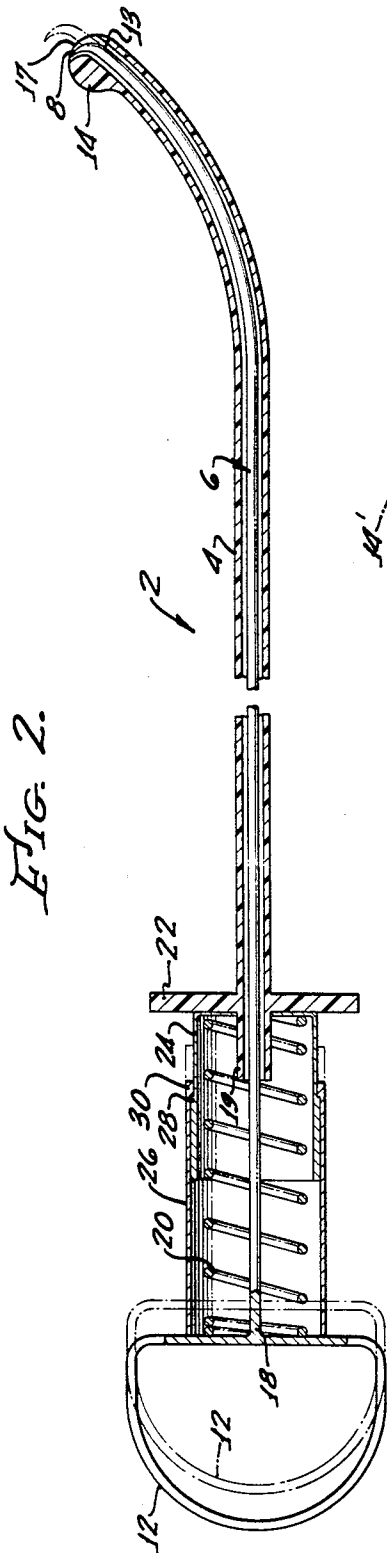
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OBSTETRICAL INSTRUMENT FOR PUNCTURING THE AMNIOTIC MEMBRANES

Filed Dec. 27, 1965

2 Sheets-Sheet 1



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FIG. 4.

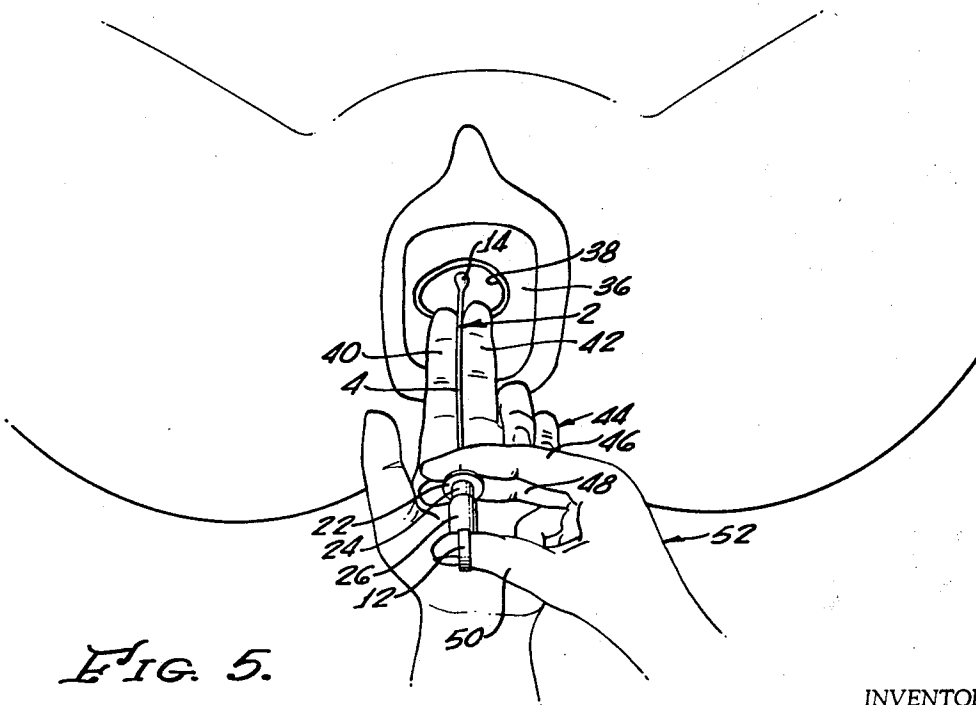
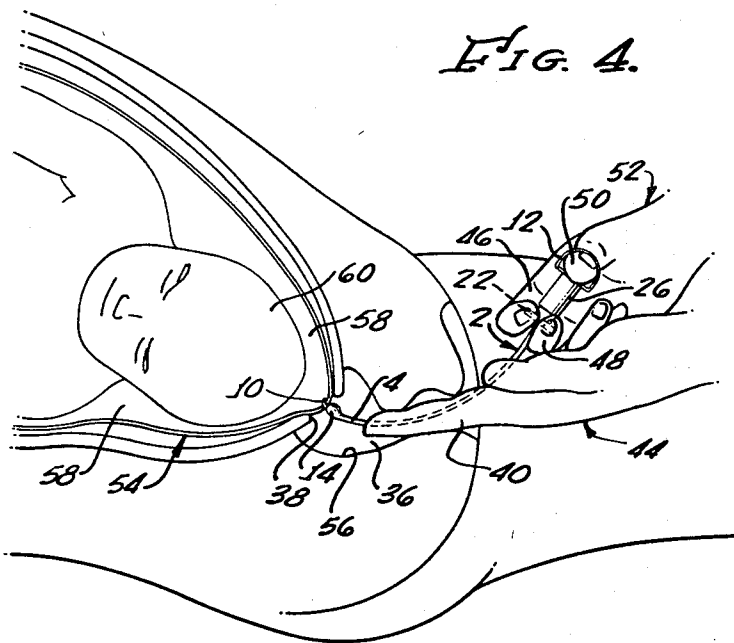


FIG. 5.

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OBSTETRICAL INSTRUMENT FOR PUNCTURING THE AMNIOTIC MEMBRANES

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ABSTRACT OF THE DISCLOSURE

A surgical instrument for rupturing the fetal membranes of a gravid female and the technique of using it are disclosed. The device can be preformed to approximate the contours of the vaginal canal of the patient. The sharp rupturing tip of the device is sheathed during insertion and withdrawal of the instrument to avoid damaging delicate surrounding tissues.

This invention relates to obstetrical surgery, and more particularly, to a surgical instrument which is inserted through the vagina and cervical canal of a gravid female to rupture the amnion and chorion membranes and release the amniotic fluid surrounding the fetus.

Often, it is necessary for a physician to rupture a pregnant woman's fetal membranes to induce labor prematurely if the fetus is dead or the mother is diabetic or toxemic. In another case, if the placenta lies partly over or just adjacent to the cervical canal and has started bleeding, rupturing the fetal membranes sometimes permits the fetal head to descend and press the placenta against its torn attachment to the uterus, or if the normally located placenta has partially separated, rupturing the membranes hastens delivery and reduces the internal pressure within the uterus. Even in connection with normal births, it is often desirable to induce labor contractions or increase their frequency and/or intensity by intentionally rupturing the amnion-chorion membranes.

In the past the rupturing operation generally has been performed by using a clamp inserted through the vagina and cervical canal to contact the fetal membranes. The clamp is manipulated by the physician so that its sharp teeth puncture the membranes.

The whole procedure is quite delicate because of the danger of injuring the fetal scalp or damaging the mother's internal tissue, the tissue being quite vascular during the late stages of pregnancy. The difficulty of the puncturing operation is compounded because the clamp must be inserted past the sensitive tissue, particularly the cervix, and manipulated to puncture the fetal membranes largely by feel rather than sight.

The size, shape, and rigidity of commonly used clamps have made them cumbersome to say the least, and often dangerous. A relatively large cervical canal is required to permit the awkward clamp to move past the cervix, and even then the operation often damages the mother or fetus.

Recognizing these difficulties, attempts have been made to rupture the fetal membranes with instruments other than clamps. For example, a specially constructed glove having an exposed sharp point on one finger has been used to pierce the membranes. As is all too apparent, however, the exposed sharp point is apt to scratch the delicate tissue during the insertion and withdrawal of the device even though such a device does permit a more efficient accommodation to be made to the individual variations in the reproductive organs of different females.

The present invention overcomes many of the difficulties of prior art techniques by providing a surgical instru-

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ment which can be safely and easily inserted and positioned adjacent to the fetal membranes, and thereafter removed from the vagina with little or no danger of scratching the delicate tissue.

In its preferred embodiment, the instrument includes a malleable, elongate, hollow tube which acts as a guide and a protective sheath for a wire extending therethrough. The forward end of the wire is bent in the form of a hook terminating in a sharp point, and the rear end has means associated with it to permit the hook to be extended and retracted with respect to the forward end of the tube. The pointed hook normally nests protectedly in the outer end of the tube.

In use, the tube and inner wire are deformed or bent to conform to the contours of the expectant mother's vagina and cervical canal as determined by the physician. Then the instrument is cradled in the fingers of one hand and inserted through the patient's vagina and cervical canal with the hook in its retracted position to shield the internal tissue from damage. When the tip of the tube is positioned adjacent the fetal membranes the physician extends the hooked tip forward of the tube to expose the sharp point. He then can manipulate the instrument to rupture the fetal membranes by scratching them with the sharp point of the wire. Thereafter, the hook is retracted and the tube removed.

The extent of protrusion of the point and its rotational position can be controlled so that the device practically eliminates the danger of injury to the fetus or the patient. In addition to the foregoing advantages, the instrument can be manufactured inexpensively. Thus, it may be discarded after a single use to obviate the need for cleaning and re-sterilizing it.

These and other objects, advantages and features of this invention will be apparent from the following detailed discussion when read with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of an obstetrical instrument constructed in accordance with this invention;

FIG. 2 is a longitudinal cross-section through the obstetrical instrument illustrated in FIG. 1, with a center portion of the tube and internal wire thereof omitted;

FIG. 3 is a perspective view of the forward end of the obstetrical instrument of FIG. 1 showing the hooked end of the internal wire nested in the bulbous end of the outer tube;

FIG. 4 is a sagittal section through the pelvis of a gravid female showing the instrument in position adjacent the amnion-chorion membranes; and

FIG. 5 is a perineal view of a gravid female showing the instrument partially inserted through the vagina.

Referring to FIGS. 1 and 2, the obstetrical instrument 2 includes a deformable elongate, hollow tube 4 having an elongate deformable wire 6 extending through it. The forward tip 8 of the wire 6 (to the right of the drawing of FIG. 1) is sharpened and the forward end bent away from the wire axis 9 to form a hook indicated generally at 10. A thumb ring 12 on the other or rear end of the wire 6 (to the left of FIG. 1 of the drawings) is used by the physician to extend the hook 10 forward of the hollow tube 4.

The elongate outer tube or sheath 4 is preferably made of malleable metal or plastic material so that it can be easily shaped to approximate the configuration of the patient's vagina and cervical canal. The wire 6 is relatively flexible so that it can conform to the configuration of the tube 4.

As is shown also in FIG. 3, the forward end of the elongate tube terminates in a bulbous enlargement 14 which is approximately oval in cross-section to minimize its dimensions. The forward face of the bulbous enlarge-

ment includes a tapered arcuate slot 16 extending radially from the main bore to receive the hook 10. It will be noted that the forwardmost surface 17 of the bulbous enlargement 14 and the forwardmost surface of the hook 10 are of substantially the same curved shape.

The rear end 18 of the wire extends a substantial distance beyond the rear end 19 of the tube 4 and is affixed to the thumb ring 12. The latter may be of any suitable shape for receiving the thumb of the person using the instrument. A compression spring 20 may be operably connected between an external shoulder 22 formed near the rear end of the elongate sheath 4 and the thumb ring 12 to urge the thumb ring normally rearward and the hook 10 into the retracted position.

A cup-shaped inner housing member 24 extends from the shoulder 22 to contain the compression spring 20 for a portion of the distance rearwardly toward the thumb ring 12. A tubular outer housing member 26 extends forwardly from the thumb ring and telescopes over the inner housing member 24. An external shoulder 28 on member 24 and an internal shoulder 30 on member 26 cooperate to define the rearmost position of the thumb ring and hook assembly with respect to the tube 4 when the hook is nested within the bulbous enlargement 14.

Gradations 34 marked on the exterior of the first tubular housing member visually indicate the extent of protrusion of the hook from the forward end of the tube.

FIGS. 4 and 5 illustrate the insertion and positioning of the present invention. The surgical device 2 is placed in position for insertion through the vagina 36 and cervical canal 38 of a patient by the physician cradling the tube between the index finger 40 and middle finger 42 of one of his hands 44 while clasping the shoulder 22 and thumb ring 12 with the fingers 46 and 48 and thumb 50 of his other hand 52. With the hook 10 in the normal or retracted position, the pre-shaped tube 4 is guided into position by the physician's fingers 40, 42 and hand. The result is that the bulbous enlargement 14 is located adjacent the amnion-chorion or fetal membranes 54 without any danger of scratching the internal tissue 56 since the hook remains interior of the enlarged end 14 during insertion of the instrument.

With the bulbous enlargement 14 positioned adjacent the fetal membranes, the hook 10 is moved into its extended position by pushing the thumb ring 12 forward toward the shoulder 22. The amount of extension can be carefully controlled since the hook is known to be just inside the enlargement 14 when retracted. Further control is achieved by noting the index marks 34 on the housing member 24 which acts as a guide for the outer housing member 26.

With the hook 10 extended forward a short distance, the surgical device 2 is moved so that the hook scratches the fetal membranes 54 to rupture them and release the amniotic fluid 58 surrounding the fetus 60 (FIG. 5). The physician may achieve this scratching action by moving the tube 4 with the fingers of his guiding hand 44 or by moving the wire 6 interior of the tube 4 by way of the thumb ring 12. The wire 6 may also be rotated to some extent since the thumb piece 12 is journaled by housing member 24. It will be noted in connection with FIG. 2 that hook 10 is bent slightly more than ninety degrees (90°) with respect to the axis 9 of the shank 13 of wire 6 so that the sharp tip 8 is best positioned to scratch the fetal membranes when the hook is extended.

After the membranes have been ruptured, the user releases the thumb piece 12 so that the compression spring 20 causes the hook 10 to retract interior of the bulbous enlargement 14. The instrument 2 may then be removed safely inasmuch as the bulbous enlargement once again shields the internal tissue from the tip 8 of the hook 10.

The tube is shown in phantom positions 4' and 4'' in FIG. 1 to illustrate that the tube will retain its deformed position, thereby facilitating its adaptability to widely different female pelvic configurations.

In an exemplary embodiment of the surgical instrument, stainless steel wire of about No. 16-20 Roebbling gauge in a one-eighth ($\frac{1}{8}$) inch outside diameter tube has been found satisfactory. In that embodiment it has been found preferable that the hook extend about one-eighth ($\frac{1}{8}$) to three-sixteenth ($\frac{3}{16}$) inch laterally away from the wire axis, and that the longest diameter of the bulbous enlargement be about one-quarter ($\frac{1}{4}$) inch. Further, it has been found desirable that the hook be capable of extending about one-half ($\frac{1}{2}$) inch forward of the tube.

While the present invention has been described with respect to an exemplary embodiment, certain modifications can be envisaged by those skilled in the art without departing from the spirit and scope of the invention. For this reason, the invention herein described should only be limited to the extent of the appended claims.

I claim:

1. An obstetrical device for rupturing the fetal membranes of a gravid female to release the amniotic fluid comprising:

- (a) an elongate deformable tubular member adapted to be inserted in a female vagina with its forward end positioned adjacent the fetal membranes;
- (b) an elongate deformable wire member extending through the tubular member, said elongate wire having a sharp point formed on its forward end in the shape of a hook;
- (c) at least one of said elongate members being malleable so that it may be shaped to conform to the pelvic configuration of the particular female whose membranes are to be ruptured;
- (d) means normally shielding the vagina and cervical canal tissue from said sharp tip as the device is inserted in and removed from the vagina;
- (e) said vaginal shielding means comprising a bulbous enlargement at the forward end of said tubular member which is larger than the diameter of said tubular member and means associated with said bulbous enlargement to receive said hooked tip in its retracted position; and
- (f) means toward the rear end of the wire member operable to move the wire in a forwardly direction with respect to said tubular member when the device is in situ to extend and expose the sharp tip so that the fetal membranes may be ruptured and for moving the sharp tip to said retracted position before said device is removed from the vagina.

2. An obstetrical device for rupturing the fetal membranes of a gravid female to release the amniotic fluid in accordance with claim 1 wherein the bulbous enlargement includes an arcuate slot for housing the hook so as to shield the vagina and cervical canal from the sharp tip as the device is inserted and withdrawn, and the forward surface of the bulbous enlargement has substantially the same shape as the forward surface of the hook.

3. A surgical instrument for rupturing the amnion-chorion membranes of a gravid female to release the amniotic fluid comprising:

- (a) an elongate deformable hollow tube adapted to be partially inserted in a female vagina to position its forward end adjacent the amnion-chorion membranes and with its rear end exterior of the vagina;
- (b) an elongate deformable wire slidably and rotatably mounted in the tube with its ends extending beyond the forward and rear ends of said tube for movement between a rearward position and a forward position with respect to said tube;
- (c) said elongate deformable hollow tube being formed of a malleable material so that the instrument may be shaped to conform to the pelvic configuration of the particular female whose fetal membranes are to be ruptured;
- (d) a sharp pointed hook formed at the forward end

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portion of the wire, the hook being sent slightly more than ninety degrees with respect to the axis of the wire immediately adjacent the bend and having a smoothly curved forward surface;

(e) a bulbous enlargement at the forward end of the tube having an arcuate slot extending radially from the main bore of the hollow tube for receiving the hook so that it acts as a sheath for the wire in its rearward position, the bulbous enlargement being larger than the diameter of said tube, generally oval and having a curved forward surface similar to the forward surface of the hook; and,

(f) means associated with the rear ends of the wire and tube for moving the wire between the rearward position with the hook sheathed and the forward position with the pointed hook exposed.

4. A surgical instrument for rupturing the amnion-chorion membranes of a gravid female to release the amniotic fluid in accordance with claim 3 wherein said

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means associated with the ends of said wire and tube to move the wire includes a thumb ring on said wire and external shoulders on said tube, and including spring means cooperating with said ring and said external shoulders to urge the wire hook normally to remain in the rearward position.

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