

[54] **INTRAUTERINE CONTRACEPTIVE DEVICE WITH SCALLOPED EDGE APPENDAGES**

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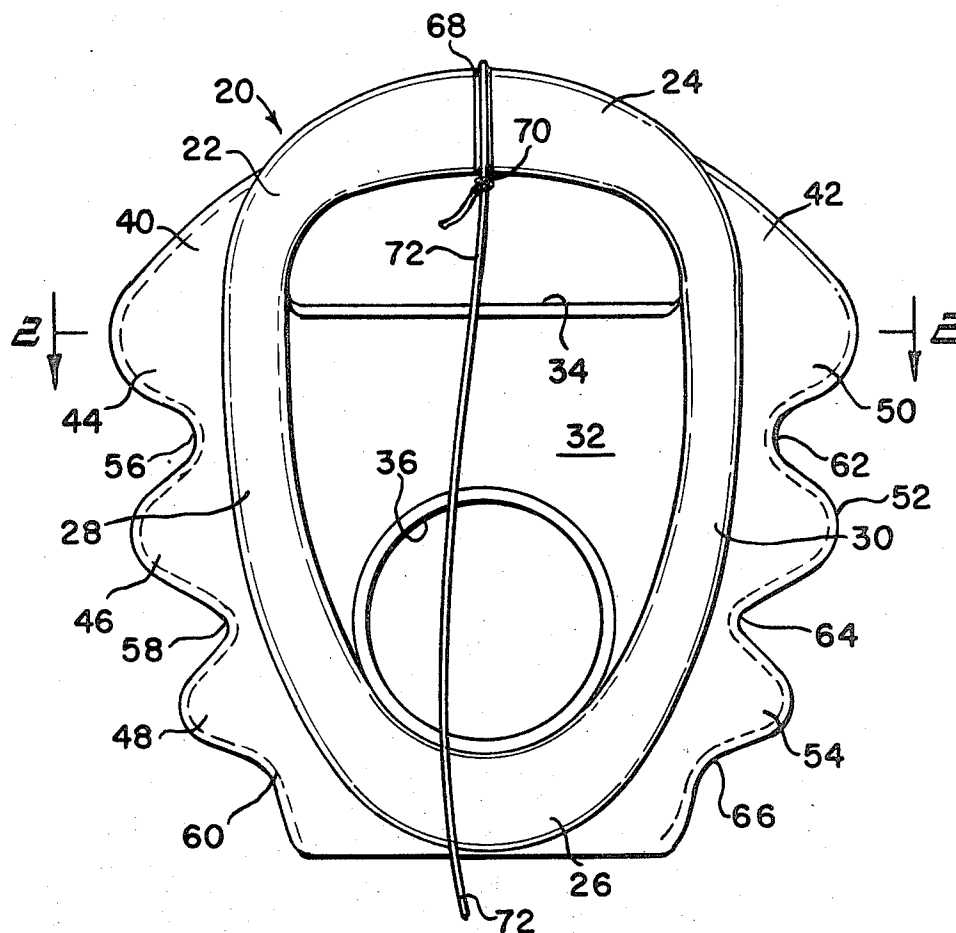
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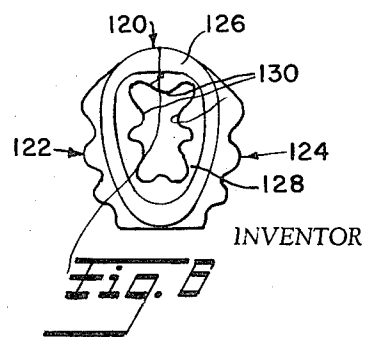
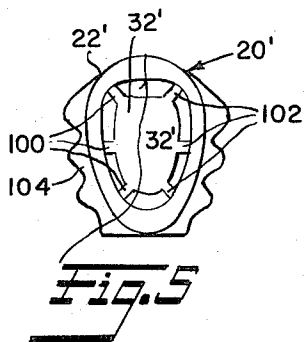
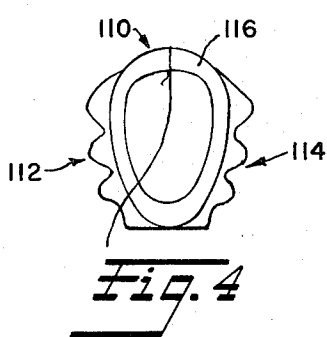
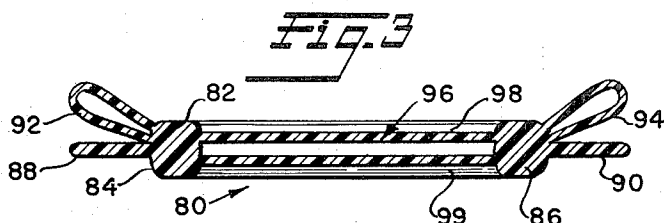
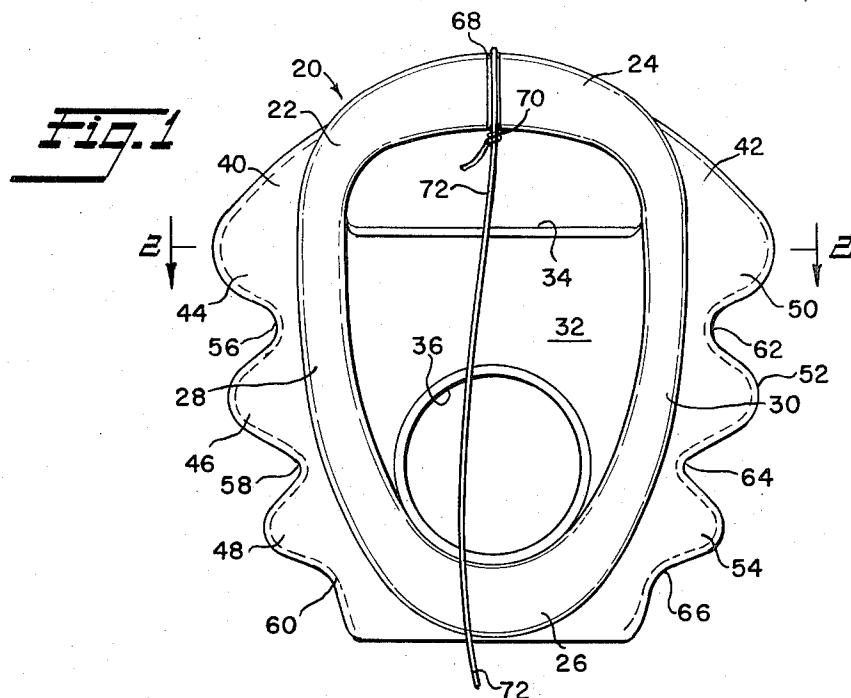
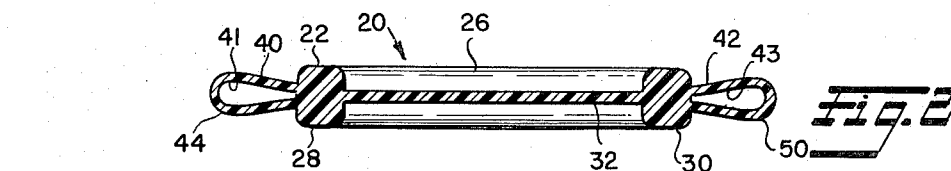
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[57] **ABSTRACT**

An intrauterine contraceptive device made from plastic and having a perimetral ring with or without a central membrane and including perimetral appendages having scalloped side edges located on each of the side portions of the perimetral ring. The width of the outer scallops preferably decreases as the locations of the scallops approach the tail portion, providing the IUD with an inverted somewhat pear shaped scalloped outline when viewed in plan. A marker and extraction string or line is secured at the nose portion but can be secured to the tail portion. The scalloped appendages are constructed in the manner of webs which are substantially flat or they can be hollow with a bulbous cross-section. Internal of the perimetral ring is preferably a membrane which may be a single wall or made hollow by having a double wall. The membrane has openings at least adjacent the nose and the tail. The internal membrane can be centrally disposed or made as internally scalloped appendages.

62 Claims, 6 Drawing Figures





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INTRAUTERINE CONTRACEPTIVE DEVICE WITH SCALLOPED EDGE APPENDAGES

CROSS REFERENCE TO RELATED APPLICATIONS

This invention pertains to improvements in the IUD which constitutes the subject matter of and is claimed in my co-pending application Ser. No. 775,729 filed Nov. 14, 1968 (now U.S. Pat. No. 3,633,574) for "INTRAUTERINE CONTRACEPTIVE DEVICE."

The IUD's herein disclosed can be inserted by using the inserter disclosed and claimed in my co-pending application Ser. No. 87,663, filed Nov. 9, 1970.

BACKGROUND OF THE INVENTION

This invention relates to contraceptive devices, particularly those designated intrauterine contraceptive devices, hereinafter referred to as IUD's. As was reiterated in the afore-described co-pending application, IUD's have had increased attention toward improving their characteristics in recent years because the population rate is becoming critical throughout many areas of the world. The IUD of the afore-described application introduced a new concept in effective intrauterine contraception, corresponding to the physiologic variations of the normal uterine cavity. Accommodation to variations in cavity shape and physiologic contractions was promoted by the light, flexible design and materials of exceptional resilience. The IUD, as basically taught in the afore-described application, is engineered so that expulsive contractions directed against the broad upper portion results in flaring and flexion at the apex, increasing resistance to expulsion. The high degree of flexibility of the plastic IUD device together with the central membrane and the side spurs are believed to contribute the major force of the effectiveness of applicant's IUD, and those details have been set forth clearly in the afore-described application. The central membrane assures increased endometrial surface contact, guards against embedment and against intestinal strangulation in the event of perforation as reported with closed loop designs. Those features make the IUD with central body, side spurs and central membrane well tolerated by nulliparous as well as multiparous patients, and result in enhanced use-effectiveness in professional practice. That IUD has an extremely low pregnancy rate, expulsion rate, removal for medical reasons, and personal removals.

Nevertheless, there is constant development under way to improve construction of IUD's in an attempt to obtain the ultimate which is 100 percent effectiveness in comfort, retention and contraception and the improvements of this invention are directed toward such a more effective IUD.

SUMMARY OF THE INVENTION

The present invention involves improvements, which increase the area of the IUD and making the surface area flexible to conform to the walls of the uterus. That is accomplished by one or more of several structural aspects: the spurs of my prior afore-described application take the form of protrusions on large side appendages, each shaped as a scalloped side extension and made hollow to provide a body which can assume a varied contour to shape itself to the endometrial surface within the uterus. Furthermore, each side portion of

the external perimeter of the rim may be provided with two or more rows of scalloped appendages which would diverge from the plane of the IUD perimetral portion and enable better retention and more endometrial surface contact within the uterus. The tissue of the uterine cavity can enfold and "grow" around the appendages, in essence grabbing and firmly locating the IUD within the uterine cavity, and the scallops will exert a pressure, particularly when hollow and deformed, which increases retention.

Accordingly, a primary object of this invention resides in an improved intrauterine contraceptive device. In this regard the improvements include provision of larger IUD surface areas for greater endometrial surface contact including, as desired, scalloped side appendages, extending outwardly or inwardly, hollow or not hollow and provided as one or more appendages on each side portion of a perimetral central ring member.

It is also an object to provide an improved IUD having scalloped appendages, hollow or not hollow and with benefits of the unique IUD set forth in co-pending application Ser. No. 775,729. As with that IUD, the IUD of this invention readily accommodates itself to various uterus sizes; resists expulsion through the cervical os; is easy to insert; and its shape and central membrane prevents possibilities of strangulation which can occur if an open type device should protrude or escape into the peritoneal cavity.

Another object resides in the provision of an improved IUD which includes a central body with a perimetral portion having a nose, tail and side portions with a plurality of scallops on side appendages extending outwardly from each of the perimetral side portions, the improvements consisting of improved IUD surface area configurations which can be one or any combination of: scalloped side appendages which can be provided in more than one row on each side portion extending outward or inward from a ring perimetral member, and can be single walled or double walled in the latter case being hollow with a closed chamber between the double walls.

Other objects reside in providing an IUD in accord with any of the foregoing objects made from a light flexible plastic such as "ULTRATHENE," polyethylene, polypropylene, ethylene, propylene, and other suitable plastic materials. In this conjunction the IUD's can, if desired, be treated by adding other materials in the form of powders molded with the plastic or coatings to enhance the ability to locate the IUD when placed and to enhance contraceptive effectiveness.

Further novel features and other objects of this invention will become apparent from the following detailed description, discussion and the appended claims taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF DRAWINGS

Various structural embodiments of this invention are disclosed in the accompanying drawings, in which:

FIG. 1 is an enlarged plan view of an IUD made in accord with the present invention showing the scalloped appendages disposed along each side of the perimetral rim and with a membrane disposed across the perimetral rim;

FIG. 2 is a transverse cross-section of the IUD shown in FIG. 1 and illustrates the hollow nature of the scalloped appendages;

FIG. 3 is an enlarged transverse cross-section similar to FIG. 2 but illustrating a modified embodiment with two rows of scalloped appendages on each of the outer side edges of the perimetral rim, one row having single wall scallops and the other row having hollow scallops and a hollow chambered, central membrane body;

FIG. 4 is a small scale plan view of a further embodiment of the scalloped appendage IUD made with no internal membrane or appendages;

FIG. 5 is a small scale plan view of another embodiment of the scalloped appendage IUD made with a central membrane secured to the perimetral rim by plural narrow-membrane bridges; and

FIG. 6 is a still further embodiment of the IUD in which appendages with scalloped edges extend both outwardly and inwardly from the perimetral rim.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1-6 in one or more respects illustrate different features of the present invention. Many of such features from one of those Figures can be interchanged or used in conjunction with the features of other Figures but, for convenience, all such possible combinations of features have not been illustrated. For example, projected scalloped edge appendages in the single row embodiment of FIG. 2 can be single wall instead of chambered and plural rows of scalloped appendages as in FIG. 3 can have any or all appendages single walled or double walled (chambered).

With reference to FIGS. 1 and 2, an IUD 20 is shown which consists of a perimetral ring 22, somewhat elongated and having a plan view like an inverted pear shape. The wider end of IUD 20 is the nose 24, the smaller end is the tail 26 and the nose and tail are joined by two side portions 28 and 30. A thin membrane 32 is disposed across the major central area within the inner perimeter of the ring 22 and, as shown, is attached essentially along the inner edge of the two side portions 28 and 30 to provide a first aperture 34 adjacent the nose end 24 and a second aperture 36 adjacent the tail end 26. Either or both of apertures 34 and 36 can be circular, as is 36, or noncircular, as is 34.

Disposed along the outer edge of the side portions 28 and 30 are substantially flat-walled appendages 40 and 42 which extend outwardly a short distance. Appendages 40 and 42 are in the manner of side wings which start adjacent the nose portion 24 and pass along respective side portions to a location adjacent the tail portion 26. The outer edges of the wing appendages are scalloped to provide protrusions 44, 46 and 48 on one appendage 40, and protrusions 50, 52 and 54 on the other appendage 42 with insets 56, 58 and 60 and 62, 64 and 66 between respective protrusions on each of the side appendages 40 and 42. The insets 56-66 of the scalloped appendages do not reach the perimetral rim 22, but rather terminate a short distance outwardly from the rim. Thus when scalloped appendages are referred to hereinafter the phrase will define appendage portions extending from the rim to provide the protrusions as well as small portions of appendage between the rim and the inset parts of the scalloped appendage.

The scalloped appendages 40 and 42 depicted on FIGS. 1 and 2 are thin double walls and completely enclose a sealed hollow chamber 41 in appendage 40 and chamber 43 in appendage 42, and the cross section contour of a protrusion, i.e., 44 and 50 seen in FIG. 2

is bulbous. Alternatively, the double walled scalloped appendages 40 and 42 can be open adjacent the nose portion 24 or tail portion 26 or open adjacent the nose and the tail. In either event, whether the chamber is closed or open at either or both ends, its thin wall hollow structure provides great flexibility enabling ease in conforming to the undulations in the interior wall surface of the uterus to provide better and more endometrial surface contact to increase retention and contraceptive effectiveness of the IUD.

Centrally located on the nose 24 are small retention grooves 68 and 70 which enable a marker line or telltale string 72 to be tied at the apex of the nose. Alternatively, the line could be secured at the tail portion of IUD 20.

Although it is not necessary, it is preferred that the central membrane 32 be discontinuous to provide the nose and tail apertures 34 and 36 to enable an efficient insertion with a stick type inserter, (not shown, but described structurally and functional in the aforedescribed co-pending inserter application). Other types of inserters may be used, in which case one or both of the membrane apertures may be eliminated. Alternatively, the membrane can be eliminated, as shown in FIGS. 4 and 6, or made in other configurations, such as that which will be described hereinafter for FIG. 5.

The perimetral ring 22 provides the structural framework of device 20, and its pear shape functions to maximize the likelihood that the IUD 20 will be retained in place after insertion in the uterus. Specifically, the ring 22 is designed to make the device flexible enough so that it yields when placed in hoop compression by the natural muscular activity of the uterus. If the device resisted such pressures unyieldingly, it might be moved in the direction of the cervical os, act as a dilating wedge, and eventually be expelled.

The cross-section of the perimetral ring portion 22 is substantially rectangular with rounded corners throughout the perimeter of the ring, but in either or both of the nose and tail regions the ring thickness is normally made greater and the direction parallel to the plane of the ring has a dimension preferably greater than it is in the direction perpendicular to that plane.

The general cross-section of the ring can have a thickness dimension of approximately 1.5 mm. perpendicular to the plane and parallel to that plane, although it may be increased, e.g., to approximately 3.0 mm. in both dimensions at either or both of the nose or tail portions. This enables a slightly stronger rim portion where the marker string 72 is attached and also when the ring 22 is subjected to hoop compression applied to the sides by the adjacent uterine walls, it will buckle first in the side regions.

One advantage of this function is that the intrauterine device 20 tends to deform in response to such compression, rather than to be cammed longitudinally relative to the uterine wall. If the ring 22 buckled first at the nose region 24, it would be subject to a camming force tending to move it toward the cervical os, with expulsion as a possible consequence. Thus the tendency of the ring 22 to first buckle in the side regions 28 and 30 helps to prevent expulsion. A second advantage resulting from such side buckling has to do with deformation of the central membrane 32 as is discussed below. The device 20 does not suffer from the disadvantage of the "long-line" type of intrauterine devices which are so flexible that one can be deformed by uterine contrac-

tions into a linear shape and thus expelled through the cervical os by a reversal of the insertion process.

However, while the ring shape and size result in response to external forces on the perimeter by deforming the entire device in a non-planar manner, the addition of the membrane 32 also enables the desired deformation whether the ring cross-section is rectangular or round or has almost any geometric shape. When the device 20 with a central membrane 32 is subjected to external forces around its perimeter, the flexible scalloped appendages tend to distort and deflect slightly in response to such forces and then will transmit these forces to the ring 22. As the ring tends to collapse, portions of the membrane 32 respond to the compressional forces by becoming non-planar and other portions of the membrane have a resultant force in tension causing the ring to deflect in a non-planar manner in the region where the membrane in tension is attached to the ring. Side forces on the device cause non-planar deformation of the device and, in particular, will cause the tail region to deflect out of the planar configuration and away from the cervical exit through the os. The afore-described action will occur whether the central member is a single thin wall member of a double wall member as shown in FIG. 3.

Ring 22 has overall dimensions which are designed to correspond to the midrange of average uterine sizes, the uterus being in normal condition, while at the same time making sufficiently firm contact with the wall surfaces of any size uterus to be firmly retained in place. Specifically, ring 22 is of a generally elliptical (pear-shaped) configuration in that the outside dimension of the ring along the nose-to-tail axis is greater than the maximum outside dimension along an axis transverse thereto. The preferred outside dimension of the ring 22 along the nose-to-tail or major axis is approximately 21 mm., and a preferred range of major axis outside diameters is from 19 to 31 mm. The preferred maximum dimension of the ring 22 in a direction transverse to the major axis is 16 mm. although a preferred range of outside diameter is from 12 mm. to 27 mm. The maximum transverse width of the ring 22 is reached at a location closer to the nose end of the device, region 24, than to the tail end, region 26. This is related to the fact that the curvature of the ring 22 at the nose of the device is more blunt, compared to the ring curvature at the tail end which is more pointed. The resulting trilobite, or buglike shape of the ring further increases the tendency of the device 20 to resist being expelled tailward through the cervical os, since, apart from any considerations of buckling, an object under sideways compression tends to be cammed toward its wider end, in this case the nose region 24.

The outside dimensions referred to so far in this detailed description have to do with the dimensions of the ring 22 alone. The lateral dimensions of the entire intrauterine contraceptive device 22, including the scalloped appendages are greater than those previously noted. In the embodiment of FIG. 1, there are three scallop protrusions 44, 46 and 48 on a side appendage 40 and identical protrusions 50, 52 and 54 on the other side appendage. The longest scallop protrusions 44 and 50 are located nearest to the nose end of the device, and the protrusions can decrease progressively in length as they approach the tail end. While it is preferred that the scalloped appendages extend outwardly from the perimeter of ring 22 along the general planar

configuration of the ring, that is not necessary, the wing-like scalloped appendages may project away from ring 22 inclined up or down at angles away from the general planar extent of the ring.

The foremost scallop protrusions 44 and 50 preferably extend about 6.0 mm., measured from the outermost tip of the protrusion to the point at the base of the appendage 40 or 42 where its leading edge intersects the extrapolated surface of the ring 22. An approximate range for this dimension is from about 2.5 mm. to 9.0 mm. The forwardmost protrusions 44 and 50 are swept back along their leading edges from their joiner with ring 22 with preferred angles relative to the longitudinal axis of the IUD of about 50° to the major axis of device 20, and the terminal scallop protrusions such as 48 and 54 can extend substantially radially or normal from the ring.

The third set of protrusions 48 and 54 near the tail end, desirably have lengths of about 2.5 mm. from the ring perimeter. A range of about 1.2 mm. to 3.7 mm. is preferred although other lengths outside of this range are useful.

The intermediate second protrusions 46 and 52 have lengths intermediate those described for the first set and fourth set of spurs.

All of the dimensions above and hereafter set forth are merely preferred dimensions and ranges. However, wide variations in any given dimension and in relative dimensions, even beyond the limits of the preferred ranges, may be employed, and moreover the described relative lengths of protrusions 44-56 are not critical. The differences in lengths between adjacent protrusions can be longer or shorter than has been shown in the drawing.

The scalloped appendages serve a number of functions. They flex to a disposition closer to the ring 22 in response to the natural muscular contractions of the uterus, and thus help the overall device 20 to yield to such contractions rather than resisting which would increase the chances of expulsion through the cervical os. The flexibility of these appendages also permits the device 20 to fit a greater range of uterine sizes, since the appendage protrusions can either remain spread out to contact a larger uterine cavity or can be flexed inwardly to accommodate a smaller one, while still helping to retain the device 20 in place.

The appendage protrusions, having decreasing lengths toward the tail, will yield somewhat to muscular contractions transverse to their length and by so yielding, apply a self-restoring force against the uterine wall to maintain the device in its proper position.

Insertion and removal of the device will offer no problems inasmuch as the scalloped protrusions will have smoothly contoured edges and will flex and buckle during both insertion and removal to prevent harm to the tissues around both the external and the internal cervical os and along the cervical canal.

Referring back to the membrane 32 (FIG. 1), one of its functions is to block the interior of ring 22 so as to prevent intrusion of intestinal tissue therein in the event the device 20 should be partially or completely perforated into the peritoneal cavity. Moreover, the membrane 32 is thin enough to be very flexible, the preferred thickness being only about 0.15 mm., and the preferred range of thickness being from about 0.05 mm. to 1.5 mm. Because of such flexibility, when the ring 22 is under hoop compression by uterine muscles,

the membrane has a tendency to buckle out of the plane of the ring 22 and consequently to bear against the internal wall of the uterus. This additional contact against the uterine wall is a further factor in resisting expulsion of the IUD 20 when muscular contractions take place.

In order to enable the membrane 32 to buckle more easily in this manner, it is detached from the ring 22 preferably at at least two locations 34 and 36 adjacent to the nose region 24 and tail region 26 respectively. Freeing the membrane 32 from the ring 22 at these locations increases the likelihood that it will buckle along a line roughly corresponding to the major axis of the device.

Relieving of membrane 32 at locations 24 and 26 is preferably amplified to the extent of providing the two distinct openings 24 and 26, previously mentioned as among the general features of the IUD 20. The nose opening 24 is useful for cooperation with certain types of uterine insertion devices, while tail opening 26 is useful for cooperation with an extracting hook. Some inserters do not require openings. However, as has been herein described, both the nose and tail openings are utilized with the special inserter described in the afore-described co-pending inserter application.

The membrane can be continuous if desired and alternatively, as shown in FIG. 5, the membrane 32' of IUD 20' can be suspended by narrow membrane strips or bridges, such as 100 and 102, at spaced intervals around and secured to the inner perimeter of ring 22'. Such membrane bridge connections can be secured at locations lying in the common mid-plane of ring 22' or in any other common plane across the ring 22' or the bridges need not lay in a common plane. The IUD 20' with its membrane 32' and the membrane bridges 100 and 102 as well as the appendages are preferably molded as a single integral unit from plastic.

When the central membrane 32' is made as shown in FIG. 5, suspended by narrow thin wall membrane bridges 100 and 102 the inner membrane body has additional flexibility which can assure disposition to provide maximum endometrial surface contact. Moreover, the opposed endometrial surfaces of the membrane can engage through the openings between the membrane bridges so the body tissues can grab or enfold the bridges to assure maintaining the IUD in proper location.

PLURAL SIDE APPENDAGES

FIG. 3 illustrates a cross-section of an IUD 80 having a perimetral ring 82 shaped like ring 22 in FIG. 1 and is included to show that each side portion 84 and 86 can include more than one scalloped appendage in other words, several rows of scalloped protrusions on each side portion of the perimetral rim. On IUD 80 one set of appendages 88 and 90, extending from respective perimetral side portions 84 and 86, are single wall thin wing-like members which have scalloped edges like the plan view of appendages 40 and 42 seen in FIG. 1 and are coplanar with the planar configuration of ring 82. A second set of appendages 92 and 94, which in this instance are made hollow, also extend from the respective perimetral side portions 84 and 86, are scalloped in a manner similar to the plan view of appendages 40 and 42 in FIG. 1. The second set of appendages are substantially planar and are inclined to one side of and away from the planar configuration of the perimetral

ring 82. More than the two sets of appendages 88, 92 and 90, 94 may be secured to respective opposite side portions of the ring, they can be inclined in either direction out of the planar configuration of the ring and all or some can be hollow or single walled types. In any event multiple sets of appendages provide increased surface area for endometrial surface contact.

FIG. 3 also shows the central membrane body 96 as made with double walls 98 and 99 although this embodiment could be made with the single wall central membrane like membrane 32 in FIG. 1. Such a double wall can confine a chamber or the space between walls 98 and 99 can be open near apertures similar to apertures 34 and 36 in FIG. 1. The double wall membrane 96 provides better surface engagement between both outer side surfaces of the central membrane and opposed wall surfaces of the uterus primarily because the joinder perimetral parts of the membrane will be spaced closer to the two "side faces" of the planar configuration of the perimetral ring, enhancing the contact of most of the central membrane surface right up to the joinder portion.

ADDITIONAL EMBODIMENTS

FIGS. 4, 5 and 6 illustrate several modifications of the IUD with scalloped appendages. Any of these IUD's 20' (FIG. 5), 110 (FIG. 4) and 120 can be made with single wall or hollow walled, scalloped appendages 104, 106 (FIG. 5); 112, 114 (FIG. 4) and 122, 124 (FIG. 6) and more than one appendage can be included on each side portion of the respective perimetral rings 22', 116 and 126 of the three IUD's 20', 110 and 120, in the manner as have been hereinbefore described for FIG. 3. Similarly the central membrane 32' of FIG. 5 can be a single wall or a double wall as has been hereinbefore described in conjunction with FIG. 3.

The FIG. 4 embodiment, IUD 110 has scalloped appendages 112 and 114 on each side portion of the perimetral ring 116 but omits the central membrane.

FIG. 5 has been described relative to the description of FIG. 3.

The FIG. 6 embodiment, IUD 120, has scalloped outer appendages 122 and 124 on each side portion of the perimetral ring 126. In addition the central membrane takes the form of a central internal appendage with scalloped edges forming protrusions 130 extending inwardly at spaced apart locations in the space defined by the inner perimeter of the ring 126. In this embodiment the scalloped membrane appendage 128 can be a single wall or made with double walls, hollow or open, in or inclined away from the planar configuration of the ring, and multiple ones of such appendages can be provided on the inside of the ring.

A talisman and withdrawal cord 72 is attached to the nose 24 or tail 26 of the IUD 20 (FIG. 1), and also on the other embodiments shown in FIGS. 3-6, for withdrawal of the IUD from the uterine cavity after use. Cord 72 may have a knot therein (not shown) which visually indicates and confirms proper insertion depth once the IUD is placed and positioned within the uterine cavity.

The material of the IUD is preferably an easily molded plastic, which is light and flexible. It preferably consists of a single piece of integrally molded plastic material mixed with a suitable amount of radio-opaque material to permit the device to be located by X-ray or fluoroscope techniques if necessary. A preferred plas-

tic material is "Ultrathene," a copolymer of ethylene, and a vinyl monomer material, catalogue listing UE632 (UE633 is also very satisfactory) of U.S. Industries, with 12 percent by weight of barium sulfate as a radio-opaque ingredient. While the proportions just mentioned are preferred, the range of barium sulfate may be anywhere from 0 to 40 percent. Alternative plastic materials which may be employed are polyethylene, polypropylene, ethylene, propylene, copolymers, and terpolymers, e.g., EPT. polyvinyl acetate, copolymers of vinyl acetate with another ethylenically unsaturated monomer copolymerizable therewith, silicone rubber, polyfluoroethylenes, e.g., Teflon, Kel-F, etc., and the like. The molded IUD device may be provided with a thin coating of a suitable material or impregnated with a suitable material in powdered form to inhibit the deposition of calcium upon the IUD after it has been in the uterus for a period of time and to otherwise enhance its effectiveness. Such materials include gold, platinum, silver, copper, zinc, tantalum, as well as alloys and salts of these and other metals. The coating may be vapor-deposited.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by Letters Patent is:

1. An intrauterine contraceptive device comprising: a central body having a perimetral portion with nose, tail and side portions and encompassing an area approximating that of an average normal condition uterine cavity, and elongate appendages extending along at least said two side portions of said perimetral portion, each of said appendages having an undulating smooth scalloped terminal edge configuration.
2. A device as defined in claim 1, wherein said appendages are made with a single wall having a substantially flat configuration.
3. A device as defined in claim 2, wherein said appendages include plural smooth contoured protrusions and are substantially co-planar with said perimetral portion.
4. A device as defined in claim 3, wherein the protrusions closest to said nose portion are longer than the protrusions closest to said tail portion.
5. A device as defined in claim 4, wherein pull line means are secured to said intrauterine device to enable removal after insertion.
6. A device as defined in claim 2, wherein plural side appendages with scalloped edges are provided on each said side portion.
7. A device as defined in claim 2, wherein said scalloped appendages are made with a single thin substantially flat wall, and plural appendages extend from each of said side portions.
8. A device as defined in claim 1 made from a plastic material comprising an ethylene vinyl copolymer.
9. An intrauterine contraceptive device comprising: a central body having a perimetral ring-like portion with nose, tail and side portions and encompassing an

area approximating that of an average normal condition uterine cavity, and at least two appendages each made with a single wall having a substantially flat configuration extending along at least each of said two side portions of said perimetral portion, all of said appendages having a scalloped terminal edge configuration, at least one of said appendages with scalloped edges being provided on the inner perimeter of said ring.

10. A device as defined in claim 9, wherein a plurality of said appendages with scalloped edges are provided on the inner perimeter of said ring.

11. A device as defined in claim 10, wherein said plurality of said appendages have different inclination relative to the planar configuration of the perimetral ring.

12. An intrauterine contraceptive device comprising: a central body having a perimetral ring-like portion with nose, tail and side portions and encompassing an area approximating that of an average normal condition uterine cavity and at least two appendages each made with a single wall having a substantially flat configuration extending along at least each of said two side portions of said perimetral portion, all of said appendages having a scalloped terminal edge configuration.

13. A device as defined in claim 12, including thin membrane means across the inner diameter of said perimetral portion.

14. A device as defined in claim 13, wherein said membrane means is hollow.

15. A device as defined in claim 13, wherein said membrane means is connected to both side portions and provides openings adjacent said nose portion and said tail portion.

16. A device as defined in claim 15, wherein said membrane means is hollow.

17. A device as defined in claim 13, wherein pull line means are secured to said intrauterine device to enable removal after insertion.

18. A device as defined in claim 13, wherein said membrane means is connected to each side portion via a plurality of narrow membrane portions.

19. A device as defined in claim 13, wherein a multiplicity of narrow spaced apart membrane portions interconnect a central portion of said membrane means to said perimetral portion.

20. A device as defined in claim 19, wherein said membrane means is hollow.

21. An intrauterine contraceptive device comprising: a central body having a perimetral portion with nose, tail and side portions and encompassing an area approximating that of an average normal condition uterine cavity, and appendages extending along at least said two side portions of said perimetral portion, each of said appendages having a scalloped terminal edge configuration, each of said scalloped appendages having double walls joined at the outer terminal edge.

22. A device as defined in claim 21, wherein said scalloped appendages are hollow, providing a sealed chamber in each appendage.

23. A device as defined in claim 22, wherein said appendages have a cross-section transverse to the planar configuration of the perimetral portion which is bulbous.

24. A device as defined in claim 23, wherein said appendages include plural protrusions and are substantially co-planar with said perimetral portion.

25. A device as defined in claim 24, wherein the protrusions closest to said nose portion are longer than the protrusions closest to said tail portion.

26. An intrauterine device as defined in claim 22, wherein pull line means are secured to said intrauterine device to enable removal after insertion.

27. A device as defined in claim 22, wherein said perimetral portion is a ring and at least one said appendage with scalloped edges is provided on the inner perimeter of said ring.

28. A device as defined in claim 27, wherein a plurality of said appendages with scalloped edges are provided on the inner perimeter of said ring.

29. A device as defined in claim 28, wherein said plurality of said inner appendages have different inclination relative to the planar configuration of the perimetral ring.

30. A device as defined in claim 22, including thin membrane means across the inner diameter of said perimetral portion.

31. A device as defined in claim 30, wherein said membrane means is hollow.

32. A device as defined in claim 30, wherein said membrane means is connected to both side portions and provides openings adjacent said nose portion and said tail portion.

33. A device as defined in claim 32, wherein said membrane means is hollow.

34. A device as defined in claim 30, wherein said membrane means is connected to each side portion via a plurality of narrow membrane portions.

35. A device as defined in claim 30, wherein a multiplicity of narrow spaced apart membrane portions interconnect a central portion of said membrane means to said perimetral portion.

36. A device as defined in claim 35, wherein said membrane means is hollow.

37. An intrauterine contraceptive device comprising: a central body having a perimetral ring-like portion with nose, tail and side portions and encompassing an area approximating that of an average normal condition uterine cavity, appendages each having a scalloped terminal edge configuration, extending along at least said two side portions of said perimetral portion, said scalloped appendages being made with a single thin substantially flat wall, and appendages in addition to said scalloped appendages extend from each of said side portions and at least one of said appendages with scalloped edges is provided on the inner perimeter of said perimetral portion.

38. A device as defined in claim 37, wherein a plurality of said appendages with scalloped edges are provided on the inner perimeter of said ring.

39. A device as defined in claim 38, wherein said plurality of said appendages have different inclination relative to the planar configuration of the perimetral ring.

40. An intrauterine contraceptive device comprising: a central body having a perimetral ring-like portion with nose, tail and side portions and encompassing an area approximating that of an average normal condition uterine cavity, appendages each having a scalloped terminal edge configuration, extending along at least said two side portions of said perimetral portion, said scalloped appendages being made with a single thin substantially flat wall, and appendages in addition to said scalloped appendages

extend from each of said side portions, and including thin membrane means across the inner diameter of said perimetral portion.

41. A device as defined in claim 40, wherein said membrane means is hollow.

42. A device as defined in claim 40, wherein said membrane means is connected to both side portions and provides openings adjacent said nose portion and said tail portion.

43. A device as defined in claim 42, wherein said membrane means is hollow.

44. A device as defined in claim 40, wherein pull line means are secured to said intrauterine device to enable removal after insertion.

45. A device as defined in claim 40, wherein a multiplicity of narrow spaced apart membrane portions interconnect a central portion of said membrane means to said perimetral portion.

46. A device as defined in claim 45, wherein said membrane means is hollow.

47. An intrauterine contraceptive device comprising: a central body having a perimetral portion with nose, tail and side portions and encompassing an area approximating that of an average normal condition uterine cavity, and plural appendages each having a scalloped terminal edge configuration, extending along at least each of said two side portions of said perimetral portion, and at least one of said scalloped side appendages is hollow and provided with a sealed chamber therein.

48. A device as defined in claim 47, wherein said at least one hollow scalloped appendage has a cross-section transverse to the planar configuration of the perimetral portion which is bulbous.

49. A device as defined in claim 47, wherein said appendages include plural protrusions.

50. A device as defined in claim 49, wherein the protrusions closest to said nose portion are longer than the protrusions closest to said tail portion.

51. An intrauterine device as defined in claim 47, wherein pull line means are secured to said intrauterine device to enable removal after insertion.

52. A device as defined in claim 47, wherein said perimetral portion is a ring and at least one said appendage with scalloped edges is provided on the inner perimeter of said ring.

53. A device as defined in claim 52, wherein a plurality of said appendages with scalloped edges are provided on the inner perimeter of said ring.

54. A device as defined in claim 53, wherein said plurality of said inner appendages have different inclination relative to the planar configuration of the perimetral ring.

55. A device as defined in claim 47, including thin membrane means across the inner diameter of said perimetral portion.

56. A device as defined in claim 51, wherein said membrane means is hollow.

57. A device as defined in claim 51, wherein said membrane means is connected to both side portions and provides openings adjacent said nose portion and said tail portion.

58. A device as defined in claim 57, wherein said membrane means is hollow.

59. A device as defined in claim 51, wherein a multiplicity of narrow spaced apart membrane portions in-

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terconnect a central portion of said membrane means to said perimetral portion.

60. A device as defined in claim 59, wherein said membrane means is hollow.

61. An intrauterine contraceptive device comprising: 5
a central body having a ring-like perimetral portion with nose, tail and side portions and encompassing an area approximating that of an average normal condition uterine cavity, and appendages extending along at least said two side portions of said peri- 10

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metral portion, each of said appendages having a scalloped terminal edge configuration, the inner ring perimeter being provided with at least one internally scalloped edge portion.

62. A device as defined in claim 61, wherein each of said appendages having a scalloped terminal edge configuration are made with a single wall having a substantially flat configuration.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,786,808 Dated January 22, 1974

Inventor(s) Irwin S. Lerner

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 9, line 47, change "smooth" to --smoothly--.

Column 9, line 50, change "a" to --A--.

Column 9, line 61, change "plural" to --additional--.

Signed and sealed this 9th day of April 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents