May 31, 1966 C. H. BIRNBERG ETAL 3,253,590

INTRAUTERINE DEVICE

Filed April 24, 1964 3 Sheets-Sheet 1

Fig. 1.

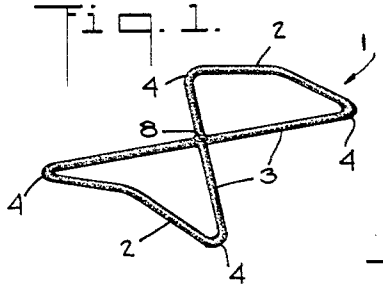


Fig. 3.

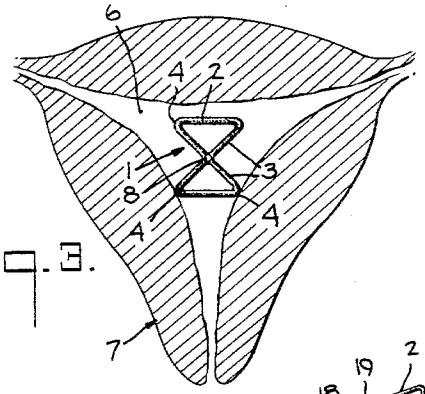
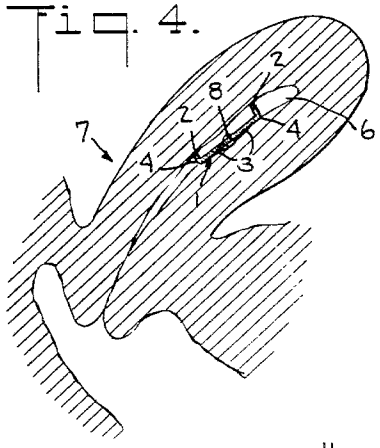


Fig. 4.



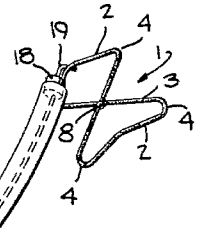


Fig. 2.

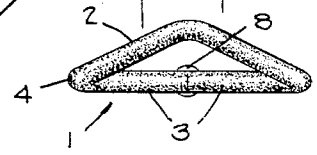


Fig. 6.

Fig. 7.

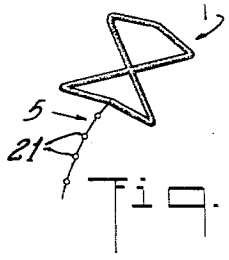


Fig. 5.

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INTRAUTERINE DEVICE

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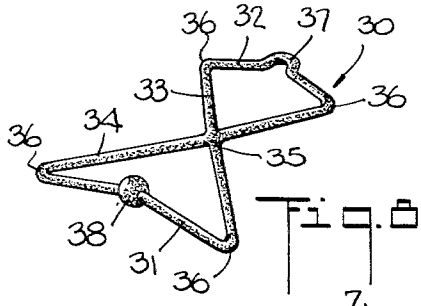


Fig. 8.

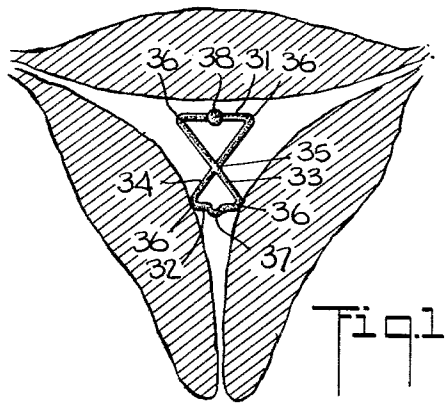


Fig. 10.

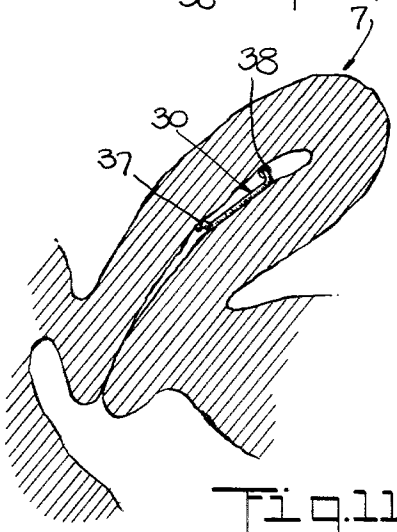


Fig. 11.

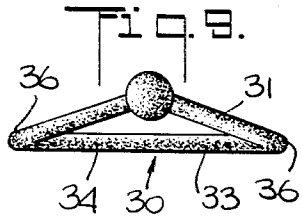


Fig. 9.

Fig. 12.

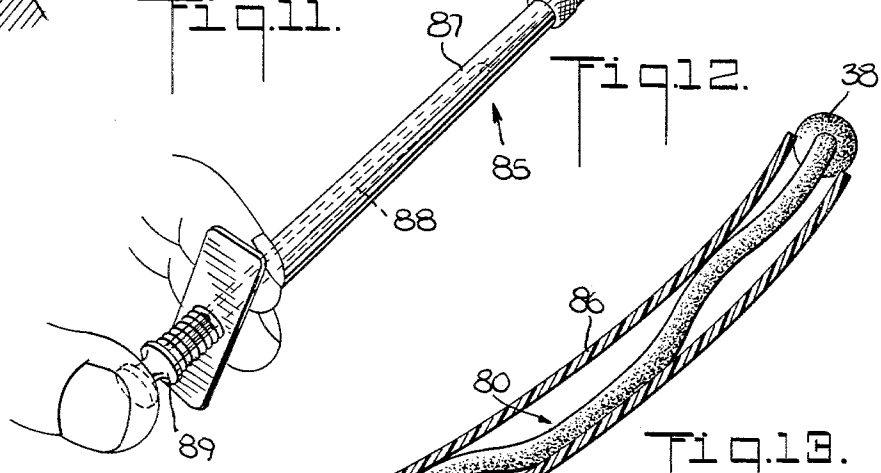
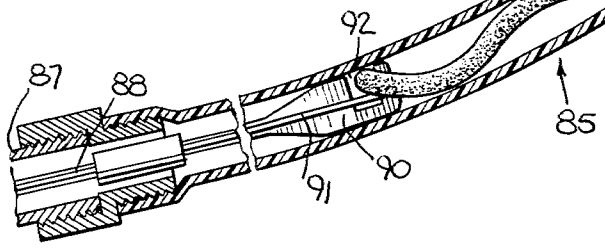


Fig. 13.



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INTRAUTERINE DEVICE

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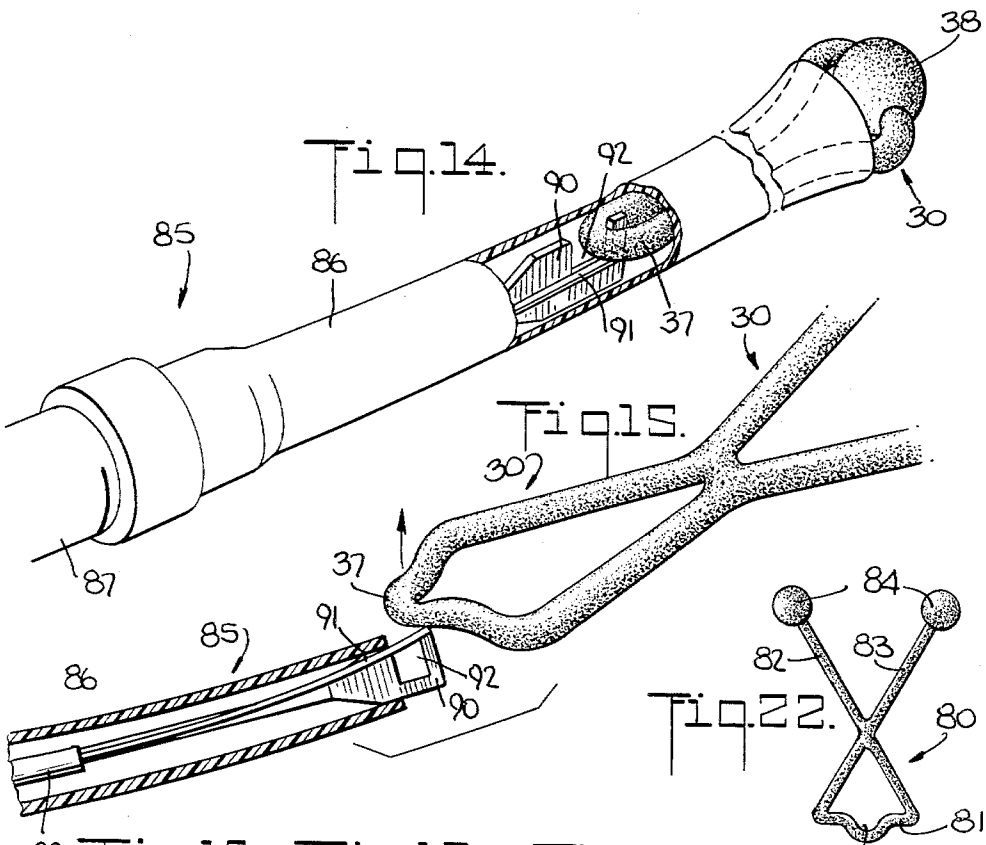


Fig. 14.

Fig. 15.

Fig. 22.

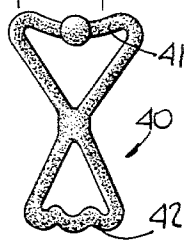


Fig. 16.

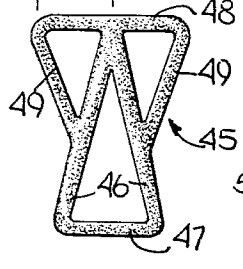


Fig. 17.

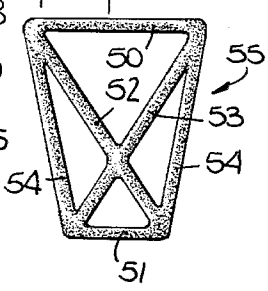


Fig. 18.

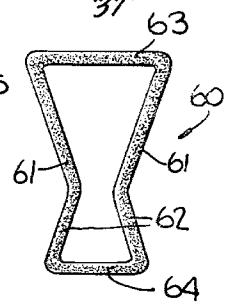


Fig. 19.

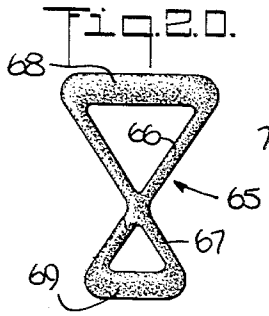


Fig. 20.

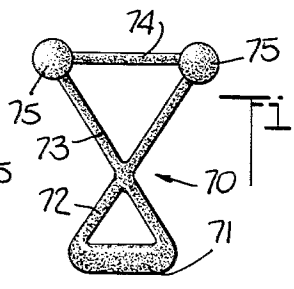


Fig. 21.

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3,253,590
INTRAUTERINE DEVICE
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Filed Apr. 24, 1964, Ser. No. 362,410
13 Claims. (Cl. 128—130)

The present application is a continuation-in-part of our pending United States patent application Serial No. 254,911, filed in the United States Patent Office on January 30, 1963.

This present invention is directed to an improved intrauterine device and more particularly to an improved intrauterine device which will not be ejected by the uterus.

Intrauterine devices of varied construction, such as Graefenberg rings, have been used for many years. However, one of the problems encountered in using such devices is that the contractions of the uterus tend to eject such intrauterine devices therefrom.

In order to avoid this, attempts have been made to use a number of coils and rings of varied construction. However, such coils and rings have been unsatisfactory because they are still subject to being ejected by the contractions of the uterus.

The present invention provides an improved intrauterine device which will not be ejected from the uterus.

Another object of the present invention is the provision of an improved intrauterine device which is of simple construction.

Another object of the present invention is the provision of an improved intrauterine device which may be readily detected without a physical examination.

Another object of the present invention is the provision of an improved intrauterine device which resists tendency force of the uterus to eject it because of lateral compression.

Another object of the present invention is the provision of an improved intrauterine device wherein each half of the device is adapted to be moved independently of the other half.

A still further object of the present invention is the provision of an improved intrauterine device in which the end legs exert pressure against the uterine walls to resist expulsion.

Another object of the present invention is the provision of an improved intrauterine device which has rounded corners that decrease any possibility of damage to the uterus during introduction.

Another object of the present invention is the provision of a mechanism for inserting an intrauterine device which will automatically release the intrauterine device after it is inserted into the uterus.

Another object of the present invention is the provision of an improved mechanism for inserting an intrauterine device.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings, forming a part of the specification, wherein:

FIG. 1 is a perspective view showing the improved intrauterine device of the present invention.

FIG. 2 is an exaggerated end view thereof;

FIG. 3 is a diagrammatic sectional view of a uterus showing the intrauterine device of the present invention positioned therein;

FIG. 4 is a sectional side view of FIG. 3;

FIG. 5 is a perspective view of a modification of the present invention;

FIG. 6 is a perspective view of the inserting mechanism for inserting the intrauterine device;

FIG. 7 is a sectional view of the front end of the inserting mechanism shown in FIG. 6;

FIG. 8 is a perspective view of another embodiment of the present invention;

FIG. 9 is an end view thereof;

FIG. 10 is a diagrammatic view showing the device in position in a uterus;

FIG. 11 is a side sectional view of the structure shown in FIG. 10;

FIG. 12 is a perspective view of another embodiment of the inserting mechanism;

FIG. 13 is a detailed sectional view of the forward end of the inserting mechanism;

FIG. 14 is a perspective view, partly in section, showing the position of the device in the inserting mechanism;

FIG. 15 is a perspective view showing the releasing action of the inserting mechanism; and

FIGS. 16 through 22 are plan views of other embodiments of the present invention.

Referring more particularly to the drawings and to FIGS. 1 to 4, the intrauterine device 1 comprises a pair of end legs 2 connected together by supporting bars 3. In the preferred embodiment shown in the drawings, the supporting bars 3 intersect each other to connect opposite edges of the end legs 2 to form corners 4. Preferably the end legs 2 and the supporting bars 3 are integral with each other and are of uniform cross-section. The end legs 2 are preferably bowed or curved as shown in FIGS. 1 and 2 for a purpose which will hereinafter be referred to.

The intrauterine device 1 is preferably made of a polyethylene material or some other resilient plastic material so that it will easily flex and will not damage the uterine walls.

When the device is inserted into the cavity 6 of a uterus 7, as shown in FIGS. 3 and 4, the corners 4 of the device 1 will abut against the inner walls of the uterus and be held in place. Any contractions of the uterus will tend to press the uterine walls against the corners 4 of the intrauterine device with greater force to prevent ejection. Furthermore, the pressure from the uterine walls will bend the device in the direction of the curve or bow in the end legs 2 so that the device will not be expelled. In fact, any contractions of the uterus will tend to more firmly hold the device therewithin.

In order to permit the intrauterine device to be X-rayed, it may be coated with a substance sensitive to X-rays or a metallic stud 8 may be placed at the intersection of the two supporting bars 3 as shown in FIGS. 1, 2 and 3. In this manner the presence of the intrauterine device may be determined by an X-ray without the necessity of a physical examination.

The modification shown in FIG. 5 illustrates a modification in which a tail 5 extends from the device 1. The tail 5 has a plurality of knobs 21 spaced at predetermined intervals, such as 1 cm. apart. With this structure the tail 5 will lie outside the uterus so that the presence of the device may be determined by manual examination and the length of the canal may be determined by the knobs 21.

Referring to FIGS. 8–11, which show another embodiment of the present invention, the intrauterine device 30 is similar in structure to the device shown in FIGS. 1–4 in that it is provided with end legs 31 and 32 connected together by intersecting supporting bars 33 and 34 (joined at point 35) to form corners 36. One leg 32 has a notch 37 therein adapted to be used to properly position the device in an inserting mechanism and the other leg 31 is provided with a knob 38 which prevents any damage to

the uterine wall when being inserted into uterus **7**. It will also be noted that leg **32** is shorter than leg **31** so that the device can properly conform to the configuration of the uterus **7**.

FIG. 16 shows a device **40** of smaller size having both legs **41** and **42** curved inwardly toward each other.

In FIG. 17 the device **45**, supporting bars **46** and the smaller leg **47** extend at an angle toward each other to the longer leg **48** and the supporting bars **49** of the longer leg **48** terminate at an angle toward each other to the supporting bars **46**.

The device **55** shown in FIG. 18 also has end legs **50** and **51** connected together by intersecting supporting bars **52** and **53**. However, additional side support bars **54** are also provided between legs **50** and **51**.

FIG. 19 illustrates a device **60** in which the supporting bars **61** and **62** which connect the legs **63** and **64** together do not intersect with each other.

The embodiment shown in FIG. 20 shows an intrauterine device **65** having intersecting support bars **66** and **67** and being provided with end legs **68** and **69** that are thicker than supporting bars **66** and **67**.

FIG. 21 is similar to the embodiment shown in FIG. 20 in that end leg **71** of device **70** is thicker than support bars **72** and **73**. However, the other leg **74**, instead of being thicker, is provided with knobs **75** at each end to prevent damage to the uterine walls.

The embodiment shown in FIG. 22 shows a device **80** which has a single leg **81** with a notch **37'** therein. The ends of the intersecting support bars **82** and **83** are free and are provided with knobs **84**.

All of the embodiments shown in FIGS. 16 to 22, described above, operate in a manner substantially similar to the embodiments shown in FIGS. 1 to 4 and FIGS. 8 to 11.

The inserting mechanism **10**, shown in FIGS. 6 and 7, comprises a hollow tube **11** having a flexible hose **12** mounted at its forward end and an enlarged flange **16** at its lower end. The tube **11** is provided with a retractable plunger **13** therein which is mounted on and controlled by a knob **14** located outside its lower end. A spring **15** is mounted between the flange **16** and the knob **14** to keep the plunger **13** in a retracted position. The plunger **13** has a resilient wire **17** extending from its forward end which lies within hose **12**. The wire **17** is provided with an enlarged portion **18** having a hook **19** thereon.

In use, the hook **19** is extended by the user, as shown in FIG. 6, by pushing on knob **14**. The leg **2** of the intrauterine device **1** is grasped by the extended hook **19**. The hook **19** is then retracted to move the intrauterine device **1** wholly within the flexible outer hose **12**, as shown in FIG. 6. The base **12** is then inserted into the uterus and the hook **19** again extended to deposit the intrauterine device **1** into the uterus.

FIGS. 12–15 illustrate another embodiment of the improved inserting mechanism. The inserting mechanism **85** is similar to that shown in FIGS. 6 and 7 in that it comprises a flexible hose **86** mounted on hollow tube **87** which is provided with a retractable plunger **88**. Plunger **88** has a control knob **89** at one end and a hook **90** at its other end.

The hook **90** is provided with a leaf spring **91** which is biased toward the open end **82** of the hook **90**. Hence, when the intrauterine device **30** is inserted into the uterus the leaf spring **91** will automatically eject the device **30** from the hook **90** (FIG. 15).

While for convenience, the mechanism **85** of FIGS. 12 to 15 illustrates and is being described with reference to intrauterine device **30** (shown in FIGS. 8 to 11), it will be understood that any of the intrauterine devices shown in FIGS. 1 to 7 and FIGS. 16 to 22 may also be used.

In operation, the device **30** first has its notch **37** inserted in open end **92** of hook **90** against the pressure of the leaf spring **91**. The hook **90** is withdrawn within

the flexible hose **86** until the knob **38** of the device **30** strikes the open end of the flexible hose **86**. In this position the device is inserted into the uterus. The rounded knob **38** at the end of the hose **86** will prevent any damage to the uterine walls.

After the device is within the uterus, the hook **90** is moved to its extended position until it protrudes beyond the open end of the flexible hose **86**. At this point the leaf spring **92**, which is now no longer under constraint of the hose **86**, will automatically move upwardly (as shown in FIG. 15) to eject the device **30** from the hook **90**. Hence, the device **30** may be properly positioned within the uterus and the inserting mechanism disengaged therefrom without any turning or twisting of the inserting mechanism so that there is no danger of any damage to the uterus.

It will be seen that the present invention provides an improved intrauterine device which will not be ejected by the uterus, which is easy to manufacture and which can be easily detected by X-rays. The present invention also provides an improved inserting mechanism for an intrauterine device.

It will further be seen that the present invention provides a device which resists expulsion because lateral compression of the end legs causes inward bowing of the legs to press them against the uterine wall in the anterior-posterior plane, thus resisting downward pressure from uterine contractions. Furthermore, the device resists expulsion because simultaneous lateral compression against the upper end legs causes the device to shorten and retract up into the fundus of the uterus rather than to lengthen and exert pressure against the internal os of the uterus.

In addition, each half of the device is free to move independently in an anterior or posterior plane so as to resist expulsive changes produced by flexing motions of the uterus. Thus, the intersecting point joining the supporting bars of each half of the device serves to limit any changes produced against half of the device by any uterine contraction from reaching and altering the shape of the other half of the device.

As a further safeguard against expulsion, the corners joining the end legs and supporting bars are constantly exerting pressure against the lateral walls of the uterus.

The fact that one end leg has as its centerpoint a rounded bulb decreases trauma to the endocervix and endometrium during introduction and the fact that the opposite end leg has a groove molded into its midpoint facilitates introduction and removal of the device by a tool.

The geometrical figures produced by the junction of the supporting bars and end legs divide the uterine cavity into multiple small spaces while providing maximum areas of touch against lateral, superior, anterior and posterior surfaces of the endometrical cavity. In addition, any large open area of endometrical surface is prevented from being produced by shifting of the device within the uterine cavity.

As various changes may be made in the form, construction and arrangement of the part herein without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in a limiting sense.

Having thus described our invention, we claim:

1. An intrauterine device made from a substantially resilient flexible plastic material comprising a pair of opposed end legs, supporting bars connecting said end legs together and being integral therewith, said supporting bars intersecting each other and being integral with each other at the point of intersection, each of said supporting bars connecting opposite edges of said end legs together, a knob on one of said end legs and a notch on the other of said end legs.

2. An intrauterine device made from a substantially

resilient material comprising a pair of substantially parallel end legs, supporting bars connecting said end legs together and being integral therewith, said supporting bars intersecting each other and being integral with each other at the point of intersection and connecting opposed edges of said end legs together, a knob on one of said end legs and a notch on the other of said end legs.

3. An intrauterine device made from a substantially resilient flexible plastic material comprising a pair of opposed end legs, at least a portion of each end leg being curved in a direction away from the plane of said device, supporting bars connecting said end legs together and being integral therewith, said supporting bars intersecting each other and being integral with each other at the point of intersection and connecting opposed edges of said end legs together, a knob on one of said end legs and a notch on the other of said end legs.

4. An intrauterine device made from a substantially rodlike, endless resilient flexible plastic material comprising a pair of opposed end legs, at least a portion of each end leg being curved in a direction away from the plane of said device, supporting bars connecting said end legs together and being integral therewith, said supporting bars intersecting each other and being integral with each other at the point of intersection and connecting opposed edges of said end legs together, a knob on one of said end legs and a notch on the other of said end legs.

5. An intrauterine device made from a substantially resilient material comprising a pair of opposed end legs, supporting bars connecting said end legs together and being integral therewith, said supporting bars intersecting each other and being integral with each other at the point of intersection and connecting opposed edges of said end legs together, and side supporting bars connecting said edges together.

6. An intrauterine device made from a substantially resilient flexible plastic material comprising a pair of opposed end legs, supporting bars connecting said end legs together and being integral therewith, said supporting bars being in substantial intersection with each other and being integral with each other at the point of substantial intersection, each of said supporting bars connecting opposite edges of said end legs together, at least one of said end legs being thicker than said supporting bars.

7. An intrauterine device made from a substantially resilient flexible plastic material comprising a pair of opposed end legs, supporting bars connecting said end legs together and being integral therewith, said supporting bars being in substantial intersection with each other and being integral with each other at the point of substantial intersection, each of said supporting bars connecting opposite edges of said end legs together, and a knob on one of said end legs.

8. An intrauterine device made from a substantially resilient flexible plastic material comprising a pair of opposed end legs, supporting bars connecting said end legs together and being integral therewith, said supporting bars being in substantial intersection with each other and being integral with each other at the point of substantial intersection, each of said supporting bars connecting opposite edges of said end legs together, and a notch on one of said end legs.

9. An intrauterine device made from a substantially resilient flexible plastic material comprising a pair of

opposed end legs, supporting bars connecting said end legs together and being integral therewith, said supporting bars being in substantial intersection with each other and being integral with each other at the point of substantial intersection, each of said supporting bars connecting opposite edges of said end legs together, at least one of said end legs being provided with knobs at its edges.

10. An intrauterine device made from a substantially resilient flexible plastic material comprising a pair of opposed end legs, supporting bars connecting said end legs together and being integral therewith, said supporting bars being in substantial intersection with each other and being integral with each other at the point of substantial intersection, each of said supporting bars connecting opposite edges of said end legs together, a knob on one of said end legs and a notch on the other of said end legs.

11. An intrauterine device as claimed in claim 10, wherein each of said end legs are curved inwardly toward each other.

12. An intrauterine device made from a substantially resilient material comprising opposed first and second end legs, first and second support bars connecting said end legs together and being integral therewith, said first support bars extending from the edges of the first end leg at an acute angle thereto and meeting each other at a point intermediate the edges of the second end leg and being integral with said second end leg, the second support bars extending from the second end leg at an acute angle thereto and terminating at and being integral with the first support bars at a point between said first and second end legs.

13. An insertion mechanism for an intrauterine device comprising a tube and a flexible hose mounted an said tube, a plunger movable within said tube, means for moving said plunger within said tube, a hook mounted on the forward end of said plunger and movable therewith, said hook having an open end and a closed end, the open end of said hook adapted to receive an intrauterine device, said plunger being of sufficient length so that when the plunger is moved to its forwardmost position the hook will extend beyond the forward end of the flexible hose, a leaf spring mounted adjacent said hook and biased toward the open end of said hook, said leaf spring being adapted to eject an intrauterine device from said hook.

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