United States Patent [19]

McDonald

[11] **3,744,481**

[45] **July 10, 1973**

[54] **MEDICAL EXAMINING METHOD AND MEANS**

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[21] Appl. No.: **144,468**

[52] **U.S. Cl.** ..... **128/006,** 128/002 B, 128/017

[51] **Int. Cl.** **A61b 1/06,** A61b 1/30, A61b 1/32

[58] **Field of Search** ..... 128/6, 17, 18, 2 B

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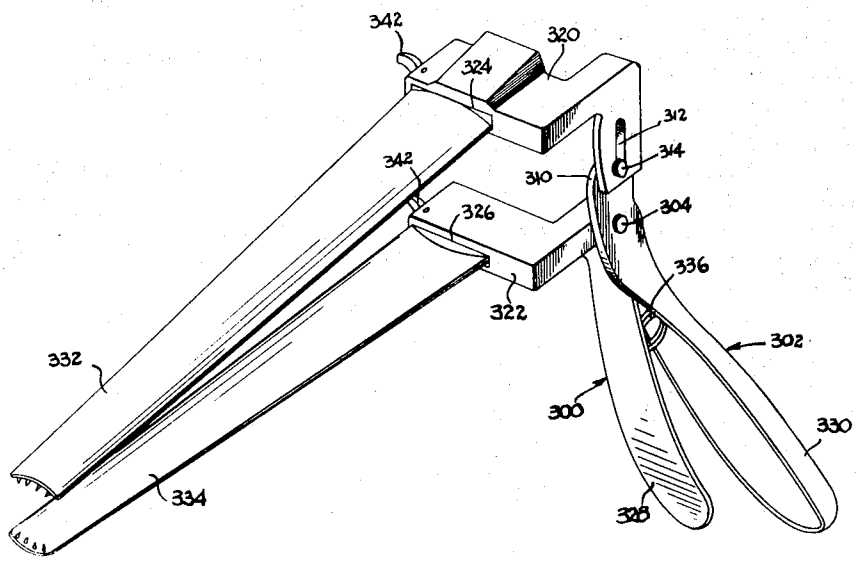
[57] **ABSTRACT**

A device for viewing the cervix and vaginal segment of a human uterus has two, three or four elongate blades removably mounted on a holder. The blades are adjustable to spread and to retain the vaginal walls including the cervico-vaginal fornix for visual observation and accessibility of surgical instruments to the uterus. A handle supports the blades and preferably has illumination sources and, optionally, a viewing lens mounted thereon. Each of the blades includes means at its distal end for securely engaging the exterior peripheral rim of a cervix for immobilizing it during surgical procedures. The two blades are resiliently biased towards each other.

16 Claims, 30 Drawing Figures



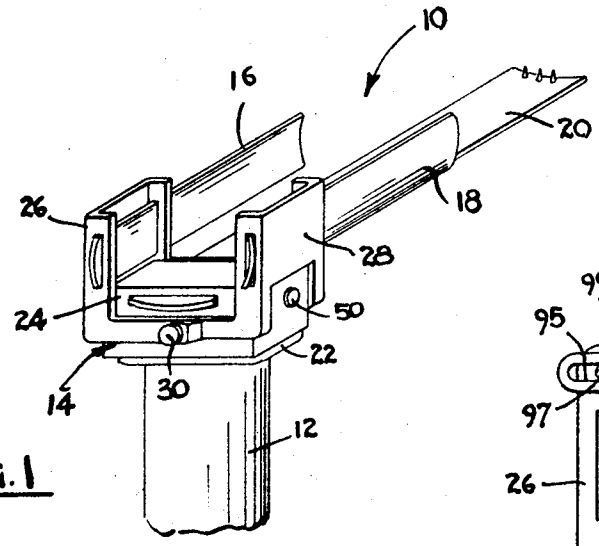


FIG. 1

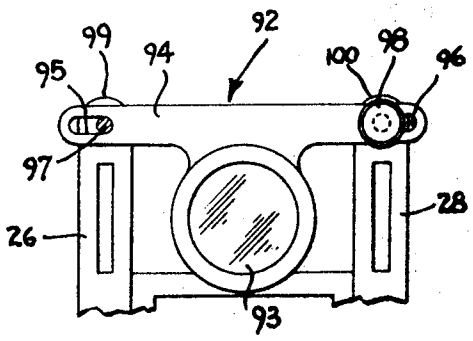


FIG. 15

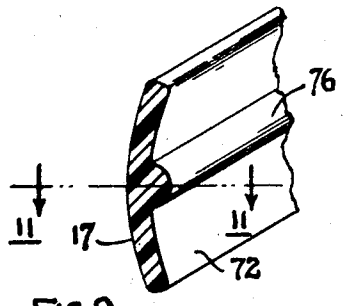


FIG. 9

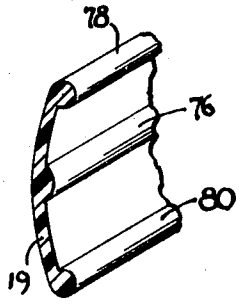


FIG. 10

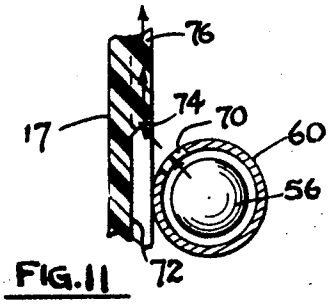


FIG. 11

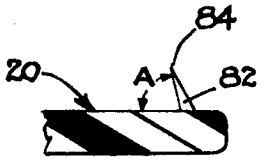


FIG. 12

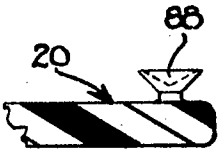


FIG. 13

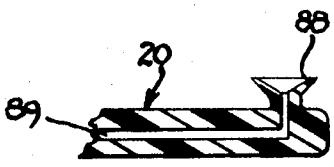


FIG. 14

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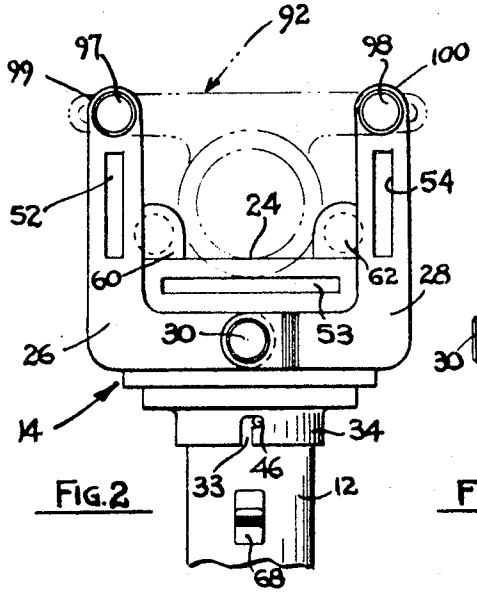

FIG. 2

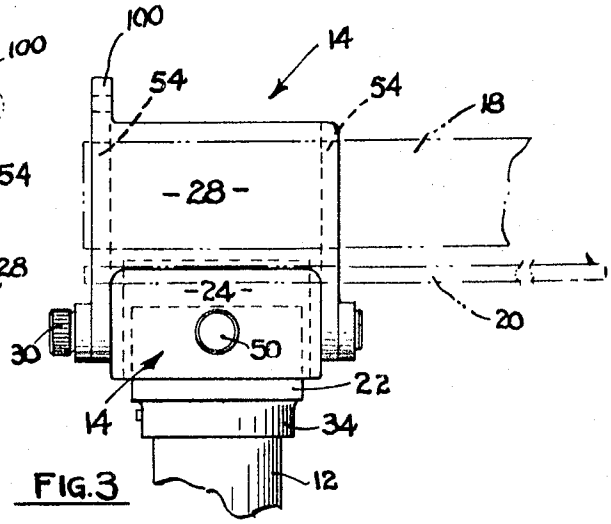

FIG. 3

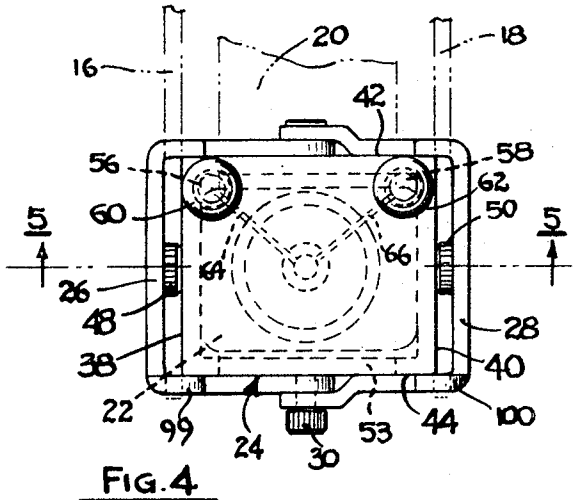

FIG. 4

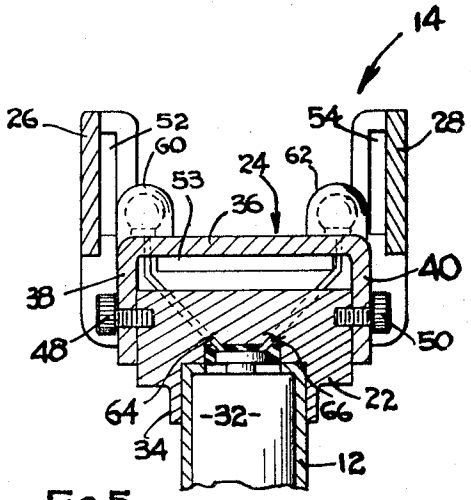

FIG. 5

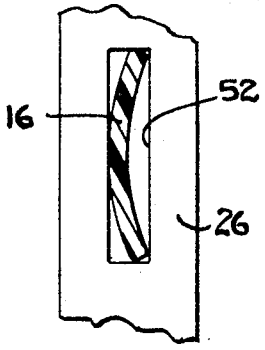

FIG. 6

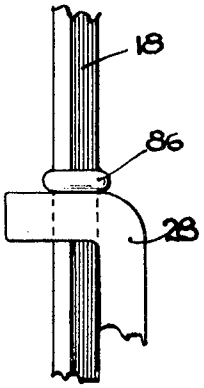

FIG. 7

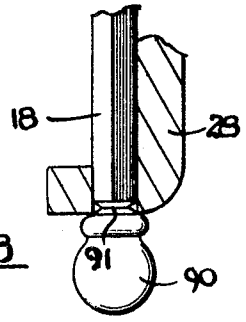

FIG 8

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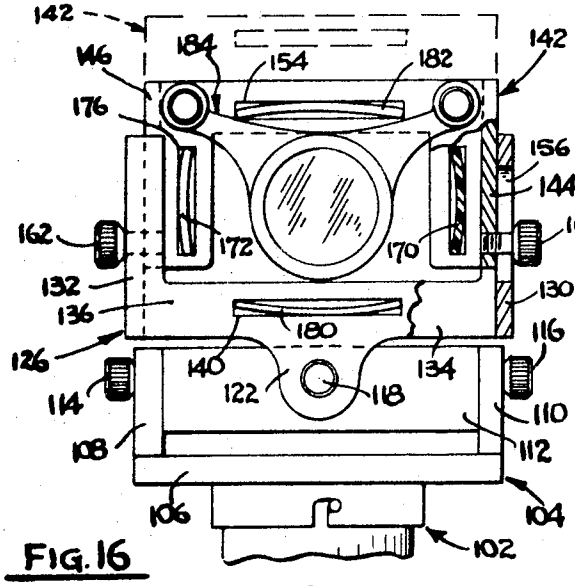


FIG. 16

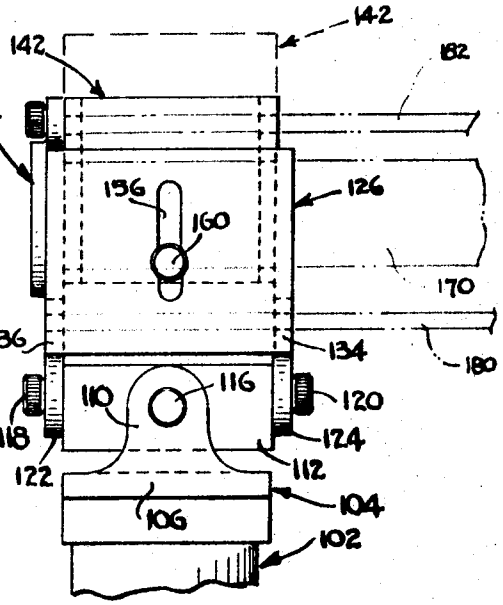


FIG. 17

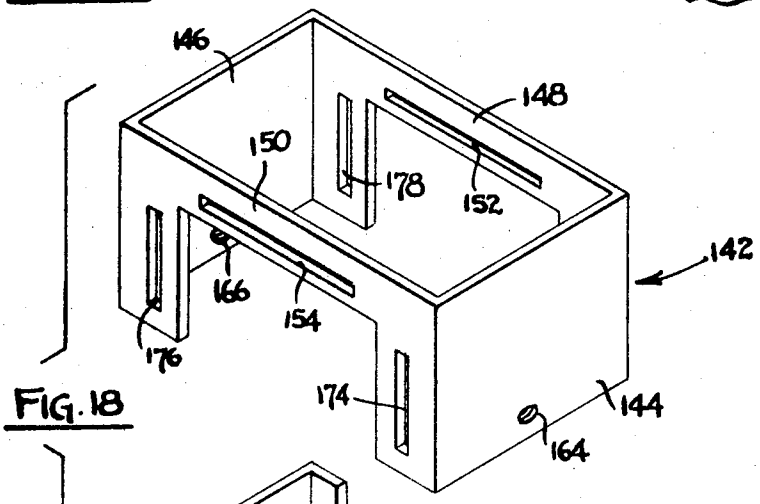
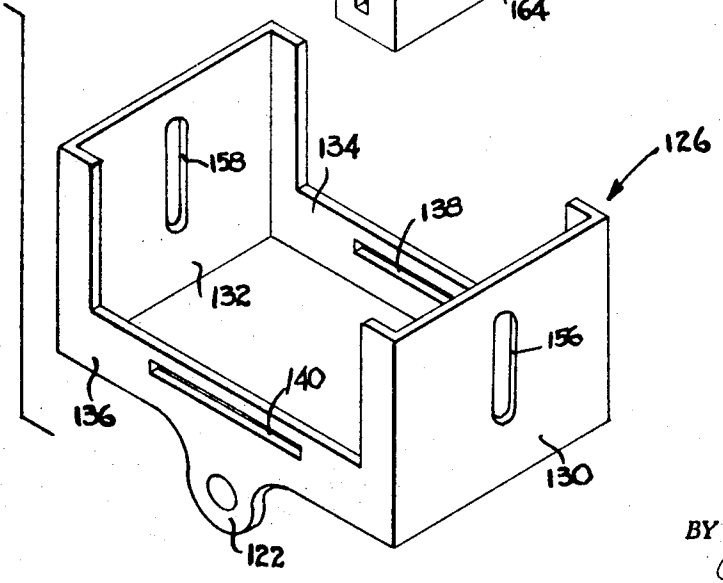


FIG. 18



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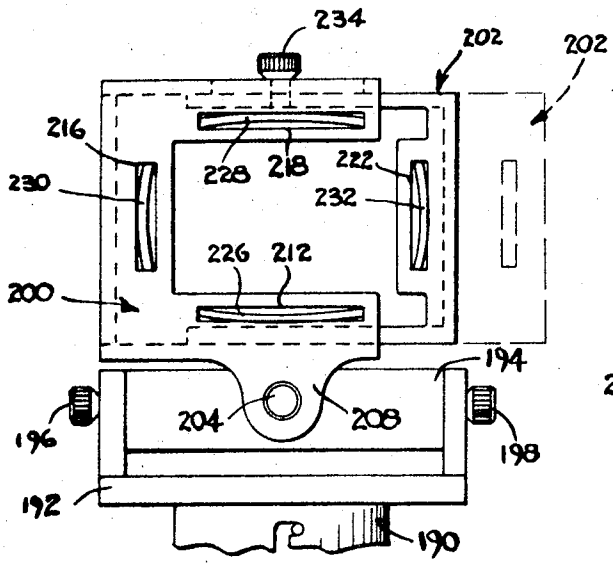


Fig. 19

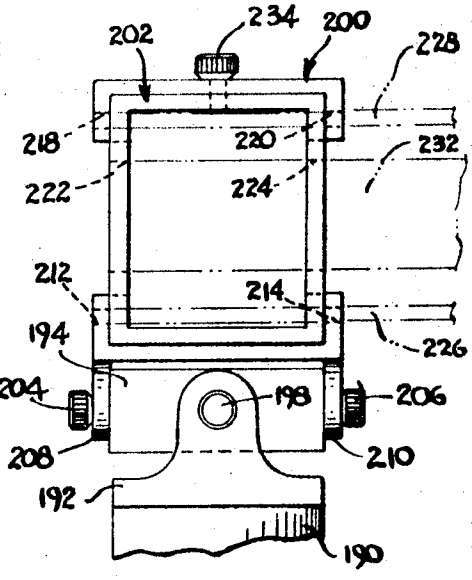
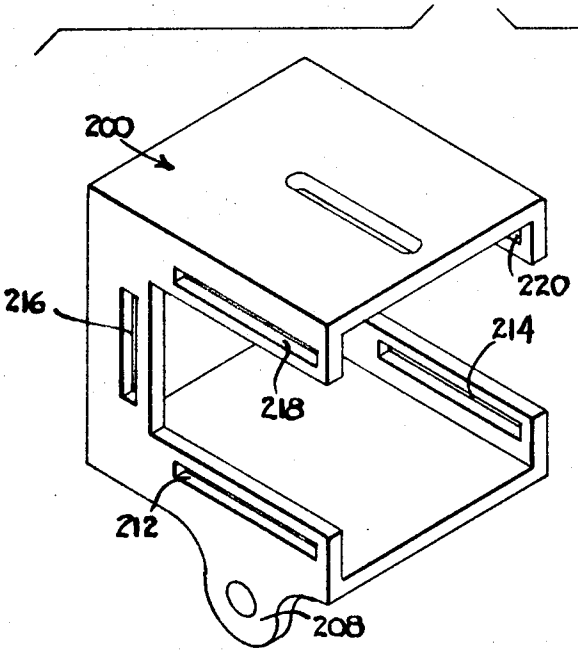


Fig. 20



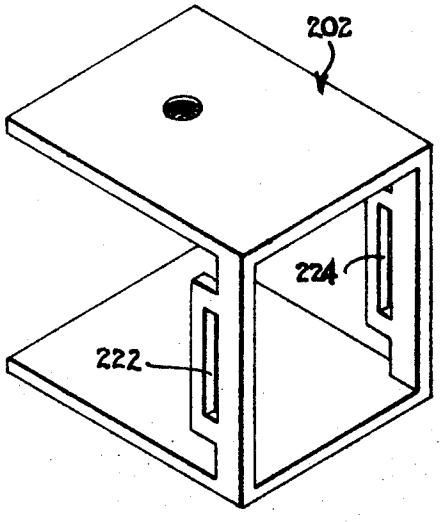


Fig. 21

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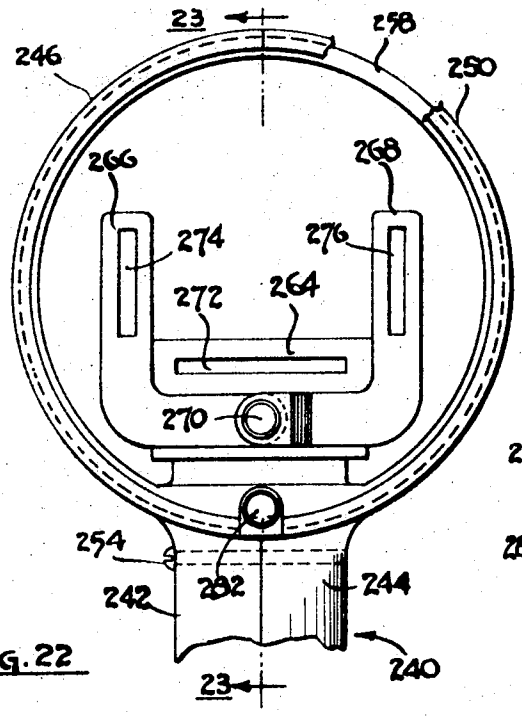

Fig. 22

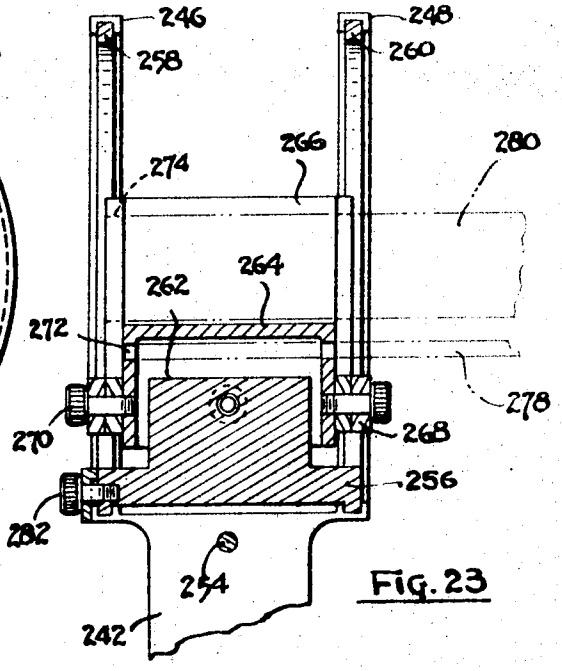

Fig. 23

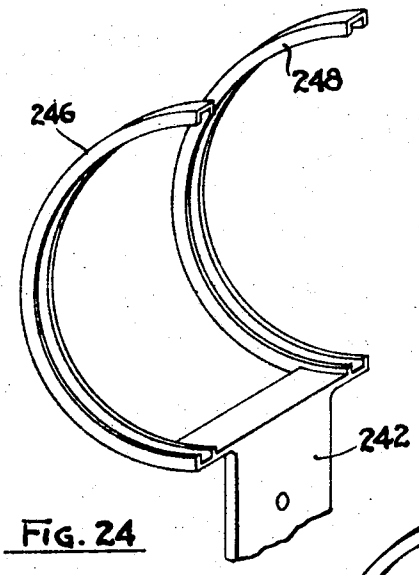

Fig. 24

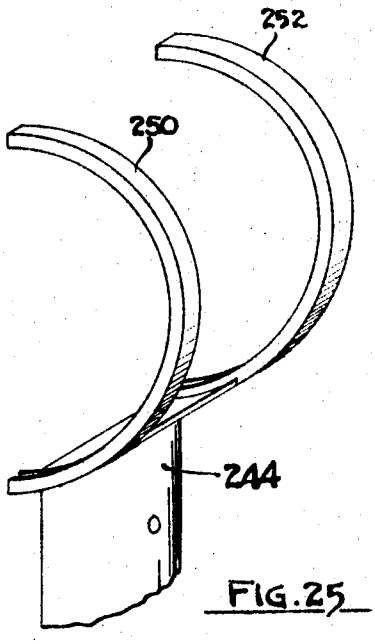

Fig. 25

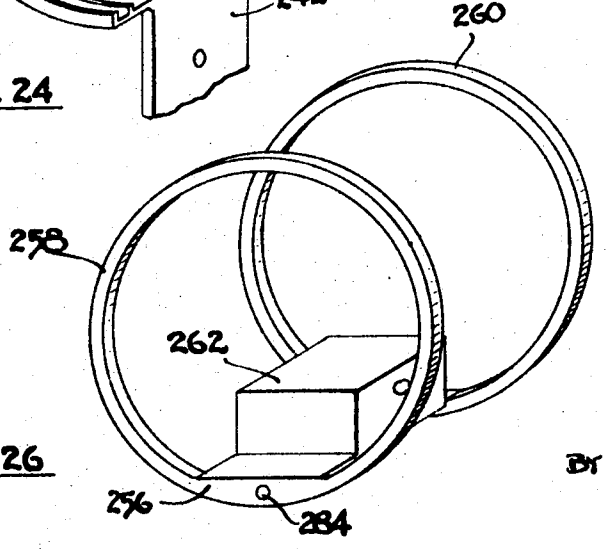

Fig. 26

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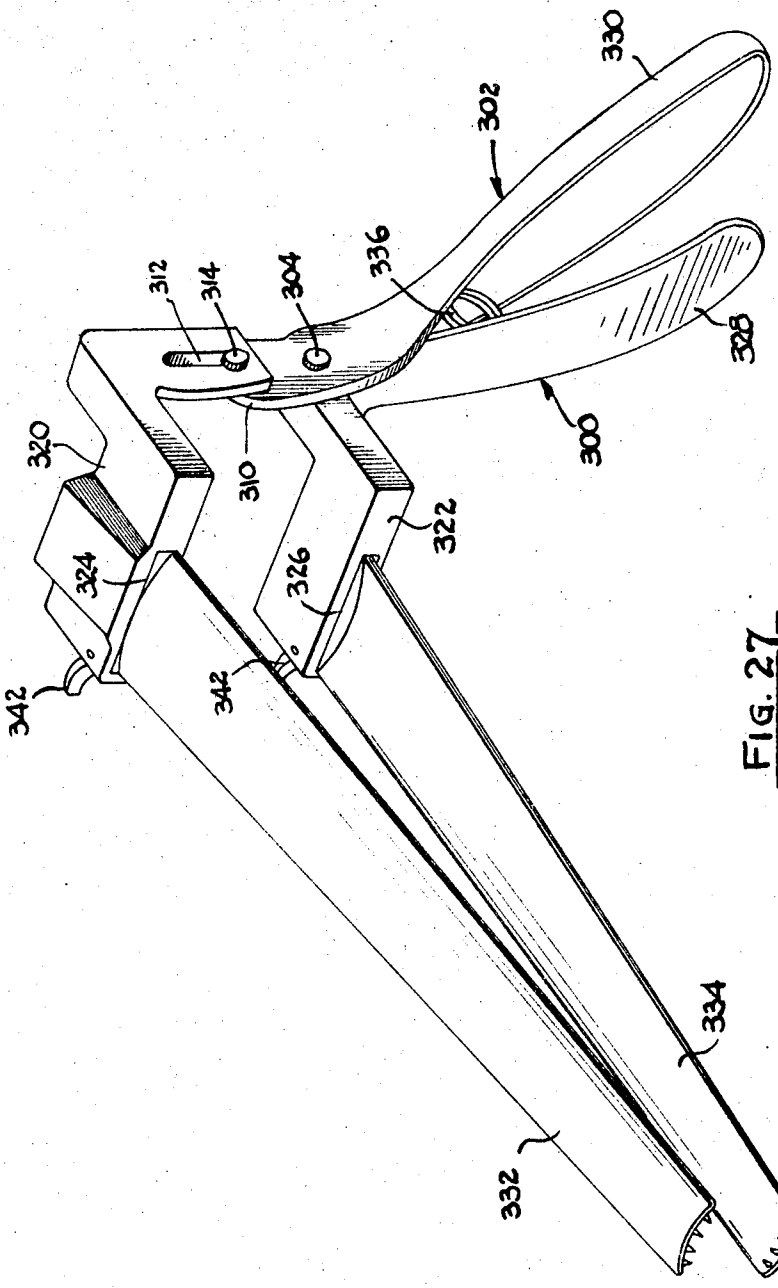

FIG. 27

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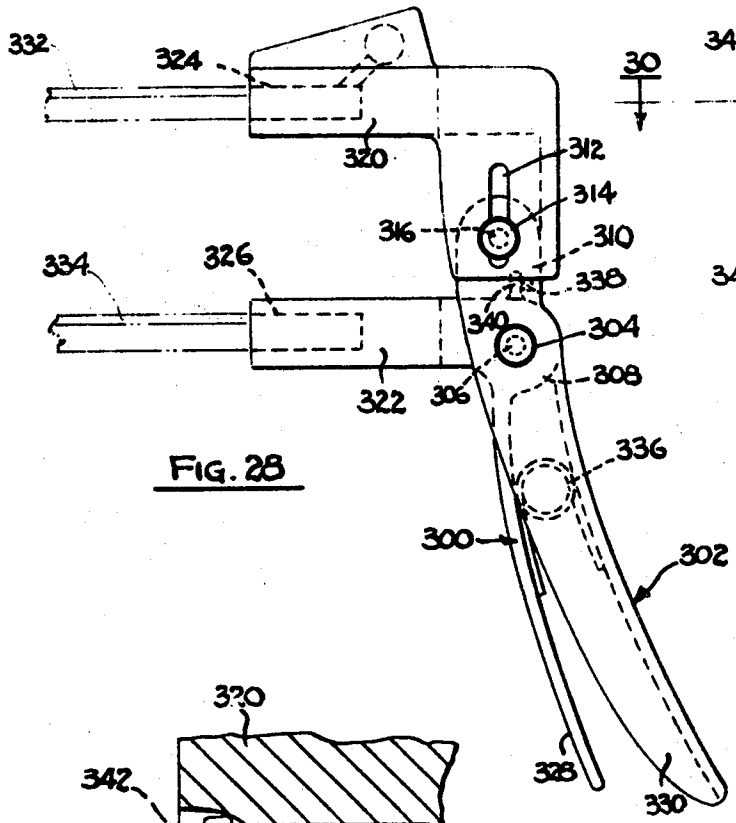

FIG. 28

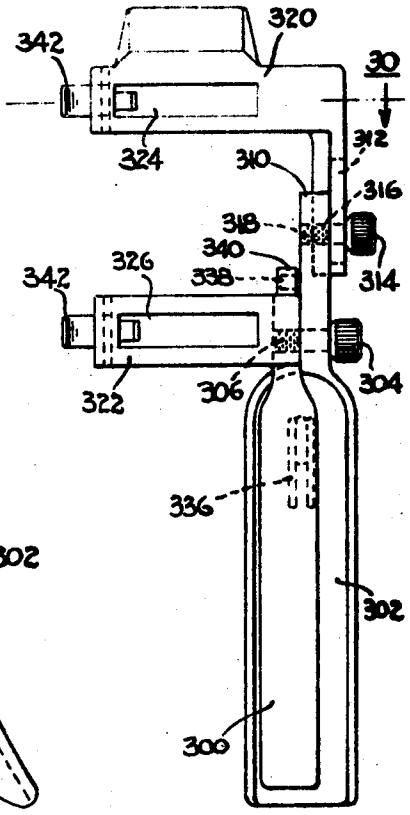

FIG. 29

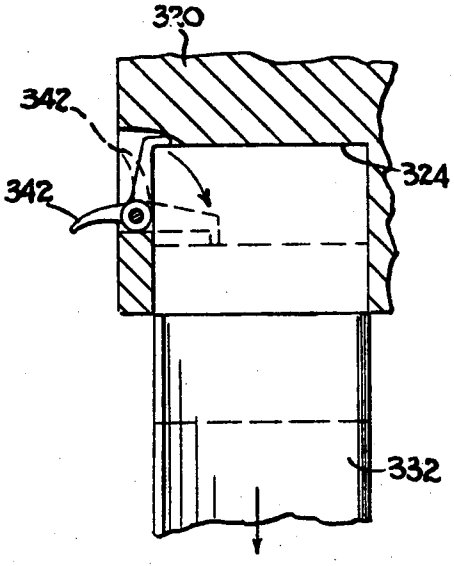

FIG. 30

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MEDICAL EXAMINING METHOD AND MEANS

BACKGROUND OF THE INVENTION

In a normal dormant state, the walls of the vagina are situated in close juxtaposition about their axial center, thus preventing direct visual observation of the cervix uteri as required for medical examination or surgery thereon. The prior art includes a familiar type of device known as a vaginal speculum having two elongate metal blades pivotally joined together about a fulcrum, whereby parting of the blades after their initial placement in situ separates and holds apart the vaginal walls unidirectionally. The foregoing type of device applies localized pressure on two oppositely confronting vaginal wall portions to establish and maintain a small distance between the same, but does not otherwise engage the walls in a manner which would prevent their displacement during contact by surgical instruments or the like. It is an inherent disadvantage of vaginal specula that the fulcrum supporting structure, and of the holding means for retaining the blades in a spaced-apart relationship, unavoidably restrict both the access area and the field of view of the situs which is sought to be examined or operated upon, particularly when instrumental contact with the cervix must be made.

In order to surgically or diagnostically operate on the cervix, as associated with conization, cauterization, specimen collection of the like, it is necessary to hold the organ securely against movement. The device most widely used in the prior art for this purpose is of the type known as tenacula. A tenaculum forcibly engages and holds the cervix to prevent its movement during surgical procedures involving the cervix uteri. This type of instrument is functionally distinguishable from the vaginal specula in that the latter does not grasp anything but merely spreads the vaginal wall unidirectionally apart, and it is not an uncommon practice for some operative techniques to involve both instruments simultaneously, which is especially cumbersome, confining, and severely restricts both the field of observation and the freedom of surgical instrument movement. Moreover, neither of the types of instrument discussed above offers any solution to the problem of providing adequate illumination to permit detailed examination of surfaces within the uterus.

SUMMARY OF INVENTION

The invention consists of a manually portable medical instrument, one embodiment as seen in FIGS. 1–5 consisting of device **10**, generally comprising a handle **12**, a hollow housing **14** mounted thereon, and a plurality of blades **16**, **18**, and **20** releasably secured to the housing. Illumination means **56** and **58** are mounted on housing **14** and are electrically energized by dry cell batteries within handle **12**. Two or more blades such as **16** and **18** are adapted to hold in spaced-apart relationship the vaginal walls of a patient during medical examination, treatment or surgery, while one or more additional blades such as blade **20** is provided with suitable means for securely engaging and grasping the outside of the cervix adjacent the cervico-vaginal fornix by suitable means such as vacuum cups **88** (FIGS. **13** & **14**) or slanted projections **82** (FIG. **12**).

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a general perspective view of the inventive device in sample illustrative form,

FIG. **2** shows an end elevational view, partly fragmented, of a portion of the device from FIG. **1**,

FIG. **3** shows a side elevational view, partly fragmented, of the structure shown in FIG. **2**,

FIG. **4** shows a top plan view of the structure seen in FIGS. **2** and **3**,

FIG. **5** shows a cross-sectional view taken along line **5—5** in FIG. **4**,

FIG. **6** is an isolated view, partly in cross-section, of a detail from the structure seen in FIGS. **2**, **3** and **4**,

FIGS. **7** and **8** are isolated views of two modifications involving details of the structure seen in FIGS. **1** through **5**, FIGS. **9** and **10** are both fragmented perspective views of two modifications involving details from structure shown in FIG. **1**,

FIG. **11** is an isolated fragmentary plan view, partly in cross-section showing a detail from the structure in FIG. **4**,

FIGS. **12**, **13** and **14** are isolated fragmentary perspective views showing modifications of a detail from the structure seen in FIG. **1**,

FIG. **15** is an isolated, fragmented view of a detail of structure suggested by broken lines in FIG. **2**, FIG. **16** is an end elevational view, partly fragmented, of a modification of the device shown in FIGS. **1** through **5**,

FIG. **17** is a side elevational view, partly fragmented, of the structure shown in FIG. **16**,

FIG. **18** is an isolated perspective view of two component detailed parts from the structure shown in FIGS. **16** and **17**,

FIG. **19** is an end elevational view, partly fragmented, of another modification of the device differing from that shown in FIGS. **1-5** inclusive, and in FIGS. **16** through **18**, inclusive,

FIG. **20** is a side elevational view, partly fragmented, of the structure shown in FIG. **19**,

FIG. **21** is an isolated perspective view of two component detailed parts from the structure shown in FIGS. **19** and **20**,

FIG. **22** is an end elevational view, partly fragmented, of a fourth modification of the device differing from those shown in FIGS. **1-5**, inclusive; in FIGS. **16** through **18**, inclusive; and in FIGS. **19** through **21**, inclusive,

FIG. **23** is a side elevational view, partly in cross-section and fragmented of the structure shown in FIG. **22**,

FIGS. **24**, **25** and **26** are isolated perspective views of three component detailed parts, respectively, from the structure shown in FIGS. **22** and **23**,

FIG. **27** is general perspective view of a fifth modification of a device incorporating the inventive principles taught herein and differing from all the other modifications shown in the previous Figures,

FIG. **28** is a side elevational view of the structure shown in FIG. **27**,

FIG. **29** is a front elevational view of the structure shown in FIGS. **27** and **28**, and

FIG. **30** is an isolated fragmentary view, partly in cross-section, of a portion of the structure shown in FIGS. **27** through **29**, inclusive.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the first embodiment shown in FIG. **1**, it may be seen that the novel structure is a manual implement generally designated by reference numeral **10**

having handle portion **12**, housing assembly portion **14** and elongate blade elements **16**, **18** and **20** secured thereto. Housing portion **14** principally comprises mounting block **22**, hollow box member **24** best seen in FIG. **5**, and oppositely confronting brackets **26** and **28** secured in pivotal relationship with block **22** by suitable pivots and holding means as suggested by pivot screw **30**.

As further seen in FIG. **5**, handle **12** may be shaped and sized to accommodate one or more standard dry cell batteries such as battery **32** axially aligned within the handle. Block **22** is provided with a flanged cylindrical cavity adapted to fit over the adjoining upper end of handle **12** and to be secured thereto by suitable means such as a lug **46** projecting from handle **12** as seen in FIG. **2** and engaging an offset or eccentric groove **33** formed in circular flange **34**. Hollow box member **24** may be of sheet metal construction and has a flat upper surface **36** joined to four downwardly-depending sides including laterally spaced-apart side portions **38** and **40** seen in FIG. **5**, as well as forward and aft portions **42** and **44** situated in the manner suggested by FIG. **4**.

Brackets **26** and **28** are adjustably pivotal with respect to block **22** and held in any desired position of adjustment by knurled knobs **48** and **50**, respectively, seen in FIG. **5**, for example. Both mentioned brackets include support means for blade elements **16** and **18** in the form of spaced-apart apertures such as suggested by apertures **52** and **54** in brackets **26** and **28**, respectively, seen in FIG. **2**. The blade elements, which are preferably of rigid or stiffly deformable material, are releasably secured within the mentioned apertures such as by deforming the blades into slight arcuate cross-sectional shape, inserting the same through the apertures, and then releasing the same. Residual stress in the deformed blade material will tend to flatten the blades against the restraint offered by the surrounding aperture edges in the manner suggested particularly by blade **16** in aperture **52** of bracket **26** shown in FIG. **6**. With appropriate sizing of interfitting components no further retention means need be utilized to secure blade **16** in bracket **26**. However, where greater security against movement of the mentioned blades relative to their supporting brackets is desired, depending upon the materials selected, a bead or projecting ridge of substantially greater width than slots **52** or **54** may be formed on the blades as suggested by intermediate ridge **86** on blade **18** contacting the forward edge of bracket **28** in FIG. **7**, or by terminal ridge or bulbous projection **90** contacting the aft edge of bracket **28** as seen in FIG. **8**. Projection **90** is adapted to be manually broken off by application of force sufficient to fracture through blade **18** at reduced cross-section groove **91** to facilitate removal of blade **18** from bracket **28** after use of the device. In either case, it will be understood that only one of the expedients suggested by FIGS. **7** and **8** is used on any one blade **18** and not both on the same blade.

Illumination means are also included in implement **10** and preferably include at least two light sources such as bulbs **56** and **58** situated within light-containing covers **60** and **62**, respectively. Bulbs **56** and **58** are connected electrically by suitable means to the batteries within handle **12** such as suggested by leads **64** and **66** in FIGS. **4** and **5**, and are energizable by an appropriate switch **68** shown in FIG. **2**, for example. Covers **60** and **62** preferable have limited illumination escape means such as narrow slits to permit the controlled escape of light as suggested by slit **70** in cover **60** over bulb **56** shown in FIG. **11**. Due to the foregoing relationship, light rays emitted through slit **70** will enter the material in blade **16** which is preferably adapted to receive the same and conduct such light rays to the distal end of the blade opposite from its supporting portion within aperture **52**. The light rays so conducted according to the principles of fiber optics will thereafter be emitted from the stated distal blade end and illuminate the surfaces within the body cavity in which blade **16** is situated. To facilitate or enhance the light-receiving and transmitting properties of blade **16**, a portion of the surface thereof is preferably cut away as shown by surface **72** in FIG. **11** to produce a planar surface portion **74** oriented substantially normal to the dominant direction of the light rays emitted from source **56** through slit **70**.

As further suggested by the modifications shown in FIGS. **9** and **10**, blade **16** may be strengthened by integrally formed beads at the center thereof in the manner shown by bead **76** on blade **17** of FIG. **9**, or by beads **78** and **80** at the edges of the blade as shown by blade **19** in FIG. **10**. The mentioned strengthening means are usable to increase resistance to bending of the blades along their length, but the blades may also be provided with a groove or other means defining a linear area of localized weakness oriented transversely across each blade to facilitate fracture thereof as required to break off the blades to dispose of the same when their material of construction is conductive to such disposability.

Lower blade **20** is provided near the distal end thereof with holding means for engaging and holding a radially contracted peripheral rim such as characterized by the cervix, by radially inward directed pulling force applied either directly to the cervix or closely proximate thereto, in order to grasp the same and to secure the cervix against movement or displacement upon contact with other surgical implements. In the example shown by FIG. **12**, the stated means comprises integrally formed and spaced-apart projections **82** which may be of generally conical form situated with the major axis at a slanted angle relative to the principal center or longitudinal axis of blade **20**, the stated angle being preferably about **75** degrees from the mentioned axis as suggested by angle A in FIG. **12**, although this angle could vary from **45** to **90** degrees. The distal edges or tips **84** on projections **82** are adapted to engage the lower outside rim of the cervico-vaginal fornix and apply pulling force thereto radially outwardly to stabilize the same against movement or to dilate the same. Alternatively, projections **82**, which are preferably formed with spanwise breadth in the shape of a tooth, may be omitted and replaced by small vacuum or suction cups as suggested by cups **88** in FIG. **13**. Cups **88** are of flexible resilient material and have a thin easily deformed peripheral edge thereon capable of adhering to a moistened surface when pressed firmly thereagainst. A further modification is suggested by FIG. **14** wherein cups **88** communicate with one or more hollow passages such as passage **89** in blade **20** which may be connected to an external vacuum source (not shown).

From the foregoing, it may be seen that the construction of device **10** adapts the same particularly for use in clinical or surgical manipulations associated with the

structure of the human cervix. Thus, since the cervix is deeply recessed within the vaginal passage, it cannot be operated upon unless the vaginal walls are sufficiently displaced to permit access to the situs of the cervix and otherwise stabilized to minimize or prevent their movement. In order to gain such access initially, blades **16, 18** and **20** should be contractible or displacable generally toward each other to achieve, in so far as possible, mutual contact between the blades along most of their length. This contraction of the blades into a close grouping relationship allows the blades to be inserted into the vagina with a minimum of difficulty or discomfiture to the patient. Thereafter, blades **16** and **18** are displaced apart from each other by rotation of their supporting brackets **26** and **28,** respectively, about a rotation axis through pivot screw **30,** until the blades are spaced-apart in the position shown by FIG. **1.** This will result in lateral displacement of the vaginal wall whereby the cervix may be viewed. When thus viewed, blade **20** is then moved by manipulation of the entire implement **10** as required to engage projections **82** against the cervix by contacting the same along an area on the far side of the tough callous ridge which surrounds the outer periphery of the normal human cervix.

Use of device **10** in the manner described above may be seen to provide the simultaneous advantages of holding separated the vaginal walls to provide access to the cervix and securely engaging a peripheral portion of the cervix to hold the same against displacement, both in a single device which may be easily positioned at any desired angularity according to the convenience of the surgeon or diagnostician using the same.

After positioning of the device, detailed observation and further operative procedures may be accomplished using viewing means such as suggested in FIGS. **2, 3** and **15.** From FIGS. **2, 3,** and **15,** it may be seen that brackets **26** and **28** are preferably provided with upstanding lugs or bosses **100** each having a tapped hole therethrough. The holes thus formed in brackets **26** and **28** are each adapted to receive the threaded shank of a thumbscrew **97** and **98,** respectively. A yoke member **92** has a laterally extending support beam **94** with a slot at each end thereof as suggested by slots **95** and **96** in FIG. **15.** The yoke **92** is thus supported on brackets **26** and **28** by thumbscrews **97** and **98** in such manner that tightening of the thumbscrews clamps the yoke firmly against the brackets. Conversely, when the thumbscrews are loosened the brackets may be pivoted toward or away from each other about a center axis through holding screw **30,** and yoke **92** will always be adjustable so that slots **95** and **96** are equidistantly spaced from holding screw **30.** Yoke **92** is also formed with a magnifying eyepiece **93** of any suitable commercially available type whereby the viewing means thus formed permits a direct line of vision between blades **16** and **18** after they have been positioned in the spaced-apart relationship shown by FIGS. **1** and **2,** for example.

While a number of modifications are suggested herein as discussed below, it is basic in all of these modifications which incorporate the inventive principles taught herein that a single device is adapted to perform both of the functions formerly identified with the separate types of medical instruments broadly characterized as specula and a tenacula, and also provides additional advantages not associated with either such types. Spreading or distention of the vaginal walls and grasping or otherwise securely engaging the outer peripheral surface of the cervix involves two very different functional operations. The first is achieved in all modifications of the device disclosed herein by initially placing at least two elongate blade elements within the vaginal passage, and displacing the blade elements away from each other a sufficient distance to permit visual access entirely through the vaginal passage to view the cervix. The second function is performed after the mentioned access is gained and consists of engaging the rim of the cervix about its outer periphery by structure adapted to apply sufficient force to stabilize the cervix against displacement by physical contact with other surgical, clinical, or diagnostic implements.

In some cases, depending upon the size or location of the rest or surgical situs and upon configurational differences between the vaginal contours of different patients, it may be necessary to vary the type of extent of blade movement or position best suited to the needs of the doctor. Accordingly, the embodiment suggested in FIG. **16,** for example, permits use of four blades rather than three as shown in FIG. **1,** and further permits a wider variation in angular and translational adjustability of the blades than that permitted by the structure of FIG. **1.**

Thus, hollow handle **102** in FIG. **16** corresponds in function with handle **12** in FIG. **5,** except that handle **102** has U-shaped bracket **104** affixed thereto by any suitable means such as by integral construction, or by a bayonet-type connection **33, 46** as described between block **22** and handle **12** seen in FIGS. **2** and **5,** for example. Bracket **104** has transverse center portion **106** formed with upstanding brackets or bosses **108** and **110** at either end thereof. Sized to extend between bosses **108** and **110** is a solid mounting block **112** held in place by two thumbscrews **114** and **116** in axial rotational alignment and penetrating through suitable holes in bosses **108** and **110,** respectively. Loosening of screws **114** and **116,** each of which has a threaded shaft engaging a threaded hole in block **112,** permits pivotal movement of the block relative to bracket **104** about an axis through the center of screws **114** and **116.**

Block **112** has a pair of tapped holes adapted to receive the threaded shafts of two more thumbscrews **118** and **120** shown in FIG. **17,** the center axes of which are in mutual alignment and oriented perpendicular to the center axes of thumbscrews **114** and **116.** The mentioned threaded shafts of screws **118** and **120** penetrate through two smooth holes in a pair of downwardly depending lobes or bosses **122** and **124,** respectively, formed on housing box **126** and illustratively by lobe **122** in FIG. **18.** Lobes **122** and **124** permit box portion **126** to be adjustably pivoted about an axis through the center of screws **118** and **120** when the screws are loose, and to be immovably joined to block **112** when the screws are firmly tightened so as to clamp the lobes against the block.

Box portion **126** has transverse base portion **128** and upstanding side portions **130** and **132** as seen, for example, from FIG. **18,** together with forward and aft portions **134** and **136,** respectively. Forward and aft portions **134** and **136** are provided with aligned slots **138** and **140** adapted to receive a blade such as blade **20** in the same manner and purpose as shown and discussed above in connection with FIG. **1.** Box portion **126** is adapted to receive and support another box por-

tion 142 in nesting relationship. Box portion 142 may be seen to include a pair of downwardly depending side portions 144 and 146 integrally formed or otherwise secured to a pair of transverse frame portions 148 and 150 comprising forward and aft surfaces of box portion 142, respectively. Frame portions 148 and 150 include slots 152 and 154, respectively, to receive and support an elongate blade-like element corresponding in form to blade 20 shown in FIG. 1 but oriented oppositely in respect thereto.

Box portion 142 is vertically slidable relative to and supported within box portion 126, the side portions 130 and 132 of box portion 126 being in substantially uniform surface contact with side portions 144 and 146, respectively, of box portion 142. The limits of such relative movement are defined by the length of slots 156 and 158, through which separate thumbscrews 160 and 162 threadedly secured in side surfaces 144 and 146, respectively, penetrate as suggested by holes 164 and 166 is side portions 144 and 146 as shown in FIG. 18 and adapted to receive thumbscrews 160 and 162 shown in FIG. 16. It will be understood that tightening of the thumbscrews by rotation thereof will cause them to clamp against the sides of slots 156 and 158, thus preventing movement between box portions 126 and 142, and holding the same in any desired position of adjustment, and that this position of adjustment will determine the adjusted distance between the two elongate blades 180 and 182 which are respectively secured within slots 138, 140 of box portion 126, and within slots 152, 154 of box portion 142. A separate pair of aligned slots on each side of box portion 142 is adapted to receive two more elongate blades 170 and 172 as suggested by slots 174, 176 and 178 seen in FIG. 18, for example. To complete the instrument shown in FIG. 16, for example, viewing means in the form of eyepiece assembly 184 is desirably included and corresponds in structure and mounting arrangement generally as described above for viewing means 92 shown in FIG. 15, except for certain obvious variations necessitated by the different overall configuration of the implement.

From the discussion set forth above, it will be understood that pivotal adjustment about two axes may be made in the device shown by FIGS. 16 and 17, these axes being defined by the common rotation axis of thumbscrews 114 and 116 in the first instance, and of thumbscrews 118 and 120 in the second instance. Moreover, after initial placement of the instrument in the examination or operative situs, lateral blades 170 and 172 will retain the vaginal walls distended or spaced-apart, while blades 180 and 182 may be positioned so that grasping means on the distal end of each blade corresponding to those discussed for blade 20 may grasp or otherwise secure the cervix against displacement.

Referring to FIGS. 19 through 21, another embodiment of the basic inventive principles may be seen wherein four blades are involved, similar to the embodiment of FIGS. 16 through 18. However, instead of the lateral blades being mounted in fixed relationship regarding the distance therebetween, and the vertically spaced-apart blades being adjustable as to the space therebetween as in the device shown by FIGS. 16 through 18, the device in FIGS. 19 through 21 involves vertically spaced blades 226 and 228 which are not adjustable as to spacing, and laterally spaced blades 230 and 232 which are adjustably variable as to the distance therebetween.

Referring to FIG. 19, hollow handle 190 corresponds in function with handle 102 in FIG. 16 and has U-shaped bracket 192 secured thereto by any appropriate means such the bayonet connection 33, 46 shown in FIG. 2. Bracket 192 supports block 194 between two releasable clamping thumbscrews 196 and 198 in the same manner as block 112 described above in connection with FIG. 16. Block 194 in turn pivotally supports a generally box-shaped assembly 200, 202 in the same manner as discussed above regarding block 112 and its relationship with the box assembly formed by elements 126 and 142. Thus, a pair of thumbscrews 204 and 206 in mutual alignment have threaded shafts which engage tapped holes in block 194 and served to clamp two lobes 208 and 210 formed on box element 200 to prevent its movement relative to block 194 when the thumbscrews 204 and 206 are firmly rotated into clamping position.

Box elements 200 and 202 nest together in translationally slidable relationship in the manner discussed above for box elements 126 and 142, except that the latter are vertically movable where the elements 200 and 202 are laterally movable. Spaced-apart and aligned pairs of slots formed in each of the elements 200 and 202 are adapted to receive blade elements of the same type as discussed above in connection with blades 16, 18 and 20 in FIGS. 1–5. The mentioned slots include slots 212, 214, 216, 218 and 220 in element 200 and slots 222, 224 in element 202, all of which support blades 226, 228, 230 and 232 shown or suggested in FIGS. 19 and 20. Relative movement between box elements 200 and 202 result in adjustably varying of distance between blades 230 and 232, after which tightening of thumbscrew 234 holds the mentioned elements in the desired position and prevents further movement thereof.

In the device shown by FIGS. 19 through 21, blade elements 230 and 232 could appropriately be provided with positive grasping means to secure the cervix such as shown in FIGS. 12, 13 or 14 and discussed above. Use of the device which permits lateral adjustment of blade distance between blades 230 and 232 would be appropriate in those cases where the localized area of medical and pathological interest in the patient would be obscured, irritated or otherwise poorly suited to the vertical type blade adjustment provided by the device of FIGS. 16–18. As in the case of the latter instrument, it will be understood that suitable optical or magnifying means may be supported substantially at the center of the box assembly 200, 202 shown in FIG. 19 as discussed above for viewing means 184 in FIG. 16. Similarly, illuminating means involving use of fiber optic material for any or all of the blades 226, 228, 230 or 232 could be used in connection with the device discussed above in connection with FIGS. 16-18 or 19 through 21. Alternatively, any of the modifications disclosed herein could be used in combination with a miniature flashlight to provide a direct beam of light toward the test situs instead of using fiber optics.

Although both of the embodiments suggested in FIGS. 16–18 and in FIGS. 19-21 provide results and advantages unobtainable with devices known to the prior art, both have the basic functional limitation that at least one pair of blades required to be inserted within the vaginal passage are non-adjustable as to the dis-

tance therebetween. It is a distinct advantage, both from the medical practitioner's, as well as from the patient's, viewpoint, if all the blades can be so collapsed or closely grouped that penetration into the vaginal passage is relatively easy after which the blades may be adjustably positioned in widely spaced-apart relationship. Moreover, while the entire implement may be rotated through application of force manually to the handle **12** or **102** in the previous embodiments, as required to position the blade in such manner as to expose the precise localized area of interest to the surgeon or diagnostician, it would be most helpful in either case for rotary adjustment to be accomplished without the need for external weights or angular displacement of the entire implement to achieve desired relative positioning between the various blades used for spreading apart the vaginal walls and for grasping the cervix. It would, in other words, be desirable and advantageous for the instrument used both to gain access to the inner vaginal terminal area and to engage the cervix, to accomplish these functions by completely adjustable blades offering a minim of resistance to penetration into the vaginal constriction which typifies the normal patient and permits angular positioning of the blades. Although complete adjustability in the foregoing sense is not achievable in the embodiment discussed hereinabove, this objective is achieved to a most remarkable extent in the devices suggested by the modifications of FIGS. **22-30,** inclusive.

Referring to FIG. **22,** a modification is shown wherein handle **240** is secured to two semi-circular elements **242** and **244** shown in FIGS. **24** and **25,** respectively, each having a portion of an arcuate track or guide as suggested by tracks **246** and **248** on element **242** and by tracks **250** and **252** on element **244.** When these two elements **242** and **244** are secured to handle **240** in operative relationship by suitable means such as threaded screw **254,** two separate parallel and perfectly circular tracks are formed, one comprising portions **246** and **250,** while the other track comprises portions **248** and **252.**

Within the stated tracks a supporting frame or chassis **256** is slidably movable throughout **360** degrees of rotation relative to the stationary elements **242** and **244,** as required to position the same in any desired condition of adjustment prior to use of the instrument. Chassis **256** is so constructed as to constitute a single unitary element including two circular support rings **258** and **260** which are each substantially planar and uniformly parallel to each other. The rings **258** and **260** are joined in fixed relationship by a connecting mass in the form of block **262.** Block **262** functions essentially similar to block **22** discussed above in connection with FIG. **5.** Thus, hollow box **264** in FIG. **23** corresponds with box member **24,** while brackets **266** and **268,** pivotally secured to block **262** by adjustable holding screw **270** corresponds to brackets **26, 28** and holding screw **30** shown in FIG. **2.** Suitable slots **272, 274** and **276** in elements **264, 266** and **268,** respectively, are adapted to receive and support elongate blade elements in the same manner as blades **16, 18** and **20** of FIG. **1,** as suggested by blades **278** and **280** in FIG. **23.**

From the above, it will be understood that complete **360** degree freedom is permitted in the initial adjustment of the blade elements using the device of FIGS. **22–26,** and that adjustment is accomplished by rotating block or mass **262** along a path defined by the circular tracks within which rings **258** and **260** are confined and guided. When a desired positional adjustment is achieved, a holding screw **282** having a threaded shaft operatively engaging a tapped hole **284** in block **262** (see FIG. **26**) is turned to apply clamping force to ring elements **246** or **250** and thus prevent further rotational movement. As further discussed above, optical viewing means of the type suggested in FIG. **15** may be included in the device shown by FIGS. **22** and **23.**

A further modification of the device disclosed herein is shown by FIG. **27** wherein two handle elements **300** and **302** are pivotally joined together about a pivot axis defined by pin **304** having shaft **306** which penetrates through lobe portion **308** formed on handle element **300** as seen in FIG. **29.**

Handle element **302** includes an upwardly extending lobe **310** having a slot **312** therein. A thumbscrew **314** has a threaded shaft **316** operatively engaging a tapped hole **318** in a blade support element or bracket **320** seen in FIG. **29.** Shaft **316** is linealy movable within narrow slot **312** to displace bracket **320** toward or away from the pivot axis defined by pin **304.** Blade support means are included in bracket **320** as well as in another bracket **322** formed integrally with or otherwise secured to handle element **300.** The stated means comprise slots or cavities **324** and **326** in brackets **320** and **322,** respectively, in each of which is releasably secured a blade corresponding to blade **20** shown in FIGS. **1** and **12.** Because pivot pin **304** is positioned somewhere between brackets **320** and **322,** it will be understood that movement of handle grips **328** and **340** toward or away from each other will cause rotation of handle elements **300** and **302** about a pivot axis through pin **304** with consequent movement of brackets **320** and **322** secured to each of the handle elements whereby blades **332** and **334** will move in an arcuate path toward or away from each other.

Preferably, resilient biasing means of any suitable type is secured between handle grips **328** and **330** in such manner as to bias the grips away from each other toward the limit of their movement, which desirably will occur when the distal ends of blades **332** and **334** contact each other. Illustratively, a single coil spring as suggested by spring **336** may be used for the foregoing purpose as shown in FIGS. **27** and **28.** To prevent escape of spring **336** when no blades are mounted in the instrument shown in FIG. **27,** for example, a limit stop such as a lug **338** integrally formed on lobe **310** may be used to make interfering contact with a projecting boss **340** integrally formed on lobe **308** of handle **300** to prevent any further relative rotation between handles **300** and **302** under the force of spring **336** after the stated lug and boss contact each other. In addition to the structure described above, it may seen from FIG. **30** that means are included in the device shown by FIG. **27** for easily ejecting blades **332** and **334** from their supported position within cavities **324** and **326** in brackets **320** and **322,** respectively. As seen from FIG. **30,** the stated ejection means include a rotatable lever **344** which is adapted to make bearing contact with the end of blade element when it is inserted within cavities **324** and **326,** this action resulting in rotation of the stated lever in a direction resulting in a portion of the lever projecting outwardly from each of the brackets **320** and **322.** Upon completion of use, manual force applied to the mentioned levers will apply force to each

of the blades in a direction which will result in ejection of each blade from its cavity.

I claim:

1. A combined vaginal speculum and tenaculum comprising:
- a handle;
- a first speculum blade connected to the handle;
- a second speculum blade opposed to the first blade;
- means for connecting the second blade to the handle for relative movement of the first and second blades towards and away from each other;
- means on the distal end of each of the blades for securely engaging the exterior peripheral rim of a cervix; and
- means for resiliently biasing the blades towards each other.

2. A combined vaginal speculum and tenaculum as defined in claim 1 wherein the means for engaging the cervix comprises a plurality of spaced apart projections on each blade, said projections on one of the blades extending generally towards the projections on the opposed blade.

3. A combined vaginal speculum and tenaculum as defined in claim 1 wherein the means for engaging a cervix comprises cups of flexible resilient material having a thin, easily deformed, peripheral edge.

4. A combined vaginal speculum and tenaculum as defined in claim 3 further comprising means for connecting a vacuum to the interior of the cups.

5. A combined vaginal speculum and tenaculum as defined in claim 1 further comprising means for illuminating a proximal end portion of at least one of the blades and wherein said illuminated blade is transparent and has a sufficiently regular exterior for transmitting light from the proximal end portion substantially to the distal end.

6. A combined vaginal speculum and tenaculum as defined in claim 1 wherein the means for connecting each of the blades to the handle comprises means for temporarily connecting the blade to the handle.

7. A combined vaginal speculum and tenaculum as defined in claim 6 wherein each of the blades includes a frangible portion for disconnecting the respective blade from the handle.

8. A combined vaginal speculum and tenaculum as defined in claim 6 wherein the means for connecting the second blade to the handle for relative movement comprises:
- means for translating a proximal end portion of the second blade relative to the first blade; and
- means for tilting one of the blades about its proximal end relative to the other blade.

9. A combined vaginal speculum and tenaculum as defined in claim 6 wherein the means for connecting each of the blades to the handle comprises a slot in the handle; and wherein the blade includes a curved portion fittable into the slot, the relative size of the curved portion of the blade and the slot providing an interference fit whereby the blade is slightly deformed in the slot.

10. A vaginal speculum comprising:
- a handle;
- a first speculum blade;
- means for temporarily connecting the first speculum blade to the handle;
- a second speculum blade;
- means for temporarily connecting the second speculum blade to the handle and opposed to the first speculum blade; and
- means on the handle for moving the blades towards and away from each other; and wherein
- each of the speculum blades includes a frangible portion for disconnecting the blades from the handle.

11. A vaginal speculum as defined in claim 10 wherein the frangible portion comprises a region of reduced transverse cross section on the blade for a manual breakage thereof.

12. A vaginal speculum as defined in claim 10 wherein the means for temporarily connecting each speculum blade to the handle comprises:
- a slot in the handle elongated in a direction transverse to the length of the blade; and
- a transversely curved portion on the blade fittable into the slot, the relative size of the blade and slot requiring increased curvature of the blade to fit into the slot for providing an interference fit therebetween.

13. A vaginal speculum as defined in claim 12 wherein each blade further comprises a projecting bead for engaging a portion of the handle for positioning the blade in a predetermined position.

14. In a vaginal speculum comprising a pair of opposed speculum blades connected at their proximal ends to an operating handle, said handle including means for translating the proximal ends of the blades towards and away from each other and means for tilting the blades relative to each other about their proximal ends, the improvement comprising:
- means on the distal end of each of the blades for securely engaging the exterior peripheral rim of a cervix; and means for resiliently biasing the blades toward each other.

15. In an improved speculum as defined in claim 14 the further improvement wherein the means for engaging a cervix comprises a plurality of teeth on the distal end of each of the blades for engaging the cervix with sufficient force to stabilize it.

16. In an improved speculum as defined in claim 15 the further improvement wherein each of the blades includes a frangible portion for selectively removing the blade from the handle.

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