SPECULUM LATCHING MECHANISM

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ABSTRACT

A latching mechanism is provided for a speculum. The speculum itself is formed of a stiffly flexible plastic material whereby two blade-like members are joined along one edge by a hinge which integrally connects the two blades together for pivotal movement between open and closed positions. The latching mechanism comprises interlocking, teeth-like protuberances formed integrally on the interior surfaces of the blades contiguous to the blade edges. These protuberances are interleaved such that they frictionally engage each other thereby to maintain the relative open or closed position of the blades. The tips of the engaging surfaces may have a raised pad to increase the frictional contact and yet maintain constant loading on blade pivotal movement.

5 Claims, 10 Drawing Figures
SPECULUM LATCHING MECHANISM

BACKGROUND OF THE INVENTION

This invention relates to a speculum and, more particularly, to a speculum having a latching member which is economical to produce and yet performs effectively.

There is on file in the Patent Office an application Ser. No. 46,725, filed June 16, 1970, entitled "Speculum" by Jean R. Poirier, now abandoned, in favor of a continuation-in-part application Ser. No. 171,187 filed Aug. 12, 1971. There is described in the said Poirier application a speculum which finds extensive use particularly in the field of gynecology. In this field and others it is often desirable and necessary for the doctor to examine both visually and with instruments the interior of certain body passages. In the case of cancer of the reproductive organs, for example, 95 percent of all cancer occurs at the cervix. One of the tests used for the early detection of such cancer is the so-called "Pap Test" which requires that a vaginal smear be made. To effect this test, the physician must open the vaginal passage or vault in order to obtain visual access to the cervix.

For this purpose, the physician typically uses one of the many vaginal speculums that are available today. Most of these speculums are made of metal and must be washed and sterilized after each use. Due to excessive vaginal discharge, particularly in women suffering from an infection, these existing instruments are difficult if not impossible to thoroughly clean. Particles often remain attached to the instrument even after washing, cleaning and sterilization. This can leave a doubt in the mind of the doctor and his staff as to whether or not they are, in fact, reinflecting the woman under examination. Further, the presently available speculums open with a jaw-like action which reduces the usefulness of the speculum. Such speculums render episiotomy repair an extremely difficult task in that the hinge portion is often in the precise area where stitching is required and tend to impair both visual and manual access.

The speculum described in the said Poirier application overcomes many of these difficulties by providing a speculum having a pair of elongated blades which are hinged along one elongated edge. In a preferred embodiment the speculum is made of plastic and is an integral unit with a so-called "living hinge."

When this speculum is used particularly in surgical repair of the episiotomy operation following child birth, the speculum should be securely lockable in a given open position such that the physician has both hands free to perform the necessary stitching. Further, the locking mechanism which facilitates this operation should be relatively simple and easy to operate and yet not impede the vision of the surgeon or obstetrician utilizing the instrument. Various locking mechanisms were described in the said Poirier application and all of these for the most part perform satisfactorily. On the other hand, these locking mechanisms do suffer from the slight disadvantage that they are somewhat difficult to operate and in some cases significantly add to the cost of the speculum.

It is, accordingly, an object of this invention to provide a relatively simple, easy to use locking mechanism for a side opening speculum.

Another object of this invention is to provide an improved low cost speculum having a locking mechanism that is integrally formed with the speculum itself.

BRIEF DESCRIPTION OF THE INVENTION

The latching mechanism for a speculum constructed in accordance with a preferred embodiment of this invention is formed integrally with the speculum itself. The speculum includes first and second members. Each member includes an elongated blade with a convex outer surface, a concave inner surface and a handle. The blade portions are integrally connected along one edge for pivotal movement. Preferably the members themselves are formed of a stiffly flexible plastic and the hinge means is formed by providing a relatively thin thickness dimension in the plastic material, i.e., the material is grooved so that the two blades may flex along this thin dimension or groove.

The latching mechanism is formed integrally with each blade and includes opposing teeth-like, interlocking protuberances on the inner surface of each blade adapted to frictionally engage each other thereby to maintain the relative positions of the blades. Preferably these protuberances are positioned contiguous to the blade pivot edges thereby to not impede the view of the surgeon. In a preferred embodiment, the end portion of the faces of the protuberances may have raised pads to increase the frictional contact between the opposing tooth-like protuberances and yet, because the area of contact remains essentially constant, blade loading also remains essentially constant.

BRIEF DESCRIPTION OF THE DRAWING

The novel features that are considered characteristic of this invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation, as well as additional objects and advantages thereof will be best understood from the following description when read in connection with the accompanying drawings, in which:

FIG. 1 is a side elevation view of a speculum of the type described in the said Poirier application having a locking mechanism constructed in accordance with this invention;

FIG. 2 is a top plan view of the speculum illustrated in FIG. 1 particularly illustrating the radially outwardly flared handles;

FIG. 3 is a front end view of the speculum illustrated in FIG. 1;

FIG. 4 is a back end view of the speculum shown in FIG. 1 which clearly depicts the locking mechanism of this invention;

FIG. 5 is a bottom view of the speculum illustrated in FIG. 1 but with the speculum now presented in its open position;

FIG. 6 is a back end view of the speculum illustrated in FIG. 5;

FIG. 7 is a cross-sectional view of the locking mechanism taken along the section lines 7—7;

FIG. 8 is a partial blown-up view of the locking mechanism as seen in FIG. 7;

FIG. 9 is a cross-sectional view of the speculum illustrated in FIG. 1 taken along the section line 9—9; and

FIG. 10 is a partial cross-sectional view taken along the section line 10—10 of FIG. 9 illustrating the locking mechanism in a closed position.
DESCRIPTION OF THE PREFERRED EMBODIMENTS

As is described in the said Poirier application, the speculum illustrated in FIGS. 1-10 has a pair of mating side members 10 and 12. Each member includes a blade portion 18 and a handle portion 20. Each of the members 10 and 12 is generally hollow and shell-like to provide a convex exterior of the required shape for the purpose intended and conversely, a generally concave interior to permit visual as well as manual access thereto. The two side members 10 and 12 are joined together by a hinge means 14 at one edge which hinge means will hereinafter be referred to as the axis of the speculum.

Each of the side members 10 and 12 is formed of integrally connected parts — a blade portion 18 and a handle portion 20 — as noted. In the preferred embodiment, the two side members 10 and 12 preferably are formed of a single piece of stiffly, flexible plastic material such as polyamide sold under the trade name "NYLON," polytetrafluoroethylene sold under the trademark "TEFLON" or alternatively, a polypropylene plastic may be used or as still another alternative a high density polyethylene plastic may be used.

The hinge means 14 is of the same material as the two side members 10 and 12. To form the hinge means, the material joining the two side members 10 and 12 along their upper longitudinal edge is merely molded or fabricated to have a relatively thin wall thickness dimension or groove as seen at 14 (FIG. 3) such that the plastic, which is stiffly flexible to begin with, can more easily flex at this point. A hinge of this type is capable of many flexures over an extended period of time without the plastic material fatiguing or breaking. The hinge 14 extends only along that portion of the adjoining edges of the side members 10 and 12 which lie in a straight line and constitute the axis of the speculum. Otherwise the flexure of the two pieces would be inhibited. It is thus seen that the hinge 14 permits the two side members 10 and 12 to flex or pivot about the common longitudinal edge of the blade portion 18 such that the lower longitudinal blade edges of the speculum may be pivoted open, as may be seen most clearly in FIG. 5, to permit visual and manual access to the interior of a body passage.

In accordance with a preferred embodiment of this invention, latching mechanism 22 is provided which permits the speculum to be pivoted about its axis between an open and closed position and remain in any desired open or closed position. This latching mechanism 22 is particularly useful for those speculums designed for surgical usage, i.e., episiotomies and the like. The locking mechanism 22 includes interleaved, tooth-like sets of protuberances 24 and 26 (FIG. 5) which are formed respectively on the inner concave surface 27 of the speculum blades in a region contiguous to the hinge 14. These protuberances are formed of the same plastic material as the speculum itself and preferably are molded integrally therewith as noted. By way of shape, they are formed to be planar, in parallel relationship to each other in planes perpendicular the axis of the hinge 14. The respective sets of protuberances 24 and 26 are offset such that when the speculum is closed they tend to interleave with each other. In this manner one protuberance of the set 26 enters the space or gap between two adjacent protuberances of the other set 24. In the embodiment illustrated there are only two protuberances in the set 24 which are positioned to interlock or interleave in the spaces between the set of three protuberances 26. Braces 28 are molded integrally with the outer two of the protuberances of set 26 to prevent their excessive flexure and to maintain close frictional contact between the interleaving protuberances. The thickness of each protuberance 24 is preferably greater than the spacing between the other set of protuberances and conversely the spacing between any pair of protuberances is less than the thickness of the mating interleaving protuberances of the other set. Stated otherwise, there should be an interference fit between the interlocking protuberances.

In a preferred embodiment of the invention, the design of the interlocking sets of protuberances is modified as illustrated to permit essentially a constant frictional load resisting pivotal movement of the blades. To achieve this, the thickness of the several protuberances of each set is reduced to less than the spacing of the protuberances in the opposing set. At the tip portion of one of the sets of protuberances 26, there is formed a pad 30 on the interior sides that are adapted to engage the other set of interlocking protuberances 24. The thickness of the pad is such that the interlocking protuberances achieve an interference fit. The pads 30 are proportioned in an arcuate fashion which are generally perpendicular to the path of movement of the tip portion of the protuberances. The arcuate pads 30 have a constant width measured along their path of pivotal movement to maintain the constant frictional loading. The point of application of the frictional resistance is at a relatively constant radial distance from the pivot point or axis of the hinge 14, hence, the frictional load resisting movement of the blades remains relatively constant regardless of blade position.

Whereas two protuberances are illustrated as being in the first set 24 and three in the second set 26, it is to be understood that this number could be one and two, three and four, or any other combination so long as the braced set exceeds by one number or protuberances in the unbraced set. Also, a single protuberance could be placed on each blade in an interfering relation, but this is not preferred. Furthermore, the number and configuration of the pads 30 may be varied but that illustrated is preferred for the reasons enumerated. In fact, as noted, the pads 30 need not be used at all and the protuberances are formed with an interfering fit.

It may be seen in the drawing that the handles 20 are flared outwardly to permit easy manipulation by the user. Immediately contiguous to the handle, the blades are recessed or formed to have a reduced radial dimension as seen at 122. This is a portion of the speculum that when in use is normally in the region of the lip of the vagina or other body passage. This recess 122 decreases the strain on the lip portion and facilitates such surgical stitching as may be required. Further out along the blade portion 18, the radial dimensions of the two blades are increased as seen at 124, although the region 126 is relatively planar, for the purpose of providing greater total movement to the speculum blades for a given arcuate pivot action of the speculum handles. This provides a wider speculum opening and better access to the interior of the body passage. The region 125 (FIG. 4) also is flared outwardly at the rear portion to avoid interference with the region to be stitched and to further insure that the speculum remains in position.
while in use. The front end portion of the blades is somewhat bulbous when they are in the closed position, i.e., the convexity of the blades increases as a function of the distance from the handles. This facilitates the speculum remaining in position within the vagina or other body passage without the normal tendency for it to be expelled by the normal contractions of the vaginal muscles.

The blades are generally planar in the vicinity of the hinge means but are rounded back inwardly as a function of the radial distance from the hinge 14 as seen at 128 (FIG. 3) such that the speculum blades when viewed from the front end position form a generally triangular silhouette of the speculum blades is relatively planar and permits the greatest access to the body cavity possible.

There has thus been described an improved speculum having a unique latching mechanism that permits low cost manufacture and positive loading against speculum movement.

It is obvious that many embodiments may be made of this inventive concept, and that many modifications may be made in the embodiments hereinbefore described. Therefore, it is to be understood that all descriptive material herein is to be interpreted merely as illustrative, exemplary, and not in a limited sense. It is intended that various modifications which might readily suggest themselves to those skilled in the art be covered by the following claims, as far as the prior art permits.

What is claimed is:

1. In a speculum which facilitates the examination of certain body passages having first and second members each having an elongated blade with a convex outer surface, a concave inner surface, an elongated edge, and a handle integral therewith, and hinge means connecting said blades together on an axis substantially co-

axial and coextensive with at least a portion of said elongated edge for pivotal movement of said members at said hinge means between closed and open positions, thereby to facilitate the opening of a body passage to viewing and examination, the improvement which includes:

spaced opposing, tooth-like protuberances one on the inner surfaces of respective ones of said blades adapted to frictionally engage each other during pivotal movement of said blades about said hinge means, thereby to maintain the relative open positions of said blades.

2. A speculum according to claim 1 wherein: said protuberances are positioned contiguous said blade edges thereby to facilitate the viewing of said body passages, and at least one of said frictionally engaging protuberances has a laterally positioned pad thereon adapted to engage the other protuberance with a substantially constant frictional loading.

3. A speculum according to claim 1 wherein said speculum is plastic and said hinge means and said members are integral.

4. A speculum according to claim 3 wherein said protuberances are plural, planar, perpendicular to said axis and positioned relatively on said respective blades to interleave with an interference fit.

5. A speculum according to claim 4 wherein the thickness of said protuberances is less than the spacing between opposing pairs of protuberances, and the tip portion of at least one of said protuberances has formed thereon a pad which together with the thickness of the protuberance exceeds the spacing between said opposing protuberances, thereby to achieve an interference fit and relatively constant frictional torque resisting pivotal movement of said blades.

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