

[54] RETENTION CATHETER

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[56] References Cited

UNITED STATES PATENTS

2,072,346	3/1937	Smith.....	27/24 A
1,391,464	9/1921	Degenhart	27/24 A
2,649,092	8/1953	Wallace	128/349 R
2,616,429	11/1952	Merenlender.....	128/350 R
3,713,447	1/1973	Adair	128/349 R
2,556,783	6/1951	Wallace	128/321

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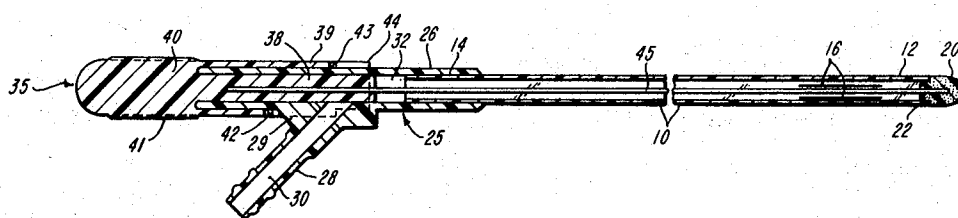
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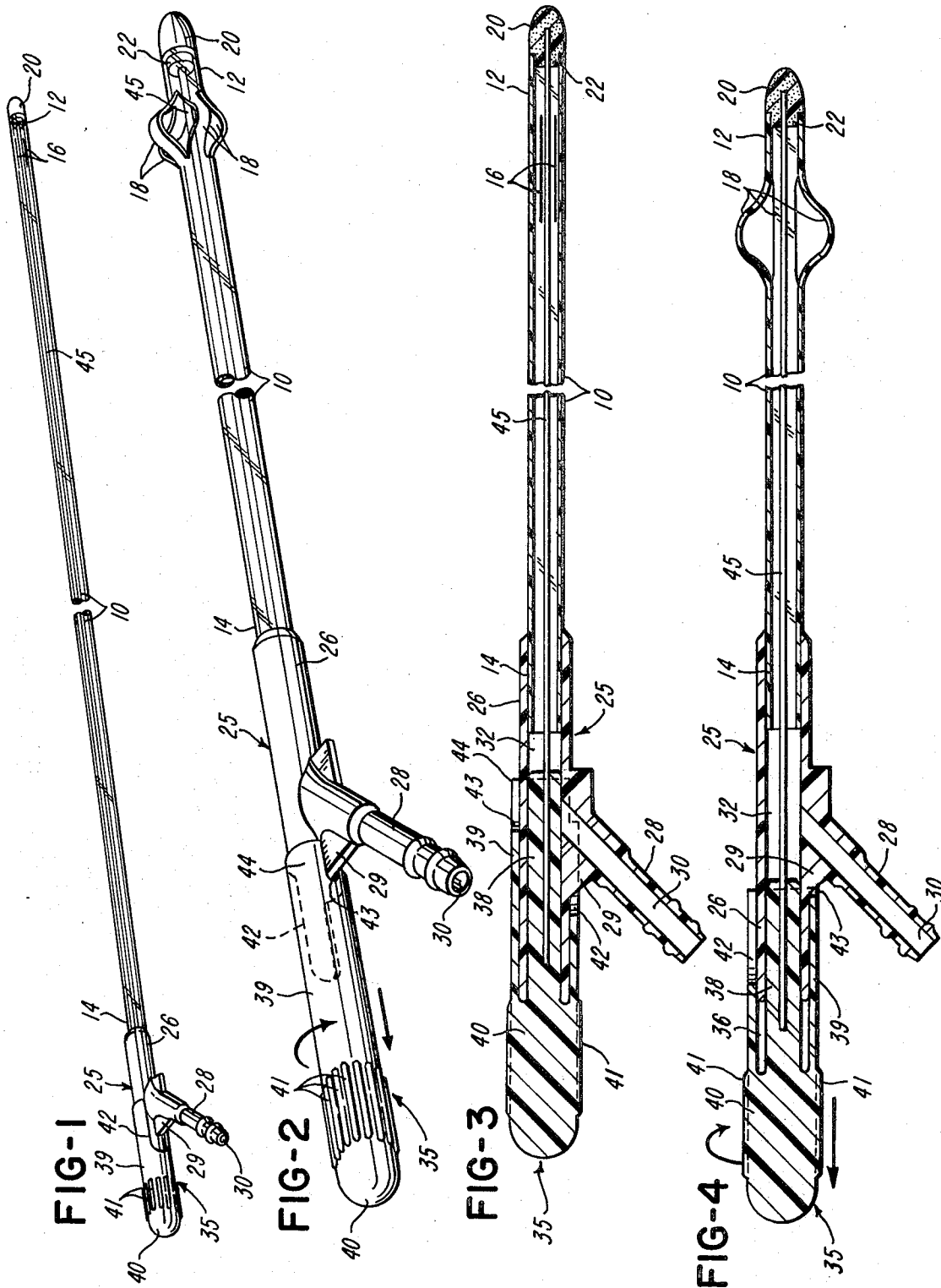
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ABSTRACT

A plurality of circumferentially spaced slits are formed within the inlet end portion of an elongated flexible plastic tube adjacent a resilient tip portion. The slits define links which flex outwardly to expanded retaining positions in response to a pulling force exerted on the tip portion by a small diameter flexible actuating line extending within the tube. A Y-shaped fitting is connected to the outlet end portion of the tube and slidably supports an actuating member which is connected to the corresponding end of the actuating line to provide for remotely flexing the links and locking them in their expanded positions. The actuating member also serves to close the outlet within the fitting during insertion and withdrawal of the tube, and the tube is adapted to compress axially in the event the actuating member is pulled before the inlet end portion of the tube enters the bladder.

6 Claims, 4 Drawing Figures





RETENTION CATHETER

BACKGROUND OF THE INVENTION

In the art of catheters of the type which is adapted to be inserted into the urinary bladder through the urethra and to be retained within the bladder, the catheter which is predominately used is commonly referred to as the Foley catheter. This form of catheter includes a molded rubber tube which defines a main fluid passage for urinary flow and a smaller parallel fluid passage which extends to an inflatable retention balloon molded as an integral part of the inlet end portion of the tube. A tubular projection is molded as an integral part of the opposite or outlet end portion of the tube and forms an extension of the smaller fluid passage. A check valve is inserted within the tubular projection, and liquid is pumped through the valve, usually by a syringe, for hydraulically expanding the retention balloon after it is inserted into the bladder.

It is of course desirable to minimize the outer diameter of the tube to provide less discomfort to the patient during insertion, use and withdrawal of the catheter. On the other hand, it is also desirable for the main fluid passage within the tube to have a maximum cross-sectional area to provide for quickly relieving fluid from the bladder through the main passage. Accordingly, the rubber catheters have been molded in various manners and configurations to increase the area of the main passage without increasing the outer diameter of the tube.

It has also been found that there is a tendency for kidney stones or particles to form on the tip portion of a rubber catheter after the catheter has remained inserted for several days. As a result, it is common for nurses to flush or irrigate the bladder several times daily through the catheter to flush out the precipitating stones or particles and to lubricate the tip portion of the catheter. If this is not performed, the patient may suffer substantial discomfort or pain and possibly injuries when the catheter is withdrawn with the particles attached to the tip portion. Furthermore, it has been discovered that if the balloon portion of a Foley catheter is inadvertently expanded before the inlet tip portion projects completely into the bladder, it is likely that the patient will suffer severe discomfort or injury, and possibly even death, especially if the balloon is permitted to remain expanded or inflated for a substantial time in a wrong area such as the prostate gland.

SUMMARY OF THE INVENTION

The present invention is directed to an improved retention-type catheter which is primarily adapted for insertion into the bladder through the urethra. The catheter of the invention is simple and inexpensive in construction, is convenient to use, and provides for significantly increasing the cross-sectional area of the main fluid passage within the tube while decreasing the outer diameter of the tube. In addition, the catheter of the invention eliminates the need for providing a syringe pump, and provides for retaining the catheter in proper position within the urethra without any danger of the retaining means expanding before it enters the bladder. Furthermore the catheter disclosed herein eliminates the problem of kidney stones forming on the inner tip portion of the tube and, in addition, provides for less

discomfort to the patient during insertion, use and withdrawal of the catheter.

In general, these features and advantages are provided by an elongated flexible tube of a resilient plastics material and which is adapted to be mechanically expanded on one end in response to movement of an actuator mounted on a fitting secured to the opposite end of the tube. The actuator also serves as a valve member for closing the outlet of the tube during insertion and withdrawal of the catheter. Other features and advantages of the invention will be apparent from the following detailed description, the accompanying drawing and the appended claims.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of a catheter constructed in accordance with the invention, with a center portion broken away, and illustrated in its normal condition ready for insertion;

FIG. 2 is an enlarged perspective view of the catheter shown in FIG. 1 and illustrated in its expanded condition for retaining the catheter after it is inserted into the bladder;

FIG. 3 is an enlarged axial section of the catheter shown in FIG. 1; and

FIG. 4 is an axial section of the catheter shown enlarged in FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The catheter shown in FIGS. 1-4 includes an elongated flexible tube 10 of a thermoplastics material preferably consisting of polyurethane having a durometer within the range of 20 to 65 and preferably about 45. The tube 10 illustrated has an outer diameter of 4 mm. and includes an inner or inlet end portion 12 and an outer or outlet end portion 14. A plurality of four circumferentially spaced slits 16 extend axially with the inlet end portion 12 of the tube 10 and define a corresponding plurality of elongated narrow links 18 as an integral part of the tube 10.

A resilient plug or tip portion 20 forms a closure for the inlet end portion 12 of the tube 10 and is preferably constructed of a polyurethane material which is more resilient than the material forming the tube 10. The plug 20 has an outer diameter which is the same as that of the tube 10 and includes a smaller diameter cylindrical portion 22 which projects into the end portion 12 of the tube and is secured by an epoxy-type adhesive. The plug or tip portion 20 may also be formed of a harder material and then coated with a more resilient material to form a resilient end surface.

A generally Y-shaped tubular fitting 25 is molded of a thermoplastics material and includes a straight cylindrical portion 26 which receives the opposite or outlet end portion 14 of the tube 10. The fitting 25 is secured to the tube 10 by an epoxy-type adhesive and also includes a tubular portion 28 which projects from the cylindrical portion 26 at an acute angle. The tubular portion 28 is reinforced by an integrally molded web 29 and defines an outlet passage 30 which forms an extension of the chamber 32 defined by the cylindrical portion 26 of the fitting 25. The tubular portion 28 is adapted to receive a flexible drainage line or tube (not shown) in generally the same manner as the outlet end portion of the conventional Foley catheter.

A generally cylindrical actuating member 35 has an axially extending cylindrical cavity 36 which receives the opposite end of the cylindrical portion 26 of the fitting 25. The cavity 36 also defines a cylindrical valve member 38 which projects into the chamber 32 of the fitting 25 and a cylindrical sleeve portion 39 which surrounds the cylindrical portion 26 of the fitting. The actuating member 35 also includes a head portion 40 which has a plurality of circumferentially spaced and axially extending ribs 41 projecting outwardly to form a finger-gripping surface for the actuating member 35.

The actuating member 35 is supported for both axially and rotary movement by the cylindrical portion 26 of the fitting 25 and is movable from a retracted or closed position (FIGS. 1 and 3) and a locked extended or open position (FIGS. 2 and 4). When the actuating member 35 is in its closed position (FIG. 3), the cylindrical portion 38 effectively closes the chamber 32 from the outlet passage 30. When the actuating member 35 is in its open position (FIG. 4), the cylindrical portion 38 is retracted to open the chamber 32 to the passage 30.

A U-shaped notch or recess 42 is formed in the outer sleeve portion 39 of the actuating member 35 and is adapted to receive the tubular portion 28 of the fitting 25 (FIG. 3) when the actuating member 35 is located in its closed position. A substantially smaller U-shaped notch 43 is also formed within the sleeve portion 39 of the actuating member 35 in diametrically opposed relation to the notch or recess 42 and is adapted to receive the reinforcing web 29 for the tubular portion 28 to lock the actuating member 35 in its extended or open position (FIGS. 2 and 4). The sleeve portion 39 of the actuating member 35 extends a greater distance axially on one side to form a part cylindrical projection 44. This projection 44 serves to prevent the actuating member 35 from being rotated on the cylindrical portion 26 of the fitting 25 by an angle greater than 180°. That is, when the actuating member 35 is rotated in either direction, the projection 44 engages the reinforcing web 29 which forms a stop for further rotation of the actuating member 35.

An elongated flexible actuating element or line 45 extends within the tube 10 and has one end portion which projects axially into the cylindrical valve member portion 38 of the actuating member 35 and is positively secured by an epoxy-type cement. The opposite end portion of the line 45 projects axially into the center of the plug or tip portion 20 and is also positively secured by an epoxy-type cement. As illustrated, the line 45 is constructed of a thermoplastic material such as nylon and has a diameter of about 1 mm. However, the line 45 may also be formed of other materials such as stainless steel wire.

The catheter shown in the drawing is used in the following manner. After the catheter shown in FIG. 1 is removed from a sanitary tube-like container, the plug or tip portion 20 and the tube 10 are inserted into the urethra with the actuating member 35 in its closed position (FIG. 3). When the tube 10 is inserted sufficiently for the inlet end portion 12 of the tube 10 to be located within the bladder, the actuating member 35 is pulled outwardly on the fitting 25 so that a tension force is exerted on the flexible line 45. This force is effective to pull on the plug or tip portion 20 causing the links 18 to flex or fold outwardly to expanded positions (FIGS. 2 and 4). In these positions, the links 18 serve to retain

the inlet end portion 12 of the tube 10 within the bladder in the same manner as the hydraulically expanded balloon of the conventional Foley catheter. The outwardly projecting links 18 are secured in their expanded positions by rotation of the actuating member 35 by 180° to a locking position where the notch 43 receives the reinforcing web 29 of the fitting 25. The urine within the bladder flows into the tube 10 through the openings defined between the expanded links 18 and discharges from the outlet end portion 14 of the tube through the chamber 32 and outlet passage 30.

When it is desired to retract the catheter, the actuating member 35 is pulled slightly to remove the reinforcing web 29 from the notch 43, and then rotated in an opposite direction by 180°. The actuating member 35 is then released so that the tension is removed on the line 45 and the links 18 are free to return to their original collapsed position (FIGS. 1 and 3) as a result of the elastic memory provided by the polyurethane material forming the tube 10 and links 18.

In the event that the inlet end portion 12 of the tube 10 is not completely inserted into the bladder when the actuating member 35 is pulled to its open position, and the links 18 are surrounded or confined by the wall of the urethra or tissue of the prostate gland, the links 18 will not expand but will remain in their collapsed positions. Instead, the tube 10 compresses axially by a distance corresponding to the extension of the actuating member 35. Since the links 18 extend axially of the tube 10 in their normal collapsed positions, the slightest restraining force exerted radially inwardly on the links 18 is effective to maintain the links 18 in their collapsed positions as a result of the substantial mechanical advantage tending to maintain the links 18 in their axially extending straight positions. Thus the links 18 can only flex to their expanded positions if the links 18 are not confined or restrained and are in an open chamber such as the bladder cavity.

When the actuating member 35 is released to its closed position (FIGS. 1 and 3) for retraction of the catheter, the outlet passage 30 is closed. Thus the tube attached to the tubular portion 28 of the fitting 25, may be removed so that the catheter may be conveniently rotated during withdrawal to lessen the discomfort to the patient.

From the drawing of the above description, it is apparent that a catheter constructed in accordance with the present invention, provides desirable features and advantages. For example, it is apparent that the catheter is simple and economical in construction and is adapted for providing less discomfort to the patient during insertion, use and withdrawal of the catheter. Furthermore, when the links 18 are flexed to their expanded positions, the links not only serve to retain the inlet end portion 12 of the tube 10 within the bladder, but also provide large openings therebetween for the flow of fluid into the inlet end portion 12 of the tube 10.

Another important advantage is provided by the small diameter of line 45 within the tube 10 for moving the links 18 between their collapsed and expanded positions. That is, the inside diameter of the tube 10 and the outside diameter of the line 45 provide for a maximum differential area for the fluid passage while maintaining the minimum outer diameter of the tube 10. As also mentioned above, there is substantially no danger of injuring a patient by pulling on the actuating mem-

ber 35 before the inlet end portion 12 of the tube 10 is inserted into the bladder, since the links 18 will remain in their collapsed positions if there is any confining force acting upon the links 18. In addition, the actuating member 35 also functions as a valve member to block or close the outlet passage 30 during insertion or extraction of the catheter so that the catheter may be simultaneously rotated to facilitate insertion or retraction, without the inconvenience of an attached drainage line or tube.

While the form of catheter herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to the precise form of catheter described, and that changes may be made therein without departing from the scope and spirit of the invention as defined in the appended claims.

The invention having thus been described, the following is claimed:

1. An improved catheter adapted for insertion into a bladder through the urethra, comprising an elongated flexible resilient tube of uniform cross-section and including an open inlet end portion and an open outlet end portion, a plurality of circumferentially spaced and generally axial extending cuts within said inlet end portion of said tube to form a plurality of axially extending links therebetween, said links being movable between normal collapsed positions and outwardly projecting expanded positions, an elongated flexible actuating element extending within said tube, a plug member closing said open inlet end portion of said tube and connected to one end of said actuating element, a substantially rigid valve body defining a valve chamber, means attaching said valve body to said open outlet end portion of said tube, means defining an outlet for said chamber, a valve member supported for movement within said valve chamber for opening and closing said outlet, means connecting the opposite end of said actuating element to said valve member, said links being movable from said collapsed positions to said expanded positions in response to axial movement of said actuating element from a released position to a latched position for retaining said inlet end portion of said tube within the bladder, and means providing for axial movement of said actuating element from said released position to said locked position without moving said links to said

expanded positions in response to application of a tension force on said actuating element when said links are restrained from being moved to said expanded positions by surrounding body tissue.

2. A catheter as defined in claim 1 wherein said flexible tube compresses axially in response to said application of said tension force on said actuating element when said links are restrained from moving to said expanding position.

3. A catheter as defined in claim 1 wherein said plug member includes a reduced portion cooperating to form a circumferential shoulder receiving the end of said inlet end portion of said tube, and the radial width of said shoulder being substantially equal to the wall thickness of said tube.

4. A catheter as defined in claim 1 wherein said tube comprises a flexible polyurethane material.

5. A catheter as defined in claim 1 wherein said plug member has a tip surface with a resiliency greater than the resiliency of said tube.

6. An improved catheter adapted for insertion into a bladder through the urethra, comprising an elongated flexible resilient tube of uniform cross-section and including an open inlet end portion and an open outlet end portion, a plurality of circumferentially spaced and generally axial extending cuts within said inlet end portion of said tube to form a plurality of axially extending links therebetween, said links being movable between normal collapsed positions and outwardly projecting expanded positions, an elongated flexible actuating element extending within said tube, a plug member closing said open inlet end portion of said tube and connected to one end of said actuating element, a substantially rigid valve body defining a valve chamber, means attaching said valve body to said open outlet end portion of said tube, means defining an outlet for said chamber, a valve member supported for movement within said valve chamber for opening and closing said outlet, means connecting the opposite end of said actuating element to said valve member, and said links being movable from said collapsed positions to said expanded positions in response to axial movement of said actuating element from a released position to a latched position for retaining said inlet end portion of said tube within the bladder.

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