

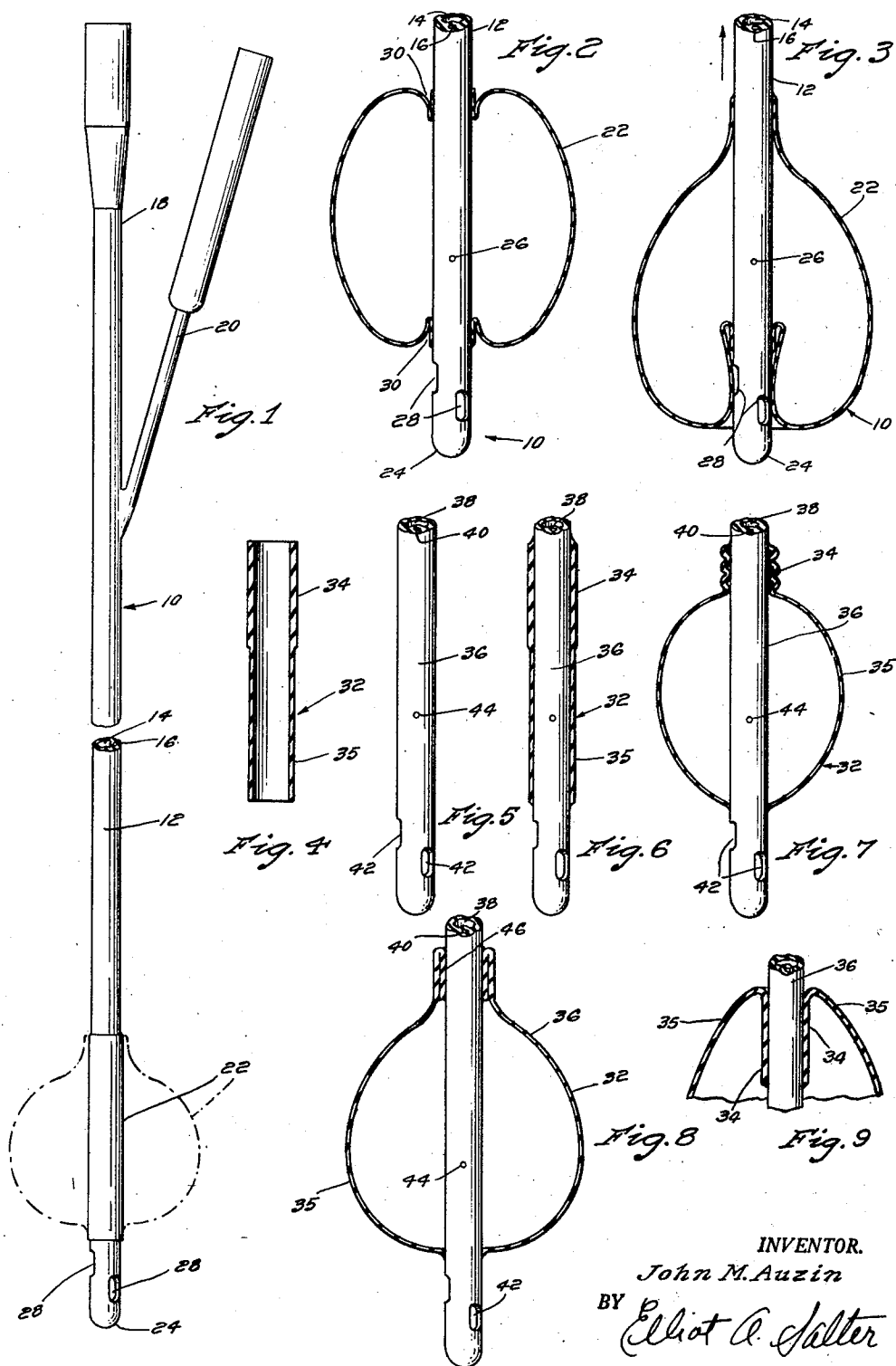
June 30, 1959

J. M. AUZIN

2,892,458

CATHETER

Filed July 31, 1956



INVENTOR.

John M. Auzin

BY

Elliott A. Jatter

Atty.

1

2,892,458

## CATHETER

John M. Auzin, Whitman, Mass.; Kathleen T. Auzin,  
executrix of said John M. Auzin, deceased

Application July 31, 1956, Serial No. 601,143

8 Claims. (Cl. 128—349)

The instant invention relates generally to surgical rubber accessories and more particularly to a novel and improved catheter construction.

A primary object of this invention is the provision of a catheter of the distensible bag type so constructed as to insure that the drainage eye will never be covered or even partially covered by the distended bag when the catheter is in use and under tension.

Another object is the provision of a catheter of the distensible bag type, which, when the bag is distended to its specified capacity, will not suffer any decrease in drainage capacity due to stretching of the catheter shaft within the bag and subsequent diminishing of the drainage lumen diameter.

Another object of the instant invention is the provision of a catheter having maximum drainage capacity, the catheter being so constructed as to insure that said capacity will not be impaired or minimized under conditions of actual use.

A further object of my invention is the provision of a distensible bag catheter so constructed that a portion of the bag remains undistended.

Still another object of the instant invention is the provision of a catheter construction which, although relatively easy and economically feasible to manufacture, is nevertheless more efficient and dependable in use.

Other objects, features and advantages of the invention will become apparent as the description thereof proceeds when considered in connection with the accompanying illustrative drawings.

In the drawings which illustrate the best mode presently contemplated by me for carrying out my invention:

Fig. 1 is a side elevation of a conventional, prior art catheter;

Fig. 2 is a fragmentary elevation, on an enlarged scale and partly in section, showing the distal end of a prior art catheter with the bag in distended position;

Fig. 3 shows what may happen to the catheter of Fig. 2 in use when under tension or pull from outside the patient's body;

Fig. 4 is a sectional elevation, on an enlarged scale, of a bag or balloon constructed in accordance with my invention;

Fig. 5 is a fragmentary side elevation, on an enlarged scale, showing the distal end of a catheter shaft or body prior to assembly with the distensible bag of Fig. 4;

Fig. 6 is a fragmentary side elevation, on an enlarged scale, showing the parts of Figs. 4 and 5 in assembled relation;

Fig. 7 is a side elevation, partly in section and on an enlarged scale, showing the catheter of Fig. 6 in the process of being distended;

Fig. 8 is a side elevation, partly in section and on an enlarged scale, showing the catheter of Fig. 6 distended for use; and

Fig. 9 is a fragmentary side elevation, partly in section

2

and on an enlarged scale, showing the catheter of Fig. 6 under maximum distention.

One of the prime disadvantages of present-day retention and pressure catheters of the distensible or balloon type, such as are in common post-operative use after prostrate gland operations and the like, resides in the fact that once the catheter is introduced into the bladder and tension is applied to the proximal end to position it and place it under the proper pressure, the whole balloon structure tends to swing or move toward the catheter distal end. As a result of this, the balloon is apt to close the drainage eyes and accordingly impair or at least somewhat minimize the capacity of the drainage system. Another disadvantage commonly found in present-day catheters of this type resides in the fact that when the balloon is distended to a specified capacity, the catheter shaft within the balloon frequently stretches, thereby decreasing the diameter of that portion of the drainage lumen and hence decreasing the capacity of the overall drainage system.

Some manufacturers have attempted to overcome the aforementioned problems by pre-forming the balloons, such as by distending the balloon portion while the catheter is still in a wet state and at the same time introducing talc or some other like powdered substance to prevent the balloon from sticking while it is drying and curing. This manufacturing technique raises new problems, however, in that the distended portion of the balloon tends to take a permanent set and to remain larger in diameter at the distended portion. Furthermore, where the balloon is pre-formed in the manner indicated, it will usually begin to distend first at the pre-set portion upon introduction of air or fluid under pressure through the inflating passage, and hence, the desired uniform inflation of the balloon is not achieved.

Thus, it has been found desirable to provide a catheter of the distensible or balloon type so constructed as to minimize movement of the distended balloon, when under tension, toward the distal end of the catheter, at least to the extent of rendering said balloon incapable of covering or blocking the catheter drainage eyes. Furthermore, my novel and improved catheter construction minimizes stretching of the catheter shaft within the balloon during inflation of the latter, thereby insuring that maximum drainage capacity will be realized at all times.

Referring now to the drawings, and more particularly to Figs. 1 through 3, there is shown generally at 10 a conventional catheter comprising an elongated, cylindrical shaft or body portion 12 having extending there-through a drainage lumen 14 and an inflating lumen 16. The proximal end of catheter 10 is provided with the conventional bifurcated tubes 18 and 20 communicating with the lumens 14 and 16, respectively. A distensible bag or balloon 22 is secured over the catheter shaft 12 adjacent to but slightly spaced from the distal end 24 of said catheter. An opening or aperture 26 provided in the catheter wall intermediate the extremities of the balloon 22 communicates with inflating lumen 16 whereby air or fluid under pressure may be introduced into said lumen to inflate the balloon 22. A plurality of drainage eyes 28 are provided at the catheter distal end, it being understood that said drainage eyes communicate with drainage lumen 14. The balloon 22 may be secured to the catheter shaft 12 by any desired means, such as cementing or the like, or it may be integrally formed therewith, such as by the dip method, but since the method of manufacture forms no part of the instant invention, no further description pertaining thereto is deemed necessary.

3

Figs. 1, 2 and 3 are directed to a conventional prior art catheter, and in Fig. 1 it will be noted that the catheter is shown with its balloon partially but not completely distended. In Fig. 2 the catheter is shown with its balloon distended for use but under no tension, and it will be noted that an overlapping exists at each end of the balloon, as clearly shown at 30. It will be understood, of course, that the catheter is first introduced into the patient's bladder, and then the balloon 22 is inflated to assume the position shown in Fig. 2. In order to properly position the catheter, and to insure that it is under the proper pressure, a longitudinal pull or tension in the direction of the arrow shown in Fig. 3 is applied to the proximal catheter end, which extends externally of the patient. As will be seen quite clearly in Fig. 3, this tension or pull causes movement of the balloon 22 in a direction toward the catheter distal end whereupon the balloon completely obscures the innermost drainage eye 28 and partially obscures the outermost one, thereby greatly minimizing the drainage capacity of the system. The catheter drainage is further minimized due to the fact that during inflation of the balloon 22, the ends thereof stretch or elongate the portion of catheter shaft 12 that is located within said balloon, thereby resulting in a diametrical reduction in drainage lumen 14.

Referring now to Figs. 4 through 9, there is shown a balloon construction designed in accordance with the instant invention, which overcomes the aforementioned difficulties and problems. Thus, I have provided a balloon 32 having a thickened wall portion 34 extending from one end thereof to a point slightly less than half way of the overall balloon length. The balloon 32 is secured to a catheter shaft 36 having a drainage lumen 38, an inflating lumen 40, drainage eyes 42, and an inflating aperture 44. As will be noted, the construction of the catheter shaft is conventional in all respects, the novel constructional features of the instant invention residing solely in the details of the balloon 32. It will be noted that when the balloon 32 is secured in position on the catheter shaft, such as by cementing or the like, the thickened balloon portion 34 is preferably located adjacent the proximal end of the catheter shaft 36, whereas the thinner portion 35 of the balloon is located most closely adjacent to the catheter distal end.

In operation and use, it will be understood that the length of the thin portion 35 is such that when all of said portion is distended, the balloon will be of the desired capacity (5 cc., 30 cc., or 75 cc.). As air or fluid under pressure is introduced through inflating lumen 40 and thence through inflating aperture 44 to the interior of balloon 32, the thinner portion 35 of said balloon will commence to distend, while at the same time, the thicker portion 34 is forced backward toward the proximal end of the catheter, all of which is clearly shown in Fig. 7. When the desired inflation of the balloon 32 has been reached, the thickened portion will have reversed and doubled-up upon itself, as shown in Fig. 8; whereby to provide a relatively firm and rigid anchor against movement of the balloon toward the catheter distal end, such as would tend to obscure drainage eyes 42. The tendency for balloon 32 to resist longitudinal movement toward the catheter distal end results first of all from the natural resistance of the doubled-up, thickened portion 34 against buckling, which action would necessarily have to occur if the balloon were to swing toward the distal end, and secondly, from the fact that the friction between the inner surface of doubled-up, thickened portions 34 and the catheter shaft, as at point 46, also functions to resist such longitudinal movement. It will be understood that the specific thickness of the balloon portion 34 is not critical, but preferably, said portion is just thick enough so that it will not tend to distend when air or fluid under pressure is introduced into the balloon.

While the catheter is capable of effective use when inflated to the degree illustrated in Fig. 8, it will be under-

4

stood that as further pressurized fluid is forced into the balloon, thickened portion 34 will continue to reverse itself until it has become completely reversed, as illustrated in Fig. 9. In such a position, the balloon is under maximum distention.

Thus, it will be seen that there has been provided in accordance with the instant invention a catheter construction which at all times functions to insure maximum drainage capacity of the system. As hereinbefore described, much greater tension can be applied to the catheter shaft at its proximal end before the balloon will move toward the distal end than is possible with present-day catheters, and hence there will be far less tendency for the balloon portion to overlap and come in contact with the catheter shaft, such as frequently happens in present-day catheters and as illustrated in Fig. 2. Furthermore, with my construction, there is no tendency to stretch or elongate the catheter shaft portion located intermediate the balloon during distention of the latter such as would cause a reduction in diameter of the drainage lumen therein in view of the fact that undistended portion 34 absorbs this tension when being forced back.

While there is shown and described herein certain specific structure embodying the invention, it will be manifest to those skilled in the art that various modifications and rearrangements of the parts may be made without departing from the spirit and scope of the underlying inventive concept and that the same is not limited to the particular forms herein shown and described except insofar as indicated by the scope of the appended claims.

I claim:

1. In a catheter having a shaft with a balloon thereon, said balloon having an inflatable wall, means rendering one end portion of said inflatable wall less readily distensible than the remainder of said wall, said means being such that the minimum pressure required to fully inflate said remainder will be insufficient to commence inflation of said one end portion.

2. In the catheter of claim 1, said one end portion being located adjacent the catheter proximal end.

3. In a catheter having a shaft with a balloon thereon, said balloon having an inflatable wall, one end of said wall having an elongated thickened portion, said portion being of greater thickness than the remainder of said wall, the relation between said thickened portion and said remainder being such that the minimum pressure required to fully inflate said remainder will be insufficient to commence inflation of said thickened portion.

4. In the catheter of claim 3, said thickened portion being located adjacent the catheter proximal end.

5. A balloon catheter comprising an elongated shaft having substantially parallel drainage and inflating lumens therein, an eye at the distal end of said catheter in communication with said drainage lumen, a distensible bag on said shaft adjacent to but spaced from the catheter distal end and an opening in said catheter shaft wall interconnecting said inflating lumen with said bag to permit inflation of the latter, said bag having an inflatable wall, means rendering one end portion of said inflatable wall less readily distensible than the remainder of said wall, said means being such that the minimum pressure required to fully inflate said remainder will be insufficient to commence inflation of said one end portion.

6. In the catheter of claim 5, said one end portion being located adjacent the catheter proximal end.

7. A balloon catheter comprising an elongated shaft having substantially parallel drainage and inflating lumens therein, an eye at the distal end of said catheter in communication with said drainage lumen, a distensible bag on said shaft adjacent to but spaced from the catheter distal end and an opening in said catheter shaft wall interconnecting said inflating lumen with said bag to permit inflation of the latter, said bag having an inflatable wall, one end portion of said wall being of greater thick-

**5**

ness than the remainder of said wall, the relation between said thickened portion and said remainder being such that the minimum pressure required to fully inflate said remainder will be insufficient to commence inflation of said thickened portion.

8. In the catheter of claim 7, said thickened portion being located adjacent the catheter proximal end.

**5**

388,510  
1,735,519  
2,050,407  
2,308,484

**6****References Cited in the file of this patent****UNITED STATES PATENTS**

|              |               |
|--------------|---------------|
| Terrell      | Aug. 28, 1888 |
| Vance        | Nov. 12, 1929 |
| Wolff        | Aug. 11, 1936 |
| Auzin et al. | Jan. 19, 1943 |