

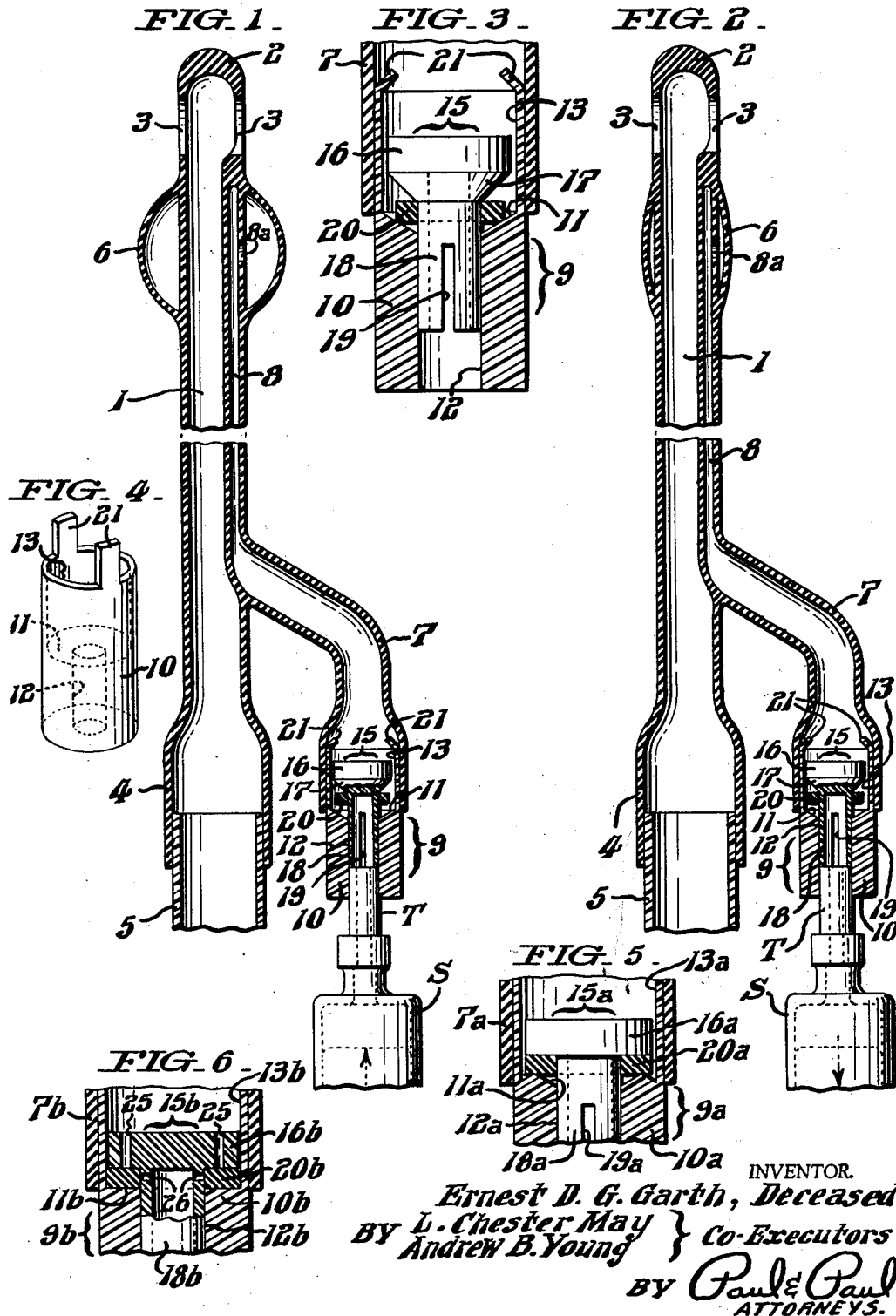
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3,131,694

CATHETERS

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3,131,694

CATHETERS

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Original application Dec. 29, 1960, Ser. No. 79,289, now Patent No. 3,087,492, dated Apr. 30, 1963. Divided and this application Jan. 16, 1963, Ser. No. 251,981
6 Claims. (Cl. 128—349)

This application is a division of the copending patent application of Ernest D. G. Garth, now deceased, Serial No. 79,289, filed December 29, 1960, now U.S. Patent No. 3,087,492, granted April 30, 1963, entitled "Valved Catheters."

The invention relates to catheters such as are used by physicians and surgeons in hospitals to drain internal organs of patients. More particularly, the invention is concerned with a catheter in the form of a flexible tube of which a portion adjacent the distal end is capable of being dilated with air, water or other fluid through an inflation tube beside or within the wall of the catheter by means of a syringe or the like, to form a bulb by which the catheter is constrained against withdrawal from the body of the patient during drainage. In such a catheter, as ordinarily made heretofore, the end of the inflation tube is closed off by the operator or by a rubber plug which is adapted to be punctured by a hypodermic needle on a syringe and to seal off itself upon removal of the needle. For deflation it has also been necessary to puncture the plug with a needle. The use of the required size needle is inconvenient and is attended at times in puncturing the wall of the inflation tube by the operator and occasionally jabbing of the needle into the operator's fingers.

The invention has for its chief aim to overcome the above and other difficulties heretofore experienced with catheters. This objective is realized in practice, as hereinafter more fully disclosed, through provision of a valve in the inflation tube of the catheter, which valve is automatically opened when the syringe is applied and which automatically closes upon withdrawal of the syringe after the retaining bulb is inflated or dilated as the case may be.

Other objects and attendant advantages will appear from the following detailed description of the attached drawings, wherein:

FIG. 1 is a broken out view in section on a magnified scale of a catheter with a valve conveniently embodying the invention in one form and showing the manner in which the bulb is expanded with the aid of a syringe or the like.

FIG. 2 is a view corresponding to FIG. 1 showing how the balloon of the catheter is collapsed in preparation for removal of the catheter from the patient.

FIG. 3 is a fragmentary view in section drawn to a still larger scale showing the construction of the valve to better advantage.

FIG. 4 is a view in perspective showing one of the components of the valve.

FIGS. 5 and 6 are views similar to FIG. 3 showing modified forms of the valve.

Generally speaking, the catheter illustrated in FIGS. 1-4 for the purpose of exemplifying the invention is of a well-known conventional type, it being formed throughout from rubber or other suitably flexible material and characterized by having a main flow tube 1 which is closed and round ended at the top as at 2 and there provided with lateral openings 3, and of which the bottom end portion 4 is flared for connection of an extension tube 5 of somewhat larger diameter. Surrounding the tube 1 immediately below the openings 3 is a thin walled

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jacket 6 capable of being expanded as in FIG. 1 to form a bulb for retainment of the catheter within an internal organ of the patient to be flushed or drained, by forcing air, water or other fluid therein by way of a laterally offset inflation tube 7 and a small continuing duct 8 longitudinally within the main tube 1 in communication, by way of an aperture 8a, with said bulb.

To facilitate introduction of the fluid utilized in expanding the jacket 6 or subsequently releasing the fluid when the catheter is to be withdrawn, a valve is provided by the present invention which is comprehensively designated 9 in FIGS. 1, 2 and 3. As shown, this valve comprises a non-metallic corrosion-resistant cylindrical body component 10 (separately illustrated in FIG. 4), which may be of a suitably hard plastic, such as nylon or polypropylene for example, and is force-fitted into or otherwise permanently secured to the open end of the inflation branch tube 7 of the catheter. In this instance, the body 10 of the valve is formed internally with a beveled seat 11 between a main axial lower bore 12 and a larger counter bore 13. The closure element 15 of the valve is preferably fashioned likewise from non-metallic corrosion-resistant material such as neoprene, and has a head 16 of which the bottom is beveled as at 17 and of which the diameter is somewhat less than that of the counter bore 13 in the valve body 10, and a pendent hollow stem 18 which has a free sliding fit in the main bore 12 of the body. A diametral slit 19 extends up from the bottom end of the stem 18 to a point somewhat below the head to provide a lateral flow port; and surrounding the stem beneath the head is a ring 20 of rubber or other suitably soft resilient non-metallic material which is adapted to normally seal downwardly upon the seat 11 within the valve body as best shown in FIG. 3. In order to limit the extent of upward movement of the closure element 15, the top edge rim of the body 10 is turned inwardly or is provided with inwardly bent stop lugs 21.

To expand the jacket 6 to form the retaining bulb after the catheter has been introduced into the patient, the tip of the syringe or pump 8 is inserted into the open bottom end of the lower bore 12 of the valve body from beneath as in FIG. 1. As a consequence, the closure element 15 is raised with incidental lifting of the sealing ring 20 from the seat 11 and establishment of communication between the upper bore 13 of the valve body 10, and the hollow in the stem 18 of said closure element by way of the slot 19 in said stem. With this accomplished, the syringe or pump 8 is operated to force air or liquid into the duct 8 to expand the jacket 6 to the extent desired or required, as shown in FIG. 1. Thereafter, as the syringe or pump is removed, it will be seen, that under the pressure created by the stretched rubber of the jacket 6, the element 15 of the valve is forced to closed position automatically, with attendant sealing of the ring 20 against the seat 11 as in FIG. 3 to prevent escape of the air or fluid from the bulb. In preparation for withdrawal of the catheter, the tip of the empty syringe or pump is again introduced into the bore 12 of the valve and the closure element 15 raised as before to clear the ring 20 from the seat 11 and establish communication between the upper bore 13 of the valve body and the hollow of the stem 18 of the closure element by way of the slot 19. Then, by operating the syringe or pump, the air or other dilating fluid will be sucked through the inflation tube to permit collapse of the bulb.

In the modification of FIG. 5 the head 16a of the closure element 15a has a flat bottom which is directly engaged by the resilient sealing ring 20a surrounding the stem 18a, and the seat 11a is formed with an upstanding sharp annular ridge against which the ring normally seals. In all other respects the construction and the manner of

its operation of the valve here is the same as set forth above in connection with the embodiment of FIGS. 1-3. Accordingly, in order to dispense with repetitive description, all features of this modification not particularly referred to but having their counterparts in the first described embodiment, have been identified by the same reference numerals with the addition however in each instance, of the letter "a" for convenience of more ready distinction.

In the modification illustrated in FIG. 6, the head 16b of the closure element 15b is flat bottomed, and is provided somewhat inward of its periphery with vertical through apertures 25. Further departures to be noted in this modification are that the seat 11b is flat; that in lieu of slots, lateral ports 26 are provided in the stem 13b of the closure element 15b immediately below the head 16b. When, in FIG. 6, the closure element 15b is raised, communication is established between the upper bore 13b of the valve body 10b and the hollow of the stem 13b by way of the holes 25 in the head 15b and the ports 26 of said stem.

While the preferred embodiments of this invention have been described in some detail, it will be obvious to one skilled in the art that various modifications may be made without departing from the invention as herein-after claimed.

Having described the invention, what is claimed is:

1. A catheter comprising a drainage tube having an inlet at the upper end for receiving body fluids and an outlet at the lower end for discharging such fluids, said drainage tube being provided along an intermediate portion of its length with a parallel duct for inflation fluid, said inflation-fluid duct being isolated from communication with said drainage tube, said inflation-fluid duct terminating at its upper end in a thin-walled jacket adapted to be expanded by applied fluid pressure into a generally round bulb encompassing but isolated from said drainage tube, said inflation-fluid duct terminating at its lower end in a branch tube; a valve in the extreme lower terminal portion of said branch tube, said valve comprising a tubular body having an upper bore and a lower bore,

an annular valve seat between said upper and lower bores, a movable closure element in said upper bore and having an under surface adapted normally to seat on said annular valve seat to close the valve, the diameter of said upper bore being greater than the diameter of said element, closure lifting means extending from the lower bore through the valve seat to the closure element, the lower end of said means being engageable and movable upward by the tip of a syringe inserted into the lower bore, and said lifting means being provided with an axially extending passage having an opening in said lower end in a position to coincide with the opening in a syringe tip and at least one lateral flow port between said lower end and the closure element.

2. A catheter according to claim 1 in which the valve seat includes a rubber-like sealing ring.

3. A catheter according to claim 1 in which the closure lifting means is tubular and in which at least one lateral flow port is approximately at its upper end adjacent the closure element.

4. A catheter according to claim 1 in which the closure lifting means is attached to the closure element to constitute a dependent stem extending through the valve seat into the lower bore.

5. A catheter according to claim 3 in which the closure lifting means is attached to the closure element to constitute a dependent stem extending through the valve seat into the lower bore.

6. A catheter according to claim 4 characterized in that said axially extending passage of the closure lifting means comprises a diametral slot extending axially from the lower end of said stem upwardly to a point below said closure element.

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