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TIDAL DRAINAGE AND IRRIGATION VALVE

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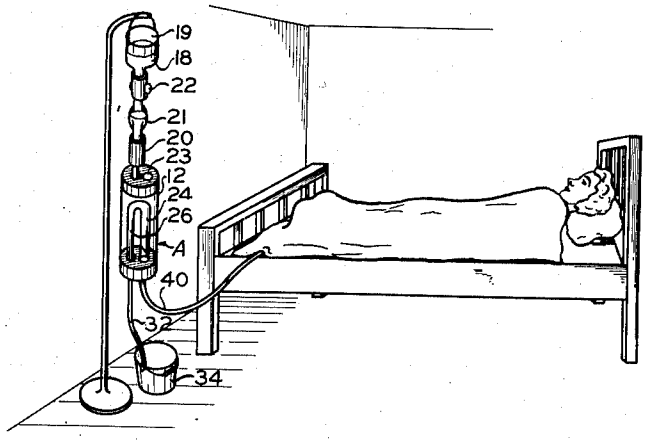

FIG. 1

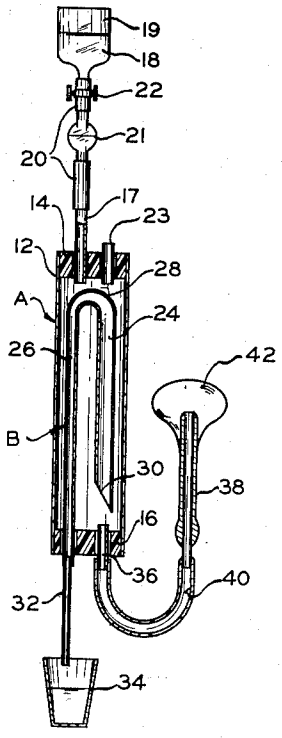

FIG. 2

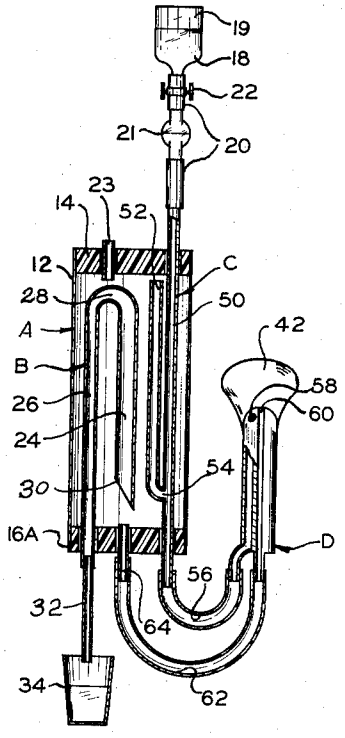

FIG. 3

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TIDAL DRAINAGE AND IRRIGATION VALVE

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1 Claim. (Cl. 128—227)

My invention relates to a tidal drainage and irrigation valve, and more particularly relates to a valve for safely controlling the automatic irrigation of a person's bladder.

In the treatment of patients who have lost the capacity to pass urinary waste materials by themselves because of a malfunctioning micturition reflex resulting from a stroke, paraplegia or similar disability, it is the common medical practice to withdraw the urinary waste by catheterization. Where bladder disease has already occurred or as a precautionary measure to prevent such infection, it is also desirable to simultaneously irrigate the bladder with bacteriostatic solutions. Thus, the usual therapy is flush the bladder continuously and during the same interval, to empty the bladder at a predetermined pressure by catheterization of the combined volume of the bacteriostatic irrigant and the body urine secretions.

In prior devices, constant great care was required by an attendant during such therapy to avoid overfilling the bladder as to cause its rupture, and yet insure that efficient irrigation of the bladder with bacteriostatic solution occurred. In particular, since the withdrawn urine was apt to be purulent, the instrument exit line could clog, thereby ultimately resulting in an excessive head of liquid placed upon the bladder.

It is, therefore, an object of our invention to construct a tidal drainage valve for safely controlling the automatic irrigation of a person's bladder.

Another object of our invention is to construct a tidal drainage valve wherein means are provided to prevent an excessive head of liquid from being exerted upon the bladder, should any portion of the lines be clogged with purulent material.

Another object of our invention is to provide a tidal drainage valve wherein a minimum of air and water locking occurs.

Another object of our invention is to provide a tidal drainage valve for the automatic irrigation of the bladder without the need of an attendant's continuous attention.

Another object of our invention is to construct a tidal drainage valve permitting observation of the interior valve processes at all times.

Another object of our invention is to provide a tidal drainage valve which may easily be set up by a technician in a minimum of time, thereafter to safely remain unattended for long periods of time.

Another object of our invention is to provide a tidal drainage and irrigation valve which is easily disassembled and lends itself to ease to cleaning and sterilization.

Other objects of our invention are to provide an improved device of the character described, that is easily and economically produced, which is sturdy in construction, and which is highly efficient in operation.

With the above and related objects in view, our invention consists in the details of construction and combination of parts, as will be more fully understood from the following description, when read in conjunction with the accompanying drawing, in which:

Fig. 1 is a perspective view of a tidal drainage valve embodying our invention.

Fig. 2 is an enlarged sectional view of the tidal drainage valve showing the details of its construction.

Fig. 3 is an enlarged sectional view of the tidal drainage valve wherein a safety manometer is incorporated therein.

Referring now in greater detail to the drawing in which similar reference characters refer to similar parts, we show a tidal drainage valve embodying our invention comprising an outer cylindrical jacket, generally designated as A, in which is mounted an inverted U-shaped syphon tube, generally designated as B.

The outer jacket A comprises a hollow cylindrical barrel **12**, preferably of an inert transparent plastic material, the upper and lower ends of which are closed with double-apertured stoppers **14** and **16** respectively.

The upper stopper **14** has an inlet tube **17** communicating with the barrel **12** whereby saline and/or bacteriostatic solutions **18** may be fed therein from a reservoir bottle **19** through flexible tubing **20** and a Murphy drip valve **21** in a conventional manner. A pinch cock **22** on the flexible tubing **20** may be adjusted to regulate the desirable rate of flow of bacteriostatic solution, preferably 30 to 60 drops per minute. A second hole **23** in the stopper **14** allows the interior of the jacket to communicate with the atmosphere.

The inverted U-shaped syphon tube B comprises a downwardly extending suction arm or upspout **24** and an exit arm or downspout **26**, the two arms being interconnected by a closed end portion **28**. It is to be observed that the suction arm **24** is of larger diameter than the exit arm **26** and has at its lower portion a biased open end **30** adjacent the lower portion of the interior of the barrel **12**. The differential diameter of the two arms together with the biased end **30** of the upspout inhibits the formation of water beads within the syphon-tube B at the termination of syphonage. In this regard it is further to be noted that a suitable wetting agent such as a polyoxyalkylene derivative sorbitan monooleate may be added to the solution **18** in order to further inhibit the production of water beads. The lower end of the exit arm **26** extends through one of the apertures in the lower stopper **16**, the interior of the exit arm being further narrowed by the insertion of capillary tube **32** therein to restrict the rate of flow of the syphon tube into a suitable receptacle **34**. The second aperture of the lower stopper **16** has a combined feed and drain tube **36** projecting therethrough and interconnecting with a single lumen catheter **38** through flexible tubing **40**. See Fig. 2. When the catheter **38** is inserted within the bladder **42** through the urinary tract, the bladder directly communicates with the jacket A through the combined feed and drain line and the tidal drainage valve functions as follows: with the tidal drainage valve mounted vertically so that the level of the bladder **42** is approximately at the midpoint of the jacket A, the solution **18** is permitted to drip from the reservoir **18** by releasing the pinchcock **22**. The flow is adjusted whereby the solution will be fed into the jacket through the inlet tube **17** at the rate of from 30 to 60 drops per minute. This rate will fill the patient's bladder in approximately one hour.

The level of fluid within the jacket A will continue to rise until it is commensurate with the bladder level at which point fluid will enter the bladder through the single lumen catheter **38**. It is to be noted that waste liquid is being delivered from the kidneys to the bladder by the body's natural processes, and this liquid urine also contributes to the filling of the jacket A when the bladder is full, the pressure therein will increase and cause the column of liquid within the jacket A and upspout **24** to rise. As the liquid rises in this manner, air may escape

through the port **23** to maintain atmospheric pressure on the growing column of liquid. As soon as the height of liquid rises above the closed end **28** of the syphon tube B, the liquid will spill over into the downspout **26** and cause a syphonic action which will act to immediately empty the contents of the jacket above the biased end **30**. Since the level of the biased end **30** in practice is at least six inches below the bladder, the bladder itself will be completely emptied of fluid before the syphonic action is broken when air enters the inverted U-tube B at **30**. After the drainage of the bladder and the interruption of the syphonic action, the solution **17** from bottle **18** will again fill the jacket to begin another cycle whereby alternate irrigation and drainage intervals will continue until the solution supply is exhausted. It is also to be observed that syphonic drainage will also occur thereafter solely by the production of urine by the body itself when the intravescular pressure is above atmospheric pressure. In Fig. 3, we show a modification of our invention in which continuous rather than cyclic irrigation is afforded through the use of a manometer inlet, generally designated as C, and a dual lumen catheter, generally designated as D.

The manometer C is contained within the jacket A and comprises a vertical inlet arm **50** which communicates with a manometer side arm **52** immediately adjacent thereto through a bore **54**. The upper end of the inlet arm **50** extends through the stopper **14** and is connected to the solution reservoir bottle **19** in the same manner as the first mentioned valve inlet tube **17**. The lower end of the arm passes through a third hole in stopper **16***a* wherein it is connected by a rubber tubing **56** to the outer chamber and orifice **58** of the dual lumen catheter D. The inner return orifice **60** of the catheter D communicates through flexible line **62** with drain tube **64**, the drain tube **64** passing through the stopper **16***a* into the barrel **12**. It is to be observed from Fig. 3 modification that the solution **17** enters the bladder directly by passing through inlet arm **50** and inlet tubing **56** into the outer chamber and orifice **58** of the dual lumen catheter D. The return line to the jacket A is separate and distinct through the inner orifice **60**, tubing **62** and drain tube **64**.

While the syphon tube B is mounted in a manner identical to the valve unit first described, there is no opportunity for residual purulent material and sediment collecting at the bottom of the jacket A to return to the bladder. Furthermore, incorporation of the manometer C modification with the dual lumen catheter permits continuous irrigation through one line and intermittent cyclic drainage to empty the bladder through a separate second line.

The purpose of the side arm **52** on the manometer C is to prevent an excessive head of solution to be imposed upon the bladder. Thus, the upper end of the side arm **52** is open and projects within the jacket A above the level of the closed end of the syphon tube B, thereby reflecting the pressure within the solution inflow circuit. If the pressure within the bladder should become excessive for any reason, as for example clogging of the exit line with solid material, the inflowing solution **18** will spill over the upper end of the side arm **52** and fill the jacket A. Thereafter, when the column of liquid rises above the closed end of inverted U-syphon tube B, syphonic action will withdraw the liquid from the jacket.

Since the entire valve is transparent, the complete operation therein is always observable. In addition, cleaning and/or sterilization of its component parts is easily accomplished by withdrawing them from the barrel **12** after removal of the stoppers.

Although our invention has been described in considerable detail, such description is intended as being illustrative rather than limiting, since the invention may be variously embodied, and the scope of the invention is to be determined as claimed.

We claim as our invention:

A tidal drainage and irrigation valve comprising an outer jacket having a vent at its upper portion thereof, a vertically disposed manometer having an inlet arm extending through the upper portion of said jacket for tubular connection with an overhanging reservoir containing irrigation solution, the lower portion of said inlet arm extending through the bottom of said jacket and being tubularly connected to one orifice of a dual lumen catheter, the second orifice of said catheter communicating with the lower portion of said jacket through a drain tube, a manometer arm having one end in communication with said inlet arm, the other end of said manometer arm communicating with the upper portion of said jacket, and a syphon member axially disposed within said jacket and having one arm communicating therewith, the second arm of said syphon member extending through the bottom portion of said jacket.

References Cited in the file of this patent

UNITED STATES PATENTS

2,385,876	Moorhead	Oct. 2, 1945
2,486,405	Henderson	Nov. 1, 1949
2,602,448	McKenna	July 8, 1952
2,710,005	McConnell	June 7, 1955

OTHER REFERENCES

Longacre: Journal of Urology, vol. 36, No. 1, pages 25–33, 128–227. (Copy in Division 55.)

Perdue: Journal of Urology, vol. 33, pages 198–200, 128–227, 1935. (Copy in Division 55.)