United States Patent Office

3,319,628
Patented May 16, 1967

REGULATOR TO CONTROL THE FLUID FLOW OF A SUCTION CATHETER

James C. Halligan, Radburn, N.J., assignor to Becton, Dickinson and Company, Rutherford, N.J., a corporation of New Jersey

Filed Feb. 3, 1964, Ser. No. 342,146
1 Clm. (Cl. 128—276)

This invention relates to a regulator for suction catheters and more particularly, to an improved regulator adapted to be used in combination with a suction catheter apparatus in which the fluid flow therethrough is controlled by regulating the flow of a second fluid therethrough.

Suction catheters generally employed for suctioning of the tracheal, bronchial, oral or nasal passages, do not have adequate means for controlled suction. Catheters of this type have many disadvantages and many difficulties are encountered when using them to aspirate fluid from a body cavity. When a catheter is inserted into a body cavity, to be aspirated, it is generally pinched off by a clamping means. When the catheter is in position to aspirate, suction is applied to the catheter and the body fluid is aspirated by releasing the clamping means which results in a sudden surge of fluid being drawn therethrough. This causes high impact to the surrounding tissue which may result in a very crude type of biopsy which irritates the surrounding tissue. Moreover, the aspirated fluid is contaminated with cellular debris making clinical tests difficult. Further, after repeated aspirations, a drying of the tissue surrounding the distal end of the catheter will result, and in some instances, actually denudes the epithelial tissue.

Several means have been employed to control the objectionable sudden surge caused by the release of a pinch clamp in a suction catheter device. Some devices employ apertures in the catheter at its proximal end, and by holding a finger or fingers over the apertures, a means is provided for creating the necessary suction to aspirate. However, this has the disadvantage of collapsing the tube in which the fluid is carried, which would cause a constriction and create a sudden increase in velocity of the fluid. Further, the danger of contamination of the fluid is greatly enhanced by placing the finger or fingers over the apertures in the tube. Another method using glass connections is subject to many disadvantages. Before use, the catheter assembly must be assembled and sterilized and after use must be disassembled, cleaned, reassembled and re-sterilized. The glass is subject to breakage during the assembly, disassembly and cleaning process which requires time and labor costs.

It is therefore an object of my invention to provide an improved regulator for controlling the fluid flow through a suction catheter by providing a means for regulating the flow of a second fluid therethrough.

Another object of my invention is to provide a regulator which is made of a substantially rigid plastic material, which does not collapse when pressure is applied thereto and which will not contaminate the fluids being aspirated by the suction applied thereto. A further object of my invention is to provide a regulator for a suction catheter apparatus in which said assembly is disposable.

Still another object of my invention is to provide a regulator for a suction catheter apparatus which is easily and inexpensively manufactured, which is an integral part of the assembly thus eliminating assembling the apparatus when used, and in which the regulating means is easily manipulated.

Generally, my invention contemplates providing a regulator for a suction catheter apparatus which includes in combination a relatively elongated flexible tube having a regulator made of substantially rigid plastic material and adapted to be removably connected between a vacuum source and one end of the plastic tube. The regulator includes a first tubular member which is removably connected to the vacuum source and plastic tube and a second tubular member formed integrally with the first tubular member so that the bore of the second tubular member communicates with the bore of the first tubular member. At the outer end of the second tubular member is a finger engaging means whereby the fluid flow through the first tubular member is controlled by regulating the flow of a second fluid through the bore of the second tubular member.

Other advantages will become more apparent by the following description and illustrative drawings in which:

FIG. 1 is a perspective view of the regulating means and flexible tube attached thereto;

FIG. 2 is a longitudinal sectional view taken along the lines of 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view taken along the lines of 3—3 of FIG. 2; and

FIG. 4 is a sectional view taken along the lines of 4—4 of FIG. 2.

Referring to the drawings and particularly to FIG. 2, my improved regulator for controlling fluid flow in a suction catheter is generally designated by numeral 10. The regulator is preferably formed of nylon, although other plastics having rigid properties may be used. The plastic material should be of the type which is inert to the fluids being collected. Regulator 10 comprises a longitudinally extending conduit tubular member 14 and is adapted to receive a flexible tubular member 16 such as a suction catheter which frictionally engages one end of the tubular member 14 at 17 in a pressed fit. Tubular member 14 is provided with ridges 18 so that an air tight connection is insured. The distal end of tubular member 16 is provided with a slotted opening 19 and beveled end portion 20. These are generally referred to as a "smooth whistle-tip and eyes."

At the opposite end of tubular member 14, a series of concentric ridges 21 is provided to frictionally engage tubing 13 which is operably connected to a vacuum source (not shown). The concentric ridges 21 are of increasing diameters so that a variety of sizes of tubing may be employed from the vacuum source. The tubing generally used to operably connect a catheter assembly may be employed. The catheter tubing may be made of polyvinyl or other suitable flexible plastic material which is not toxic to the patient or to parenteral fluids collected. It is convenient to use a tubing which is translucent or transparent as opposed to an opaque tubing, although an opaque tubing may be used.

A second tubular member or control tube 22 is formed integral with tubular member 14 so that bore 23 of tubular member 22 is in communication with bore 24 of tubular member 14. A flanged portion 24 is integral with tubular member 22 at its distal end and comprises a concave surface 25 extending inwardly from the outer portion of flange 24 and approximately at its mid-point, a second concave surface 26 is formed which communicates with bore 23 of tubular member 22. The flanged surfaces 25 and 26 are concavely designed to receive a finger of the operator to regulate and control the suction.

When using my improved regulator 10, the flexible tubular member 16 is placed into either the oral, nasal, tracheal or bronchial passages of a patient from which fluid is to be aspirated. A suitable vacuum source is operably connected to one end of the tubular member 14 so that it...
communicates with concentric ridges 21. When fluid is to be aspirated from the desired cavity, a suitable container is interposed between the vacuum source and regulator 10 and a suction is applied by placing a finger, such as the thumb, on the concave surface 25 of flange 24. Depending upon the amount of suction required, light or heavy thumb pressure may be used, regulating the flow of air through bores 23 and 25. Thus, if bore 23 is only partially covered by the finger, a partial vacuum is produced and fluid aspirated will flow through the apparatus slowly thereby causing substantially no irritation to the tissue due to suction impact. Thereafter, closure by full pressure of the finger over bore 23 may be employed to increase the fluid flow from the body cavity by reducing the flow of the second fluid (air) through the regulator.

It has been found that suction applied in this manner, even when at maximum flow of fluid through the catheter apparatus, substantially eliminates irritation of the surrounding tissue, thereby substantially reducing cellular debris therefrom.

It is obvious that many changes in design and materials may be employed without departing from the spirit and scope of my invention.

I claim:

A suction catheter apparatus having improved regulating means for controlling the fluid flow and suction there-through comprising a flexible plastic elongated catheter beveled at one end and having an opening formed adjacent said end, a regulator formed of a relatively rigid plastic material having a longitudinally extending conduit tube, the other end of said catheter being mounted in sealing engagement at one end of said conduit tube and the other end of said conduit tube adapted to be mounted to a source of suction so that material sucked through the catheter will be drawn through the conduit tube, an integrally formed control tube extending transversely from said conduit tube between the opposite ends and provided with an open outer end formed with a flanged finger engaging piece surrounding the opening, said finger engaging piece having a first concave surface extending inwardly from the outer portion of the flange to approximately the mid-point thereof and a second concave surface of greater angularity to the transverse axis of the finger piece than the first concave surface and extending inwardly from the first concave surface so that the lower portion of said second concave surface communicates with the bore of said control tube whereby the regulation of air flow is controlled by varying the pressure applied by a finger on the finger engaging piece.

References Cited by the Examiner

UNITED STATES PATENTS
2,715,899 8/1955 MacLean __________ 128—276 X
3,039,463 6/1962 Dickey et al. __________ 128—276
3,039,469 6/1962 Fountain _____________ 128—351

FOREIGN PATENTS
121,673 6/1927 Switzerland.

RICHARD A. GAUDET, Primary Examiner.
DALTON L. TRULUCK, Examiner.