

[54] **SUCTION CONTROL ARRANGEMENT FOR A SUCTION CATHETER**

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[51] Int. Cl. .... **A61m 1/00**

[58] Field of Search .... **128/276-278, 128/211, 297-302; 15/419, 421, 339; 251/142, 148, 149.1, 152, 205**

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[57] **ABSTRACT**

A suction control arrangement for a suction catheter having a body portion with a passageway formed longitudinally therethrough and a port means formed therein to provide access to the interior of the passageway, and having a cap means mounted on the body portion with an opening formed in it. The cap means is movable on the body portion such that the opening in the cap means and the port in the body portion may be aligned to eliminate suction through the passageway and the body means when the body means is attached at its opposite ends to suction conduit means in a suction catheter system. Alternately, the cap means may be moved to a closed position over the port means to establish suction in the system. The body portion and cap means have cooperative locking means to maintain the cap means in selected open or closed position with respect to the body portion.

**5 Claims, 4 Drawing Figures**

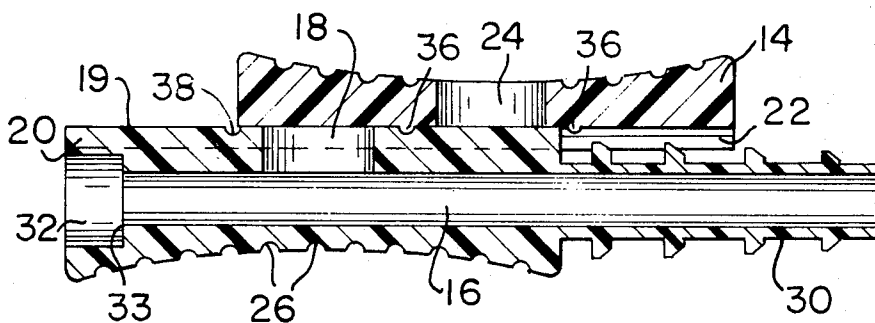


FIG. 1

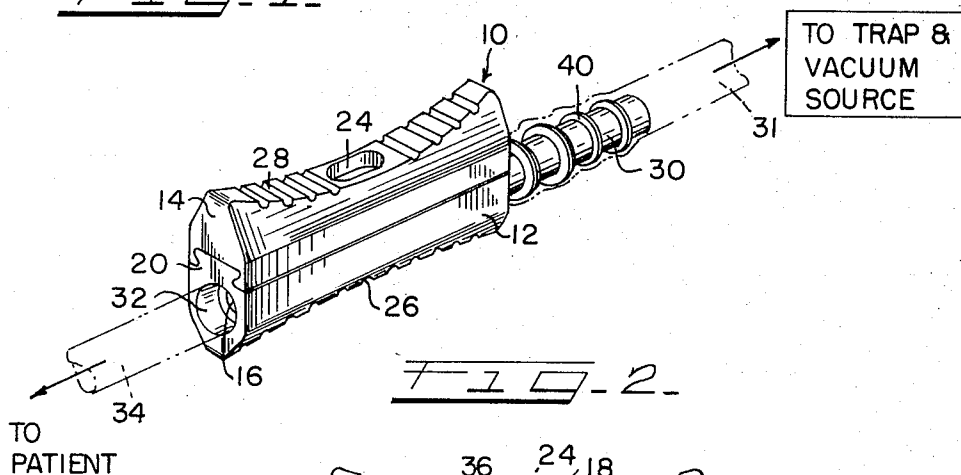


FIG. 2

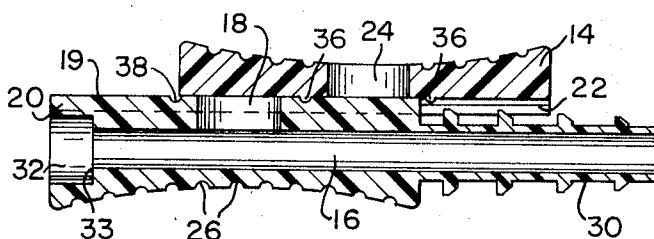
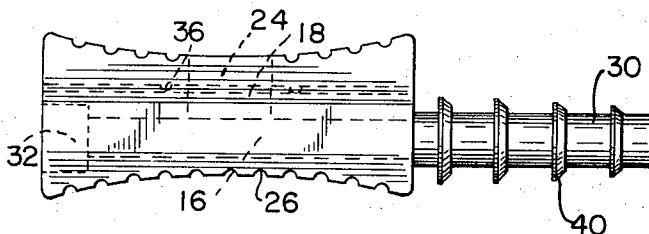
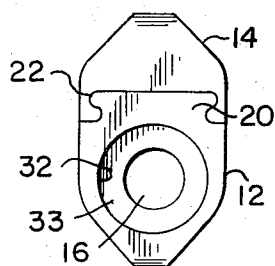


FIG. 3

FIG. 4



## SUCTION CONTROL ARRANGEMENT FOR A SUCTION CATHETER

### BACKGROUND OF THE INVENTION

The present invention relates to suction catheter systems in general, and, in particular, to means for controlling the vacuum used in such systems to withdraw fluids from body cavities in medical and surgical procedures.

Suction catheter systems are widely used and essential in various medical and surgical procedures for aspiration of mucous, blood and other bodily fluids out of various body cavities. Such systems usually include flexible, hollow catheter tubing or conduit which may have one end inserted into a body cavity and be attached, at its opposite end, to a fluid trap. Another port on the fluid trap will ordinarily provide for attachment, by similar conduit or hose, to a source of vacuum, which establishes vacuum in the system so that fluid may be withdrawn from the patient by the catheter and deposited in the trap.

It has been discovered that many hospitals and clinics use two different kinds of suction catheters by preference and requirement. In one type of catheter similar to that described above, suction remains constant without any means for controlling or eliminating its effect. In the other popular type of catheter system, however, suction may usually be eliminated or established by placing a finger over a hole in the catheter itself. One form of this type system uses a loosely hinged flap valve, which may be pressed over a port formed in the catheter, by a finger of the nurse or attendant. This type of system is designed for use in surgical processes in which aspiration of bodily fluids from delicate internal cavities or organs such as the lungs is to be undertaken, since it is desirable to eliminate suction from the system during the insertion of the catheter into a lung and then to establish suction once the catheter has been inserted.

One of the major disadvantages of the above systems is that a single system will not provide both constant and controlled suction. Also, both these systems and newer systems which control suction by rolling a latex sleeve over a vent in the catheter require either the constant use of one hand or the immediate use of both hands of the attendant to operate the control, thus depriving the attendant of maneuverability and the use of both hands in critical situations, and making the insertion and placing of the catheter more difficult. In addition, such open vent systems will contaminate the finger used to establish suction, if gloves are not worn.

### DESCRIPTION OF THE INVENTION

The present invention provides a simple, inexpensive, contamination-free means for controlling suction in a suction catheter system in a positive manner while freeing both of the hands of the attendant or nurse for use in inserting the catheter or performing other related tasks. The suction control means of this invention overcomes the disadvantages of the prior art by a body portion having a passageway or bore formed therein and extending longitudinally therethrough. The passageway is open at its opposite ends and the body portion has means disposed at these ends for attachment of conventional flexible catheter means. Thus, the control means of this invention may be placed directly in a suction catheter system. The body portion also has a port

means opening at the top of the body portion and providing access to the interior of the passageway therethrough.

A cap means or slide is mounted on a channel formed in the top portion of the body portion for sliding movement along the body portion with respect to the opening of the port means. This slide has an opening formed in it which may be aligned by movement of the slide with the opening of the port means of the body portion. When these two openings are so aligned, the vacuum establishing fluid flow through the catheter system will be broken, thus eliminating suction. Alternatively, the slide means may be moved over the port to close off the port opening and establish vacuum and the resulting fluid flow in the catheter system.

The body portion and slide preferably have cooperating grooves and ribs formed in their adjacent faces, so that the slide may be locked into a selected open or closed position with respect to the port in the body portion. Thus, the cap or slide and the locking means permit the suction control means of the present invention to be positively maintained in either open or closed position, thereby freeing the hands of the attendant for other work.

Accordingly, it is an object of the present invention to provide a suction control means for use in a suction catheter system which is simple in design and construction and inexpensive to manufacture.

It is also an object of this invention to provide a suction control means for use in a suction catheter system which may be easily manipulated to alternatively establish or eliminate suction through the system;

It is another object of this invention to provide a suction control means for a suction catheter system which may be moved to and maintained in a closed suction position or an open non-suction position;

It is also an object of this invention to provide a control means for a suction catheter system which does not require the constant use of at least one hand of the operating attendant to maintain it in suction or non-suction position;

These and other objects of this invention will become evident from the following description of the drawings illustrating the preferred embodiment wherein;

FIG. 1 is a perspective view of the suction control means of this invention shown as installed in a suction catheter system;

FIG. 2 is a side elevational view of the suction control means shown in FIG. 1, shown in an open or non-suction position;

FIG. 3 is a side cross-sectional view of the suction control means shown in FIG. 1 in a closed or suction position; and,

FIG. 4 is a left-end elevational view of the suction control means shown in FIG. 1.

Referring now to the drawings and more particularly to FIG. 1, the suction control means of this invention is shown generally at 10 as placed in a suction catheter system. This suction control means 10 preferably includes a body portion 12, having a cap means or slide 14 mounted on it for sliding movement with respect to it. The body portion 12, has a conduit means or passageway 16 formed longitudinally within it which serves to carry the fluid removed from the patient by suction. The interior of this passageway 16 is tapped or made accessible from the outside of the body portion 12 by a port means 18 which is formed through the

body portion 12 and opens at the top surface 19 of the body portion. Disposed along the upper portion of the body portion 12 is a longitudinal slide channel 20 which receives the cap means or slide 14 as will be explained below.

The cap means or slide 14 is mounted on the body portion 12 by fitting a slide channel groove 22 around the complementary shaped slide channel 20. Thus, the slide channel 20 and slide channel groove 22 engage to form a tongue and groove type connection which effectively prevents accidental movement or removal of the slide 14 from the body 12 due to normal or lateral forces but permits easy sliding movement of the slide 14 axially along the body 12. The slide 14 has an elongated opening 24 formed near its center. When the ends of the slide 14 are aligned with the ends of the body 12, the opening formed by the port means 18 in the top surface 19 of the body 12 is aligned with the opening 24 in slide 14. The alignment of these openings opens the interior of the passageway 16 to the atmosphere. Thus, when the system is in a vacuum condition, and the opening 24 is then aligned with port 18, the vacuum will be broken at the point in which the control means 10 is placed in the system since the system will be open at that point to the atmosphere. With vacuum and the suction force thus eliminated, fluid flow out of any body cavities, or the adverse effect of suction itself on the delicate walls of bodily organs, such as the lungs, will be prevented.

Alternatively, when constant suction through the system is desired, or when the catheter has been placed inside a body cavity so that aspiration of the fluid may be begun, the slide 14 is moved along the slide channel 20 relative to the body portion 12 until a solid portion of the slide 14 completely obstructs the opening of the port 18 as shown in FIG. 3. In this position, the suction catheter system will be closed to the atmosphere and suction force established between the source of vacuum (not shown) and the opposite end of the system, to withdraw fluids.

The slide 14 and body portion 12 are provided with locking means including position ribs 36, formed on the underside and within the groove 22 of the slide 14 and correspondingly shaped position grooves 38, formed on the top surface of slide channel 20 on body portion 12. A plurality of these ribs 36 and grooves 38 may be formed in spaced relationship on the adjacent surfaces of the slide 14 and body 12 so that the ribs 36 engage the grooves 38, as shown in FIG. 2, to maintain the opening 24 in alignment with port 18 and control means 10 in open or non-suction position. When a sufficient axial force is exerted on the slide 14 with respect to the body portion 12, the ribs 36 may be moved out of the grooves 38 and the slide 14 moved along the slide channel 20 and body portion 12 to a closed or suction position. The slide 14 may be also locked in this selected position by disposition of one of the ribs 36 in a groove 38 formerly occupied by the other rib, and disposition of the other rib 36 over the edge of the slide channel 20.

It is recognized that other locking means, such as teeth disposed on various parts of the slide 14 and body 12 may be used to perform a similar function of selectively positioning the slide 14 with respect to the body 12. In addition to positioning the slide 14 with respect to the body 12, the corresponding ribs 36 and grooves 38 also function as stop means to prevent overtravel of

the slide 14 on channel 20 off of the body portion 12.

To allow placement of the suction control means 10 in a suction catheter system, the body portion 12 is formed with attachment means or adapters at opposite ends of the passageway 16, as shown in FIGS. 1-3. A rear or downstream attachment extension 30 is formed integrally with the body portion 12 at the downstream end of the control means 10, as it is positioned in the system. This attachment extension 30 consists of a generally cylindrical hollow conduit formed of a material homogeneous with that of the body portion and having an interior diameter substantially the same as that of the passageway 16. A series of annular radial holding flanges 40 which decrease in diameter toward the end of the attachment 30 are disposed around its outer circumference. These holding flanges act to maintain the downstream conduit 31 shown in hidden lines in FIG. 1 in a fixed position with respect to the control means 10 despite the vacuum in the system.

At the opposite end of the conduit 16 is formed an upstream, enlarged attaching recess 32 which is molded integrally with the body portion 12 to form a transversely enlarged end section of the passageway 16. This enlargement provides an annular shoulder 33 against which an end of the upstream conduit means or conduit adapter 34, shown in hidden lines in FIG. 1, may be brought. This enlarged recess 32 permits use of adapters having upstream ends sized to receive catheters of various diameters and to fluid-tightly connect them to passageway 16.

The configuration of the suction control means 10 is specifically designed to permit ease in handling and quick manipulation with one hand during catheterization procedures. Lower gripping grooves 26 are formed in the bottom and edge of the body portion 12, and a number of like upper gripping grooves 28 are formed in the top surface of slide 14, to assure non-slip grip of the control means. As shown in the drawings, both the top surface of the slide 14 and the bottom of the body portion 12 are curved inwardly toward the center from their outside edges along their length to conform to the shape of the operator's hand. Likewise, as shown in FIG. 4, there is an inward taper toward the center portion of the control means 10 at both its top and the bottom from either side to further adapt the shape of the control 10 to the operator's hand.

Though it is preferred to place the control means 10 in a suction catheter system of which a portion is shown in FIG. 1, it is evident that a single conduit means, such as 34, of suitable diameter, could be placed entirely through the passageway 16 and fixed with respect thereto. An opening or port might then be formed in this passageway and aligned with the port 18 in the body 12 to effect the same results as shown in the preferred embodiment.

The suction control means of this invention may be formed from any inexpensive and easily molded material such as a thermoplastic which is impervious to fluids, non-toxic, is considered reliable in operation by medical authorities, and will not be, in any way degraded or dissolved by a fluid passed through it. The subject invention is extremely simple in operation and its number of parts, and therefore, very inexpensive to manufacture. As such, it particularly is suited for use in disposable-type suction catheter systems. However, it is also extremely reliable in its operation, and functions

to free the hands of the attendants to perform other duties by providing a quick and sure means of controlling the suction force in the suction catheter system.

While the invention has been described in relation to a preferred embodiment thereof, it will be apparent to those skilled in the art that the structural details are capable of wide variation without departing from the principles of the invention.

I claim:

1. A suction control arrangement for a suction catheter comprising:
  - a body portion interconnecting two sections of the suction catheter;
  - fluid conduit means formed in said body portion and providing a continuous flow path between the two sections of the suction catheter;
  - port means formed in said body portion to provide access from the exterior of said body portion to said fluid conduit means;
  - cap means mounted on said body portion for linear movement relative thereto;
  - an opening formed in said cap means, movement of said cap means with respect to said body portion resulting in a desired amount of alignment between said opening and said port means to control the suction applied by the suction catheter;
  - gripping means formed on said body portion and on said cap means to permit said cap means to be moved with respect to said body portion by one hand of an operator; and
  - complementary means formed on said body portion and said cap means to provide for selectively positioning said cap means at various relationships of said opening and said port means and to maintain said cap means in the selected positions to provide a constant suction.
2. A suction control arrangement as claimed in claim 1 wherein:
  - said body portion comprises guide means formed thereon and extending longitudinally therealong; and
  - said cap means comprises channel-shaped slide means mounted on said guide means for sliding movement therealong, said slide means being movable longitudinally along said guide means with respect to said body portion to allow said opening formed in said slide means to be moved to selected positions with respect to said port means to control the suction and thereby the fluid flow through said fluid conduit means.
3. A suction control arrangement as claimed in claim 1 wherein said complementary means comprises:
  - notches formed in said body portion transverse to the

longitudinal axis thereof; and

ribs formed in said cap means to selectively engage desired ones of said notches, engagement of said ribs and said notches being effective to stop and lock said cap means in a selected position with respect to said body portion to provide a constant suction of a controlled magnitude.

4. A suction control arrangement for a suction catheter comprising:
  - an extended body portion;
  - attachment means formed at each end of said body portion to provide a fluid tight engagement between said body portion and two sections of the suction catheter;
  - fluid conduit means formed in said body portion and providing a continuous flow path between the two sections of the suction catheter;
  - a projecting guide means extending along the length of one side of said body portion;
  - a port formed in said projecting guide means and said body portion to provide access from the exterior of said body portion to said fluid conduit means;
  - channel-shaped slide means formed on said cap means to engage said projecting guide means on said body portion to provide for sliding movement between said body portion and said cap means, movement of said cap means with respect to said body portion resulting in varying degrees of alignment between said opening in said cap means and said port in said body portion to cause the suction catheter to produce a desired amount of suction;
  - complementary means formed on said body portion and said cap means to provide for selectively positioning said cap means at various relationships of said opening and said port and to maintain said cap means in the selected positions to provide a constant suction of a desired magnitude; and
  - gripping means formed on said body portion and on said cap means to permit said cap means to be moved with respect to said body portion by one hand of an operator.
5. A suction control arrangement as claimed in claim 4 wherein said complementary means comprises:
  - notches formed in said body portion transverse to the longitudinal direction thereof; and
  - ribs formed in said cap means for engagement with said notches, engagement of said ribs and said notches resulting in the locking of said cap means at selected positions with respect to said body portion to provide a constant suction of a desired magnitude.

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