# United States Patent

[11] 3,595,234



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[21] Appl. No. **800,546**
[22] Filed **Feb. 19, 1969**
[45] Patented **July 27, 1971**



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[54] **VACUUM CONTROL FOR MEDICOSURGICAL SUCTION TUBE**
**4 Claims, 6 Drawing Figs.**


[52] **U.S. Cl.** ..... **128/276**
[51] **Int. Cl.** ..... **A61m 1/00**
[50] **Field of Search** ..... 128/276-
—278, 298—300



[56] **References Cited**

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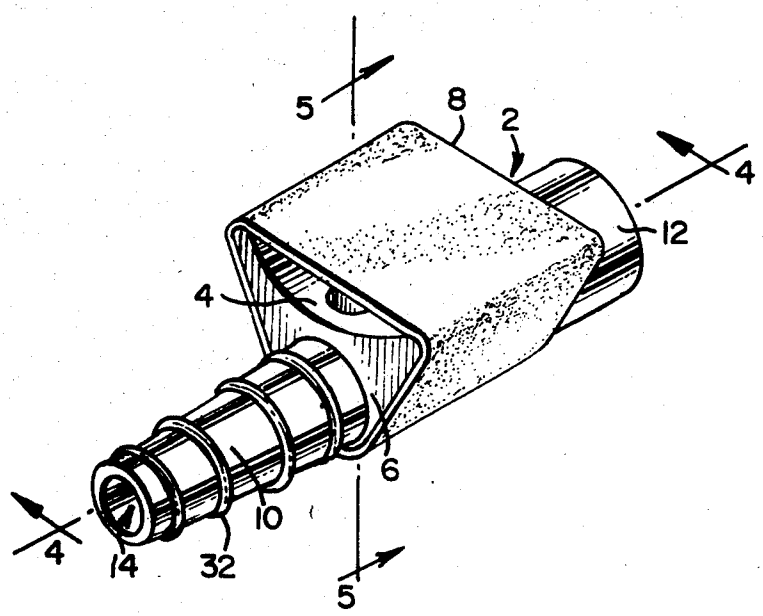
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**ABSTRACT:** A vacuum controller for a medicosurgical suction tube is formed with a concave face aligned with a longitudinal bore through the connector. An elliptical opening passes through the concave face to the bore and an elastic band surrounds the central portion of the controller. When a medicosurgical tube assembly attached to the controller is connected to a vacuum source, a suction is not pulled in the tube assembly until the elliptical opening is closed by depressing the elastic band onto the concave face. The elastic band serves to prevent contaminating material entering the tube assembly from the control finger of the operator and suctioned material in the tube from touching the control finger of the operator.

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Fig 1.

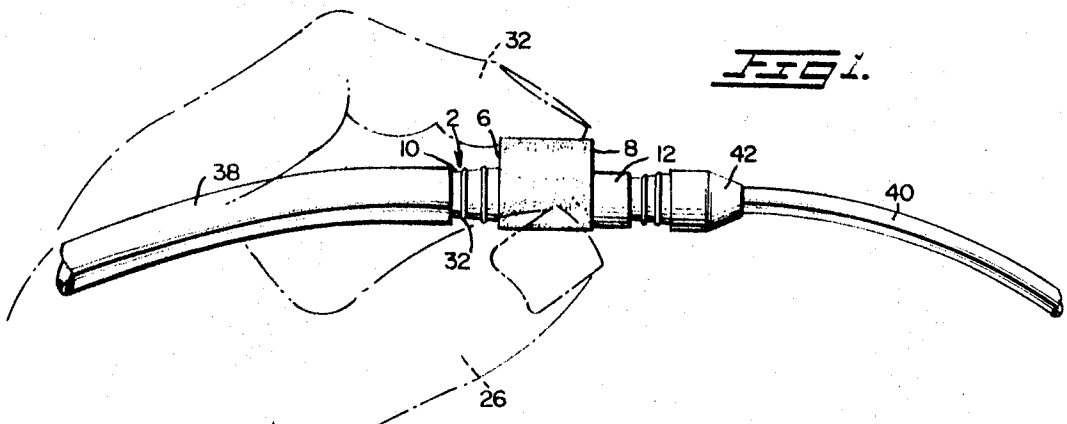
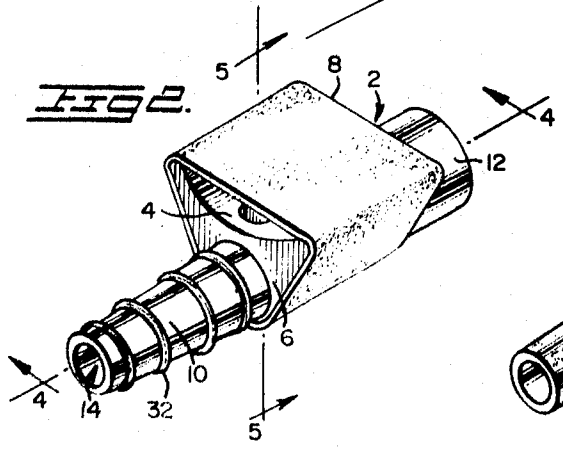



Fig 2.



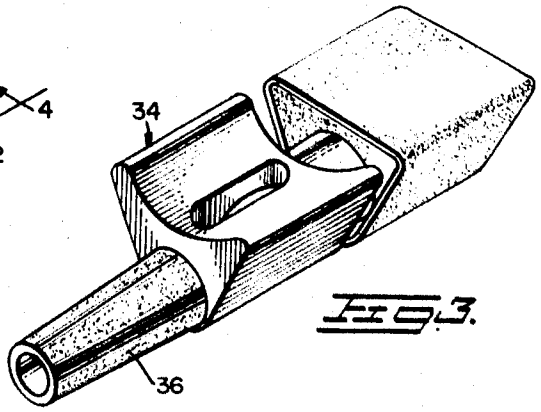




Fig 3.

Fig 4.

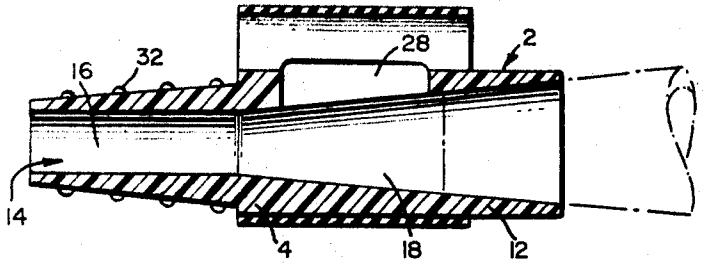



Fig 5.

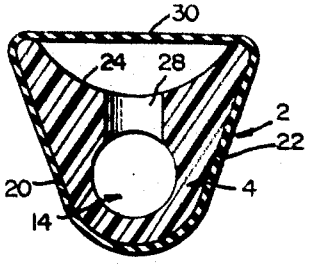
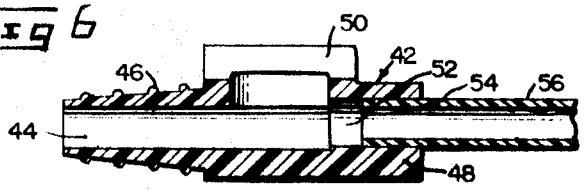



Fig 6




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# VACUUM CONTROL FOR MEDICOSURGICAL SUCTION TUBE

## BACKGROUND OF THE INVENTION

Medicosurgical suction tubes are constructed in a variety of shapes and sizes for a number of different applications in medical and surgical procedures. Such medicosurgical suction tubes can take the form of suction catheters which are used for the aspiration of mucus from the nose, mouth, pharynx, trachea or bronchi of patients. Alternatively, such suction tubes may be used for connection to sump drain tubes or other pieces of equipment or structures where application of a vacuum as a part of a clinical or surgical operation is required. The new vacuum controllers of this present invention are contemplated for use in connection with any form of medicosurgical suction tube whether it be a suction catheter, suction connector tube or the like.

The control of suction, either in extent of time or degree of vacuum may be required in connection with the use of medicosurgical tubes. In many types of patient treatments, it is frequently necessary for the person administering the treatment to have some means associated with the suction tube structure which permits vacuum to be instantaneously controlled from an on to an off position and vice versa. A convenient way of accomplishing this has been to provide a small aperture somewhere in the suction tube structure and the control of suction has been accomplished by the person administering the treatment placing a thumb or finger over this aperture. As can be understood, closing the aperture with the thumb or finger induces the vacuum whereas uncovering the aperture breaks the vacuum by admitting atmospheric air to the system. The control aperture in some devices has been constructed in a suction catheter near the proximal end (see U.S. Pat. No., 3,375,828).

The direct contact of a thumb or finger of a person administering treatment to a patient using the medicosurgical suction tube as a means for control of the suction has been recognized by the medical profession and surgical equipment manufacturers as a potential source of contamination. Accordingly, it would serve to aid maintenance of sterile conditions if some means were provided by which the convenience of control of suction in devices of this type could still be accomplished by simple manipulation of a thumb or finger but at the same time the thumb or finger would not come into direct a new with a suction control aperture constituting a part of the suction tube structure. However, in providing such an improvement, there is the requirement of assuring that the means provided to avoid direct contact with the control aperture does not interfere with absolute and immediate response of the system to the movement of the thumb or finger of the operator. Thus, there could be disastrous results if the means used to prevent direct contact of the thumb or finger with the control aperture failed to permit the vacuum to be broken as soon as the thumb or finger was removed from the control unit. Such a circumstance would result in the continued application of the vacuum when the person administering the treatment found it necessary to cease the application of the suction.

## OBJECTS

A principal object of the present invention is the provision of a new form of vacuum controller for medicosurgical suction tubes. Further objects include the provision of:

1. Vacuum control means for medicosurgical suction tubes, e.g., suction catheters or the like, in which control of the suction can be obtained by manipulation of a thumb or finger of the person administering treatment to a patient but in which the thumb or finger effecting the control does not come into direct contact with the aperture through which control of the suction is regulated.
2. Improved vacuum controllers for medicosurgical suction tubes which can be made and sold at relatively low cost for use with disposable suction catheters or the like intended for a single use with a single patient.
3. An improved vacuum controller for a medicosurgical suction tube which is positive in operation insuring immediate response to movement of a thumb or finger of an operator in use of a suction tube structure involving the vacuum controller.



Other objects and further scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description, while indicating preferred embodiments of the invention, is given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description. It should also be understood the foregoing abstract of the disclosure is for the purpose of providing a nonlegal brief statement to serve as a searching scanning tool for scientists, engineers, and researchers and is not intended to limit the scope of the invention as disclosed herein nor is it intended it should be used in interpreting or in any way limiting the scope or fair meaning of the appended claims.

## SUMMARY OF THE INVENTION

The foregoing objects are accomplished by forming a vacuum controller for medicosurgical suction tubes to include a central body portion having a longitudinal axis and a pair of opposed ends transverse to the axis. On one of the ends, there is provided an integral male connector portion and from the other end, an integral female connector portion extends axially. The body portion of the connector is provided with a side face of concave shape, there is a bore extending axially through the body portion and through the integral connector portions and an elliptical opening extends through the side face with the concave shape to the bore, creating a fluid conduit through which air may be drawn into the bore of the vacuum controller. Around the periphery of the central portion of the controller there extends an elastic band, such as a rubber band, which is of sufficient width to completely cover the elliptical opening in the concave side face when the rubber band is depressed into contact with the face by the thumb or finger of an operator using the vacuum controller.

Advantageously, the body portion of the controller is formed with a triangular cross section providing, in addition to the concave side face, two additional side faces, the elastic band then extending round these three faces and being in contact with two of them and effectively held above the other because of the concave configuration.

As additional preferred features, the vacuum controller is molded as an integral or single unit of plastic material, although it can be fabricated from metal parts as a single unit or separate parts suitably screwed or otherwise fastened together.

Advantageously, the effective are of the opening through the concave side face is greater than the smallest transverse cross-sectional area of the bore which extends through the connector. The male connector portion of the controller may be provided on the outside with ribs or raised portions which serve as gripper means for tubing that may be placed around the male connector portion. Alternatively, the male connector portion may be smooth, but preferably of tapered form. The vacuum controller may be a unit in itself being unconnected to any suction tubing assembly or, alternatively, it may be permanently attached to a medicosurgical suction tube through the female connector portion which would form the proximal end section of the suction tube, e.g., a suction catheter.

## BRIEF DESCRIPTION OF THE DRAWING

A more complete understanding of the structure and method of use of the new vacuum controllers for medicosurgical suction tubes may be had by reference to the accompanying drawing in which:

FIG. 1 is a perspective view of a preferred embodiment of vacuum controller in accordance with the invention.

FIG. 2 is a perspective view of an enlarged scale of a vacuum controller of the invention similar to that shown in FIG. 1.

FIG. 3 is an exploded perspective view of another form of a vacuum controller in accordance with the invention.

FIG. 4 is a side sectional view taken along the line 4–4 of FIG. 2.

FIG. 5 is an end sectional view taken along the line 5–5 of FIG. 2.

FIG. 6 is a side sectional vie of another embodiment of vacuum controller in accordance with the invention.

Referring in detail to the drawing, the vacuum controller 2 comprises a central body portion 4 having a pair of opposed transverse ends 6 and 8. An integral male connector portion 10 extends axially from the end 6 and an integral female connector portion 12 extends axially from the other end 8. A bore or hole 14 extends axially through the body portion and both connector portions forming a fluid passage through the controller. This bore or hole may be of uniform diameter throughout but, advantageously, the portion 16 extending through the male connector portion 10 will be of uniform diameter while the portion 18 extending through the center body portion and the female connector portion 12 will be tapered.

The body portion 4 may have any desired number of sides but a triangular cross section comprising three side faces 20, 22 and 24 is preferred since this enables the controller to be most easily accommodated to the fingers of the hand 26 of the operator using the suction tube structure incorporating the vacuum controller.

The side face 24 of the body portion 4 is concave in shape and an elliptical opening 28 extends through the face 24 into the longitudinal bore 14.

An elastic band 30, e.g., a rubber sleeve formed of "Penrose" rubber tubing, is stretched over the three faces 20, 22 and 24 of the center portion of the controller. Advantageously, the band is of a width equivalent to the distance between the opposed ends 6 and 8 of the center portion, although it may be narrower than this. In any event, it should be sufficiently wide so that when the band 30 is depressed by a finger 32 of the operator's hand 26, the elastic band will cover completely the opening 28.

The male connector portion, as shown in FIGS. 1, 2 and 4, may have ribs or protrusions 32 which serve as gripper means for tubing that may be placed around the male connector portion 10. In an alternative form of controller 34 as shown in FIG. 3, the male connector portion 36 is of smooth wall tapered configuration.

The vacuum controller may be unconnected to any other portion of a suction tubing assembly creating a single unit as shown in FIGS. 2 and 3. Advantageously, however, the controller may be attached to a suction connector tube 38 by forcing it over the male connector portion 10 as shown in FIG. 1. In a preferred embodiment, the suction catheter 40 will be provided on its proximal end section with a male connector 42 which is tapered to fit into the female connector end 12 of the vacuum controller.

In view of the foregoing description, the method of use of the new vacuum controllers will be readily apparent to those acquainted with the use of suction catheters and equivalent medicosurgical suction tubes. As shown in FIG 1, the connector tube 38 is positioned over male connector end 10 and attached at the other end to a source of vacuum (not shown) and the male connector 42 of the suction catheter 40 is inserted into the female connector 12 of the vacuum controller. With the vacuum then being drawn through the tube 38, no suction is created in the tube 40 as long as the elastic band 30 remains in the normal position as shown in FIG. 5 created by the elasticity in the band. However, when the finger 32 of the operator's hand 26 is depressed on the band 30 over the concave side face 24 of the controller, the opening 28 will be covered, but without the finger 32 coming into direct contact with the opening 28. This effective closing of the opening 28, then, prevents air from the surrounding atmosphere entering the system and immediately the vacuum existing in the line 38 will be applied to the suction catheter or equivalent tube 40.

To insure positive operation of the controller, the elastic band 30 should have sufficient strength to return to an open position as shown in FIG. 5 upon release of the operator's finger 32. This drum effect insures that the band will pull off the opening or slot 28 when the finger is removed thereby releasing the suction from the suction catheter 40.

The opening 28 is advantageously of elliptical shape to permit only partial covering by the depressing of the band 30 in the event that some partial application of vacuum existing in the line 38 is desired in the suction catheter 40. However, the opening 28 may be circular in shape In any event, it is desirable that the effective area of the opening 28 be equal to or greater than the smallest transverse cross-sectional area of the longitudinal bore 14 in the controller. In the embodiment shown in the drawing, this would be the cross-sectional area of the portion 16 of the bore or hole 14.

The rubber sleeve or elastic band 30 provides protection against entrance into the tube assembly of contaminating material from fingers of the user. Also, it prevents the finger of the operator from being contaminated by contact with suctioned material passing through the controller bore. Hence, it is preferably maintained as shown in the drawings. However, if for some particular reason it was desired to use the controller without the rubber sleeve, it can be easily rolled back or pulled off of the center portion 4 of the controller.

In an alternative form of medicosurgical tube incorporating the vacuum controller, the controller 2 would be permanently attached to the distal end of the tube 38 which would lead to the vacuum source, e.g., the tube 38 can be permanently attached to the controller by the use of solvent, cement or the like. The suction catheter 40 instead of having a molded connector such as 42 shown in FIG. 1, could have a tapered end fitting to slip into the female connector end 12 of the vacuum controller as shown in phantom line in FIG. 4. This arrangement provides economy of use of suction catheters. Thus, a catheter with a plain connector end, such as the male connector 42, is less expensive to manufacture than a suction catheter complete with a vacuum controller permanently attached. In the recommended hospital procedures today, a sterile disposable suction catheter is used only once and then discarded. In some cases, a patient will be suctioned every 15 minutes for 24 hours or more. With the vacuum controller 2 attached to the connector tube 38, the vacuum controller will not be discarded with each suction catheter.

Where economy of use might be less important than some other consideration, the vacuum controller 2 could be made a permanent part of the suction catheter 40, e.g., by cementing the proximal end of the catheter in the female connector end 12 of the controller. In such case, the opening in the connector end 12 would need to be made in various sizes to accommodate the different standard sizes of suction catheters in use, e.g., 5 to 18 French size.

The male connector end 10 of the controller 2 can be made in various sizes to fit into various sizes of connector tubes although with a tapered form, the connector end 10 will make a tight seal with a fairly broad range of tubing sizes.

The controller 2 may be made as a separate unit without being permanently attached to either a connector tube or to a suction catheter.

The modified version of the vacuum controller shown in FIG. 6 is useful where permanent attachment to a suction catheter is desired. Here, the controller 42 includes the longitudinal bore 44, tapered male connector end 46, female connector end 48 and concave side face 50. The end 48 has a cylindrical opening 52 into which the proxinal end 54 of the suction catheter 56 is cemented.

The embodiments of the invention in which I claim an exclusive property or right are defined as follows:

1. A vacuum controller for a medicosurgical suction tube comprising a central body portion having a longitudinal axis and a pair of opposed ends transverse to said axis, an integral male connector portion extending axially from one of said ends and an integral female connector portion extending axially from the other of said ends, said body portion having a side face of concave shape, a bore extending axially through said body portion and said connector portions, an opening extending through said side face to said bore and an elastic band extending around the periphery of said central portion of sufficient width to completely cover said opening when depressed into contact with said side face.



2. A vacuum controller as claimed in claim 1 wherein said central body portion is of triangular cross section.

3. A vacuum controller as claimed in claim 1 wherein the effective area of said opening is greater than the smallest transverse cross-sectional area of said bore.

4. A vacuum controller as claimed in claim 1 that is permanently attached to a medicosurgical suction tube through the female connector portion and forms the proximal end section of the suction tube.