March 14, 1967 J. R. CRUSE 3,308,825

SURGICAL SUCTION DEVICE

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Fig 1.

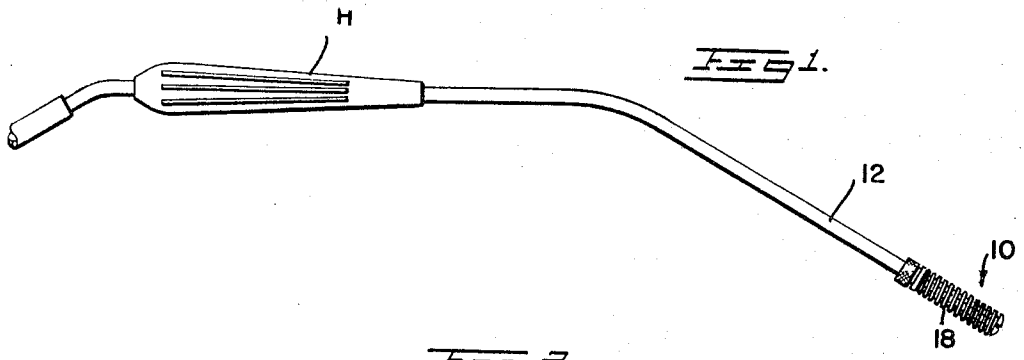


Fig 2.

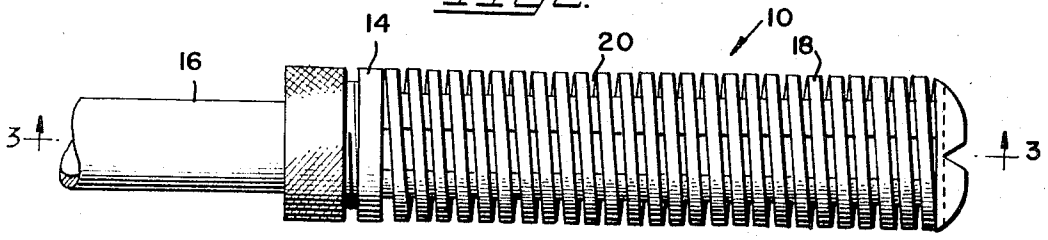


Fig 3.

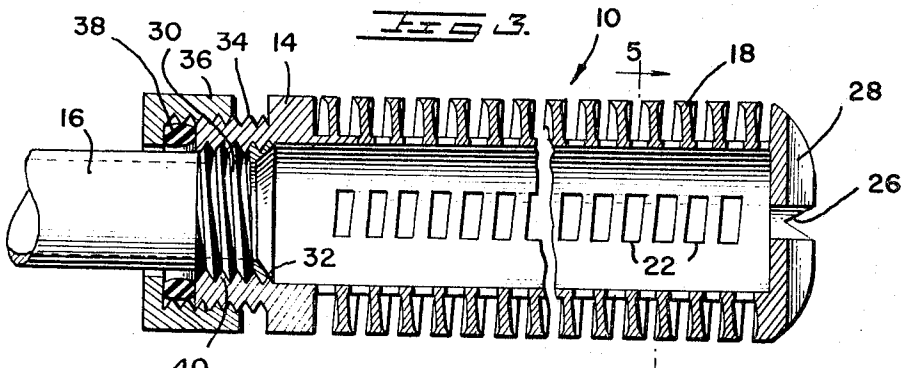


Fig 4.

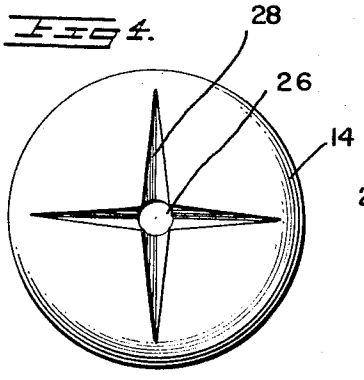
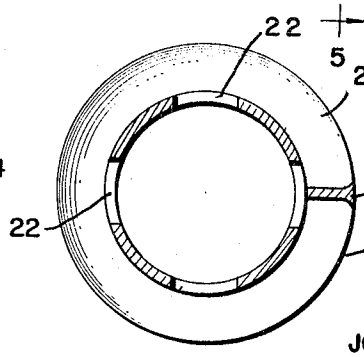


Fig 5.



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Fig 6.

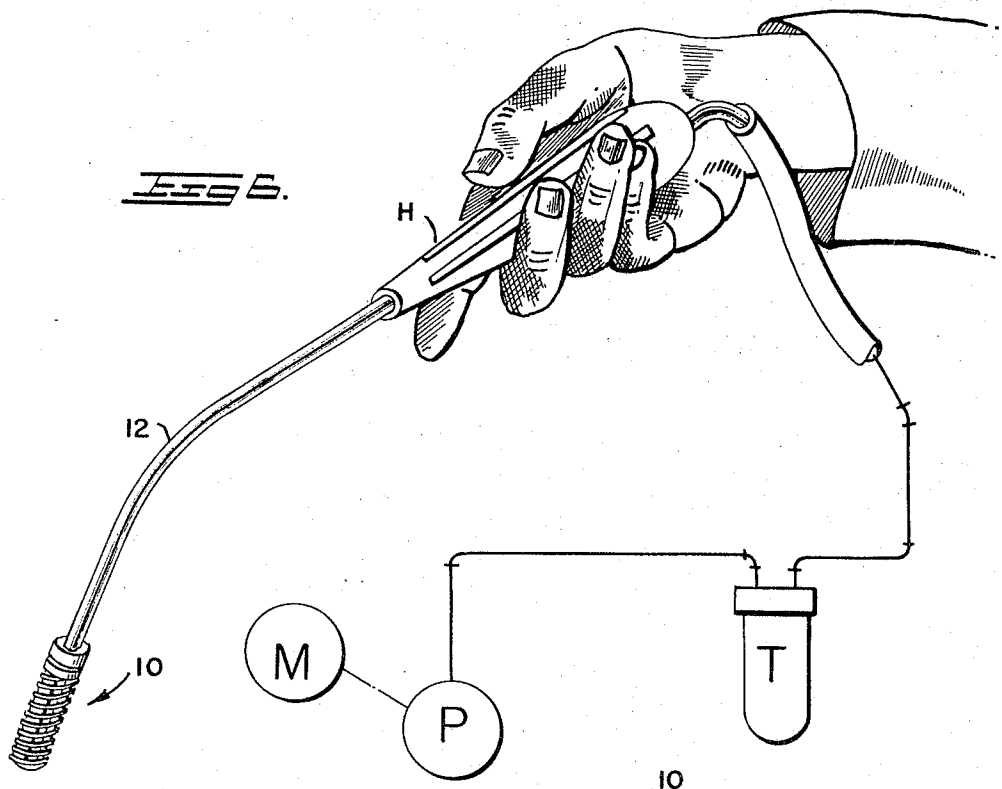


Fig 7.

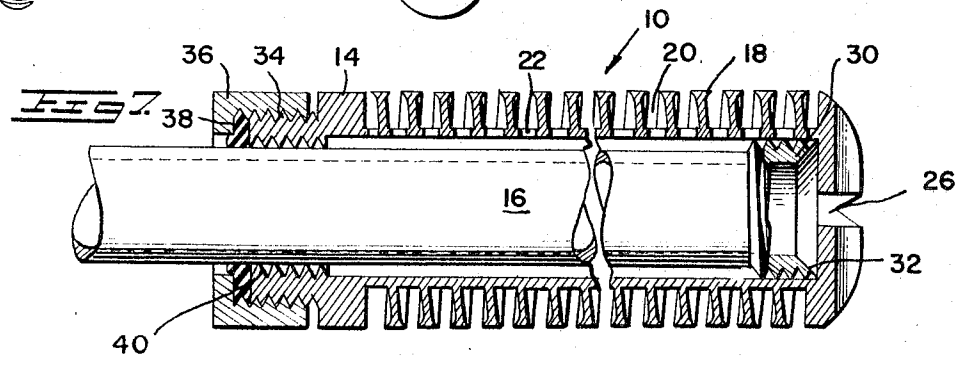


Fig 8.

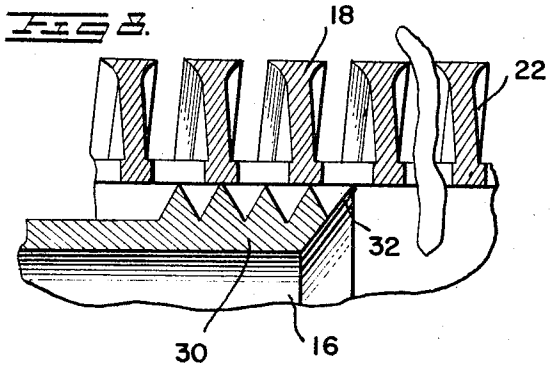
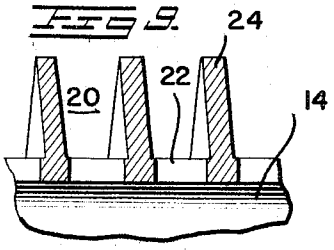


Fig 9.



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3,308,825

SURGICAL SUCTION DEVICE

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Filed Aug. 2, 1963, Ser. No. 299,561
11 Claims. (Cl. 128—276)

The present invention relates to improvements in suction devices adapted particularly for dental and surgical uses.

Such suction devices are an important part of almost all dental and surgical procedures. They provide evacuation of irrigation fluid, blood and other excess body fluids from the operative field. Such evacuation of fluid also enables the surgeon visually to observe smaller bleeding blood vessels for purposes of clamping or suturing.

Such suction devices ordinarily consist essentially of a suction source, a trap for the collection of wastes, connector tubings and a suction tip which is the component actually used in the operative area. Many shapes and sizes of such suction tips have heretofore been employed. The placement of orifices may vary such as circumferentially on the distal end and or along the sides of the suction tip. Such discharge orifices or ports are, of course, necessary but soft tissue, serosal surfaces, gauze sponges, soft blood clots, and the like, tend to adhere to or actually become incarcerated in the orifices with resultant trauma and hemorrhage of the more delicate tissues. Further, when such blood clots and other matter dry and solidify, much time and effort is required to clean an obstructed tip during or following a procedure.

It is a principal object of the present invention to provide a greatly improved suction tip for use with surgical suction devices of the foregoing general character.

Among its more particular objects the invention contemplates the provision of a suction tip wherein the discharge ports are protected so as to tend to prevent entry of tissue, membrane, soft blood clots, gauze sponges or the like into the fluid discharge ports so as to prolong the operativeness of the tip and to facilitate its cleaning for reuse.

Another object of the invention is to dispose the discharge ports in the tip in such a manner that complete stoppage is highly unlikely and at least some of the ports remain constantly clear to provide some degree of operative suction.

A further object of the invention is to provide a suction tip wherein the effective suctioning surface may be selectively varied so that the tip may be adjusted for particular requirements. For example, the suctioning surface may be completely open for fast evacuation such as when removing irrigation fluid or it may be restricted for finer suction such as when employed for identifying injured blood vessels or blood vessel stumps.

Still another object of the invention is to provide a suction tip wherein provision is made for the shearing off of any non-fluid material which may penetrate and clog the discharge ports so as to clean and reopen such ports to maintain the tip in operative suction condition.

In its more specific aspects the invention contemplates the combination of an outer apertured tube and a telescoping inner suction tube adjustable relative to the apertures or discharge ports of the outer tube so as to regulate the degree of suction, the said inner tube also being provided with an annular cutting edge to shear off any material tending to clog any of the discharge ports.

Other objects and advantages will be apparent from the following detailed description taken in conjunction with

the accompanying drawings wherein preferred embodiments of the principles of the invention have been selected for exemplification.

In the drawings:

FIG. 1 is a side elevational view of a suction tip constructed in accordance with the invention shown attached to a manipulating handle and suction rod adapted for connection to a suction source;

FIG. 2 is an enlarged side elevational view of the suction tip shown in FIG. 1;

FIG. 3 is a sectional view taken on the line 3—3 of FIG. 2 and showing the inner suction tube in fully retracted position with respect to the outer tube;

FIG. 4 is an end view of the tip;

FIG. 5 is a transverse sectional view taken on the line 5—5 of FIG. 3;

FIG. 6 is a perspective view showing the surgical suction device as in use and indicating its operative connection to a source of suction;

FIG. 7 is a view similar to FIG. 3 but showing the inner suction tube in fully extended position within the outer tube;

FIG. 8 is an enlarged fragmentary sectional view showing the shearing action of the inner tube relative to the discharge ports of the outer tube; and

FIG. 9 is an enlarged fragmentary sectional view showing a modified form of wall defining the groove provided along the exterior of the outer tube.

Referring more particularly to the drawings, wherein like numerals refer to like parts, the suction tip of the present invention is indicated in its entirety at **10** and is shown in FIGS. 1 and 6 as attached to the free end of a suction rod **12** and manipulating handle H which in turn are operatively connected to a source of suction indicated by the motor M, pump P and trap T, such as is usually avaiable in the ordinary hospital operating room. Of course, any other source of suction may also be employed.

The suction tip **10** is composed of an outer tubular member **14** and an inner telescoping open ended suction tubular member **16** each formed of any suitable rigid material, stainless steel or plastic, for example. Conveniently, the inner tube **16** may be an extension of the suction rod **12**, as shown.

The outer tube **14** is provided with annular ribs **18** defining an external groove **20** extending substantially along the length of the tube. The groove **20** communicates through the ports **22** with the interior of the tube **12** for the drainage of material through such ports to the suction end of inner tube **16**. The side ports **22** are preferably arranged in longitudinal quandrant series. The groove **20** is preferably in the form of a continuous helix to provide a continuous conveying path for the withdrawn fluid so that, for example, if one port is clogged the fluid will pass to the next. The ribs **18** are preferably widened at their outer end extremities so as to restrict entry of material which might tend to clog the wider ports **22**. However, for convenience of manufacture or other reason the modified form of ribs shown at **24** in FIG. 9 may be employed if desired.

A further discharge port **26** is provided at the forward free end portion of the outer tube **14** and radialy extending grooves **28** form tracks for the entry of fluid to the port **26**. As will also be apparent, the walls defining the grooves **28** project forwardly of the port **26** so that if the free end of the tube **14** bears against flesh or solid matter the recessed grooves **28** continue to provide for the drainage of fluid through the recessed port **26**. As a further advantage when the grooves **28** and port **26**

are in suction operation the device may be tilted to enable the surgeon clearly to see the injured or cut ends of bleeding blood vessels during the suction process.

The inner suction tube **16** has an open free end for the entry of fluid drawn through the ports **22** or **26** and is slidable within the outer tube **14** as indicated by its extreme positions shown in FIGS. 3 and 7. Provision is also made for the locking of the inner tube **16** in any selected position along the length of the outer tube **14** so as to regulate the degree of suction, as will hereinafter be explained. The free end portion of the inner tube **16** carries at its forward free end portion outwardly extending threads **30** of a diameter greater than that of the tube **16** such as closely to clear the inner wall of the outer tube **14**. For shearing off any tissue, clots or other material which may extend through and tend to clog the side ports **22** as indicated in FIG. 8 an annular cutting blade **32** is provided at the forward free end of the inner tube **16**.

For securing the outer tube **14** to the end portion of the suction rod **12** the reduced rearward end portion of the tube is externally threaded as indicated at **34** for threaded engagement with an annular cap **36** encircling the rod **12** or its extension **16**. An O-ring **38** is positioned between the cap **36** and the rearward end extremity of the tube **14** to permit free longitudinal movement of the inner suction tube **16** when the O-ring is in relaxed condition as shown in FIG. 3 and to lock the tube **16** in any selected longitudinal position by frictional engagement with the outer wall of the tube when the O-ring is in compressed condition as shown in FIG. 7.

The reduced rearward end portion of the outer tube **14** is also internally threaded as indicated at **40** to mate with threaded portion **30** of the inner tube **16** when the inner tube is in fully retracted position as shown in FIG. 3. It will be apparent that when in such retracted position all ports of the outer tube **14** are open for the ingress of fluid along the length and at the tip of the outer tube. It will also be apparent that when the portion **30** is in forward unthreaded engagement and the O-ring **38** is relaxed the inner tube **16** may be extended into the outer tube **14** any desired distance up to its fully extended position as shown may be desired. Turning of the knurled annular cap **36** so as to expand the O-ring **38** against the outer wall of the inner tube **16** will, of course, lock or anchor the inner tube in any such extended position.

For some uses of the device it may not be necessary to employ the slidable inner suction tube **16** and in such cases it may be omitted and the outer tube **14** attached directly to the suction rod **12**.

It is to be understood that my invention is not confined to the precise construction and arrangement of parts as herein illustrated and described but embraces all such modifications thereof as may come within the scope of the following claims.

I claim:

1. In a surgical suction device, a suction tip which comprises, an outer tube having an end wall at its free end, an external helical groove provided substantially along the length of said outer tube, a plurality of side ports communicating said groove with the interior of said outer tube, an external transverse groove provided at the free end portion of said outer tube, a port communicating said transverse groove with the interior of said outer tube, an open end inner suction tube axially slidable inwardly of said outer tube for withdrawing fluid material introduced through said ports, annular means carried exteriorly of said inner tube for shearing non-fluid material protruding through the side ports of said outer tube as said inner tube slides across said side ports, and means for locking said inner tube in selected position relative to said outer tube.

2. In a surgical suction device, a suction tip which comprises, an outer tube having an end wall at its free end, an external helical groove provided substantially along the length of said outer tube, a plurality of side ports communicating said groove with the interior of said outer tube, an open end inner suction tube axially slidable inwardly of said outer tube for withdrawing fluid material introduced through said ports, annular means carried exteriorly of said inner tube for shearing non-fluid material protruding through the side ports of said outer tube as said inner tube slides across said ports, and means for locking said inner tube in selected position relative to said outer tube.

3. In a surgical suction device, a suction tip which comprises, an outer tube having an end wall at its free end, an external helical groove provided substantially along the length of said outer tube, a plurality of side ports communicating said groove with the interior of said outer tube, an external transverse groove provided at the free end portion of said outer tube, a port communicating said transverse groove with the interior of said outer tube, an open end inner suction tube axially slidable inwardly of said outer tube for withdrawing fluid material introduced through said ports, and annular means carried exteriorly of said inner tube for shearing non-fluid material protruding through the side ports of said outer tube as said inner tube slides across said side ports.

4. In a surgical suction device, a suction tip which comprises, an outer tube having an end wall at its free end, an external helical groove provided substantially along the length of said outer tube, a plurality of side ports communicating said groove with the interior of said outer tube, an open end inner suction tube axially slidable inwardly of said outer tube for withdrawing fluid material introduced through said ports, and annular means carried exteriorly of said inner tube for shearing non-fluid material protruding through the side ports of said outer tube as said inner tube slides across said ports.

5. In a surgical suction device, a suction tip which comprises, an outer tube having an end wall at its free end, an external helical groove provided substantially along the length of said outer tube, a plurality of side ports communicating said groove with the interior of said outer tube, an external transverse groove provided at the free end portion of said outer tube, a port communicating said transverse groove with the interior of said outer tube, an open end inner suction tube axially slidable inwardly of said outer tube for withdrawing fluid material introduced through said ports, and means for locking said inner tube in selected position relative to said outer tube.

6. In a surgical suction device, a suction tip which comprises, an outer tube, an external helical groove provided substantially along the length of said outer tube, a plurality of side ports communicating said groove with the interior of said outer tube, an open end inner suction tube axially slidable inwardly of said outer tube for withdrawing fluid material introduced through said ports, and means for locking said inner tube in selected position relative to said outer tube.

7. A suction tip for a surgical suction device which comprises, telescoping relatively slidable inner and outer tubes, the said outer tube having an end wall at its free end, outwardly projecting annular ribs carried by said outer tube and defining grooved areas at the outer surface of said outer tube, ports provided in the wall of said outer tube to communicate said grooved areas with the interior of said outer tube for the ingress of fluid through said ports, the said inner tube being adapted for connection to a source of suction and having an inlet port exposing said fluid to said suction and means for locking said tubes in selected relative telescoping position.

8. The suction tip of claim **7** additionally including blade means carried by said inner tube for shearing any non-fluid material projecting through the outer tube ports.

9. The suction tip of claim **7** wherein the ports are provided substantially along the length of the side wall of the outer tube.

10. The suction tip of claim 9 additionally including a port in the end wall of the outer tube.

11. The suction tip of claim 10 wherein grooved areas communicating with the end wall port are provided in the end wall of the outer tube.

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