

[54] **SUCTION SURGICAL INSTRUMENT OF THE FORCEPS TYPE**

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[51] Int. Cl.² **A61B 17/30; A61M 1/00**

[58] Field of Search **128/276, 2 R, 2 B, 346, 128/321, 309, 318, 354, 349, 350**

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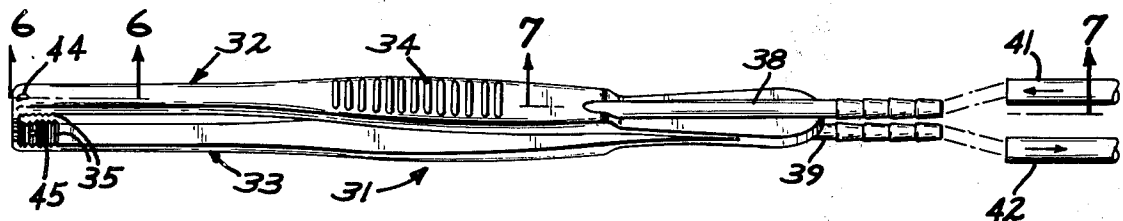
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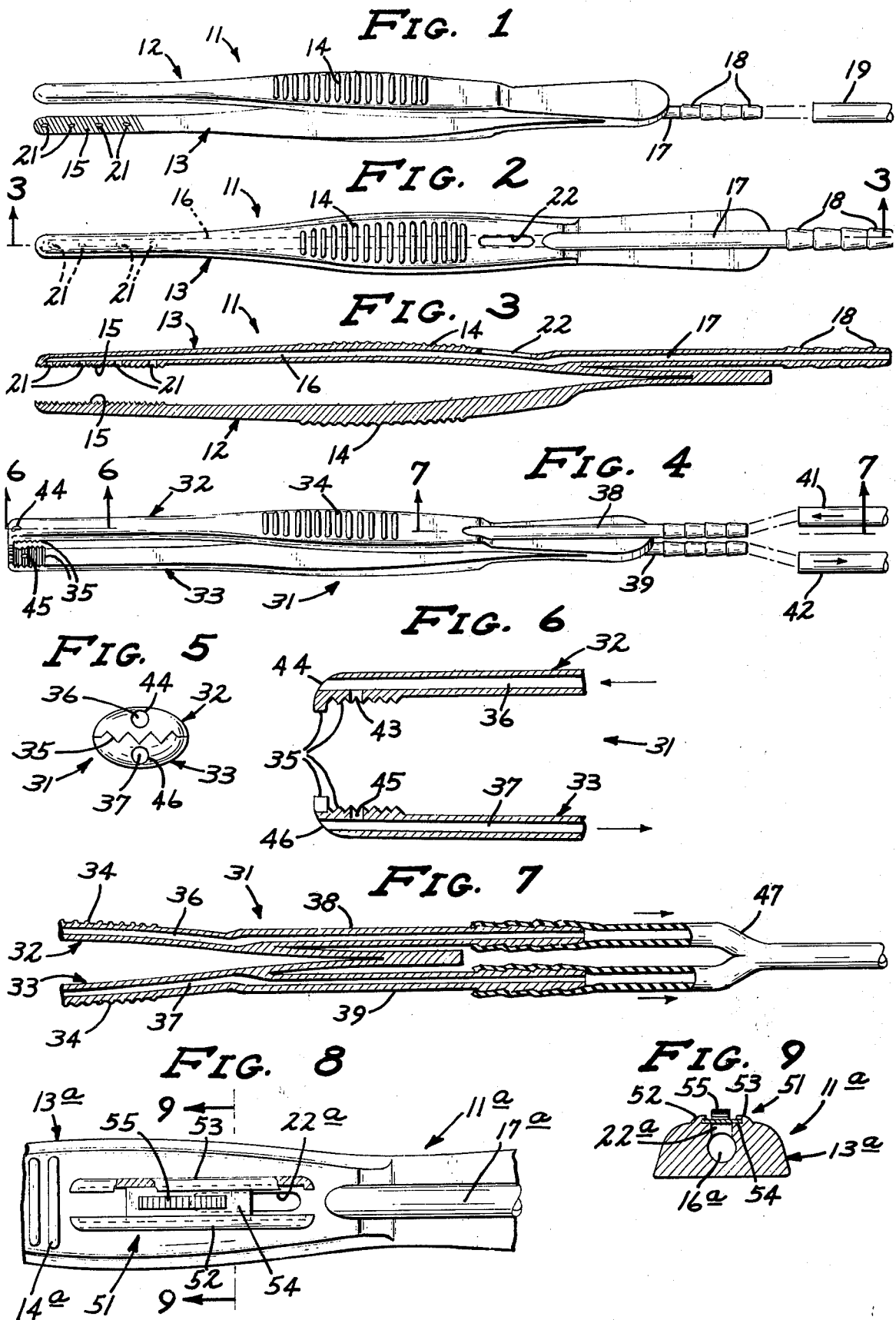
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ABSTRACT

Surgical forceps are disclosed which consist of first and second legs attached at one end in a tweezer-like configuration. One of the legs includes a small conduit which terminates in one or more inlets disposed on the inner face of the tweezer end. The opposite end of the conduit is adapted for connection to a source of vacuum to permit fluid to be drawn away from a surgical area. In an alternative embodiment, a similar conduit is formed in the other forcep leg which is adapted for connection to liquid under pressure, terminating in an opening on the extreme tip of the tweezer to permit cleansing of the surgical area.

15 Claims, 9 Drawing Figures





SUCTION SURGICAL INSTRUMENT OF THE FORCEPS TYPE

This is a continuation of application Ser. No. 384,461, filed on Aug. 1, 1973, which was a continuation of prior application Ser. No. 198,900, filed on Nov. 15, 1971, both abandoned.

The invention relates generally to surgical instruments and is specifically directed to surgical forceps of a tweezer-like configuration which includes suction means for removing the fluid and/or gases from a surgical area, and in some instances these instruments include fluid delivery means for cleansing a surgical area.

A problem encountered in the performance of surgical operations is the removal of blood and other body fluids, including gases, from the area in which surgery is undertaken. The presence of such fluids may be the direct result of incision, or there may have been an accumulation prior to entry into the area. Gases are a problem, for example, when a Bovey current is being used. Where the problem arises, it is ordinarily necessary that such fluids or gases be removed as quickly as possible to permit the surgeon to carry out his tasks with the least possible obstruction.

One solution to the problem has been the provision of a probe or similar device which is connected to a vacuum source and is capable of aspirating body fluids from the surgical area. However, when the surgeon is using other surgical instruments in his operative tasks, it is necessary either that the suction device be manipulated by a surgical assistant, which is often impossible or at best hindering or disrupting due to space limitations; or, that the surgeon change instruments as often as the accumulation of fluids becomes a problem.

Our invention enables the surgeon to perform the normal surgical tasks as well as the suction removal of accumulated fluids from the surgical area simultaneously with a single surgical instrument. The instrument comprises a surgical forceps of tweezer-like configuration and includes one or more aspirating openings at the pincer end of the instrument which communicate with a fluid conduit carried by and movable with one of the forceps legs. The conduit is connected to a source of vacuum, thus permitting the surgeon to effect the removal of body fluids simply by exposing the suction openings to the fluid.

Our invention also contemplates a second fluid conduit associated with the opposite forcep leg which terminates in similar openings at the pincer end of the instrument. The second conduit may be connected to a source of liquid under positive pressure, which can permit the surgeon to cleanse the surgical area in much the same manner as fluid removal, or to an additional vacuum source which can permit additional fluid removal in situations where it is desired to remove large quantities of fluid quickly.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of surgical forceps embodying the inventive principle;

FIG. 2 is a side elevation of the surgical forceps showing the side opposite that seen in FIG. 1;

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 2;

FIG. 4 is a perspective view of an alternative surgical forceps;

FIG. 5 is an end view of the surgical forceps of FIG. 4;

FIG. 6 is a fragmentary sectional view of the alternative surgical forceps taken along the line 6—6 of FIG. 4;

FIG. 7 is a fragmentary sectional view of the alternative surgical forceps taken along the line 7—7 of FIG. 4;

FIG. 8 is an enlarged fragmentary view in side elevation of an alternative structure for variably controlling the amount of applied vacuums, portions thereof being broken away and shown in section; and

FIG. 9 is a sectional view taken along the line 9—9 of FIG. 8.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With initial reference to FIGS. 1—3, a surgical forceps embodying the inventive principle is represented generally by the numeral 11. Forceps 11 are of tweezer-like configuration, consisting of a pair of elongated leg members 12, 13 which are commonly affixed at one end and project in cantilever fashion from the affixed point. Members 12, 13 are preferably formed from stainless steel for sterile purposes, and have a spring characteristic which causes the leg members to be normally biased away from each other.

The outer face of each leg member 12, 13 has an irregular surface portion 14 at an intermediate point thereon to provide a gripping surface for the user. The leg members each terminate in a functional end, such ends together cooperating to perform the forceps function. In the embodiment of FIGS. 1—3, the functional ends of leg members 12, 13 are rounded and each has a serrated portion 15 on its inner face, the teeth of such serrated portions alternately merging with the other to provide an efficient clamping or pincer function.

As best shown in FIG. 3, leg member 13 has formed therein an extended passageway or conduit 16, one end of which communicates with a tubular connector 17 rigidly affixed to leg member 13. Connector 17 terminates in a series of tapered, annular segments 18 which adapt the conduit 16 for connection to a vacuum source (not shown) through a flexible tube 19.

The opposite end of conduit 16 terminates in a plurality of bores 21 which open on the inner face of leg member 13 within the serrated portion 15. It will be appreciated that the connection of tubular connector 17 will effect a sucking or aspirating action at the bores 21, which permits the removal of fluids and gases from a surgical area by simple exposure of the inner face of leg member 13 to the area. The amount of vacuum is controlled by the user by means of an elongated opening 22 which communicates with conduit 16 and is disposed on the outer face of leg member 13 immediately rearward of irregular surface 14. If vacuum is not desired at the functional end of forceps 11, the elongated opening 22 is left uncovered. When all or part of the vacuum is deemed necessary, the user simply covers all or part of elongated opening 22.

In FIG. 4—7, an alternative forceps embodying the inventive principle is represented generally by the numeral 31. Forceps 31 is much the same as forceps 11, comprising commonly affixed leg members 32, 33 each of which has an irregular gripping surface 34 disposed on the outer surface thereof. The functional ends of leg members 32, 33 are somewhat more squared than

those of forceps 11, as shown in FIG. 4, and the serrated portion 35 of each extends to the extreme tip as well as the inner face of each functional end (see FIG. 5).

One principle modification of forceps 31 is directed to the inclusion of extended passageways or conduits 36, 37 respectively, in each of the leg members 32, 33. Similarly, each of the conduits 36, 37 communicates with a tubular connector, designated 38, 39, respectively; and, by means of the series of tapered segments, each connector is adapted to receive a flexible tube 41, 42. As is indicated by the arrows in FIG. 4, flexible conduit 41 is connected to a source of fluid, either liquid or gas, under positive pressure for rinsing or otherwise cleansing the surgical area; and flexible tube 42 is connected to a vacuum source as described above.

As best seen in FIGS. 5 and 6, conduit 36 opens at the functional end of leg member 32 by a bore 43 disposed on the inner face within the serrated portion 35 and a bore 44 disposed at the tip of the forceps. Similar bores 45, 46 are provided for leg member 33. It will be appreciated that location of the bores 43, 46 enable the user to apply or draw fluid, either at the inner functional face or the extreme tip of forceps 31.

In FIG. 7, the respective tubular connectors 38, 39 of forceps 31 are commonly connected to a single vacuum source by a flexible tube 47 having a bifurcated end.

FIGS. 8 and 9 disclose a modification to the vacuum control of forceps 11. The modified forceps is represented generally by the numeral 11a, and the parts corresponding to those of forceps 11 are designated by the same numeral with the addition of the letter a. As shown, forceps 11a includes an elongated opening 22a to control the vacuum at its functional end, and a sliding valve assembly represented generally by the numeral 51 assists in providing a more precise control of the vacuum. Sliding valve 51 consists of a pair of elongated guiding members 52, 53 affixed to the outer face of leg member 13a, each of which defines an elongated slot in which a sliding valve member 54 is disposed. Preferably, the fit of valve member 54 within the slots is sufficiently tight so that movement is frictional, thus permitting it to be retained in a preselected position. Movement of the sliding valve member 54 is facilitated by an irregular surface portion 55, which provides a gripping surface for the user's fingers. As will be appreciated, sliding valve member 54, in its extended position, is fully capable of sealing elongated opening 22a; and its movement to a selected position to open, partially seal or fully seal elongated opening 22a effects control of the vacuum at the forceps tip.

We claim:

1. Surgical forceps of a tweezer-like configuration, comprising:
 - a. first and second elongated movable leg members of essentially the same length and having functional ends defining opposed inner faces and distal outer faces, the leg members being commonly affixed and projecting from the fixed point in cantilever fashion with the functional ends normally biased apart and cooperable to perform a forceps function;
 - b. and fluid conduit means associated with one of said first and second leg members, the conduit means being adapted for connection to a source of fluid pressure differential and terminating in a first opening disposed on the inner face of said one leg

member, and a second opening disposed on said distal outer face thereof in a position which is accessible for all manipulative and relative functional positions of said one leg member.

2. The device defined by claim 1, and further comprising second fluid conduit means associated with the other of said first and second leg members, the second conduit means being adapted for connection to a source of fluid pressure differential and terminating in a first opening disposed on the inner face of said other leg member, and a second opening disposed on the outer face thereof in a position which is accessible for all manipulative and relative functional positions of said other leg member.

3. The device defined by claim 2, and further comprising a connector member affixed to said first and second leg members and commonly communicating with said first and second conduit means.

4. The device defined by claim 1, wherein the conduit means is adapted for connection to a source of vacuum, and further comprising a closeable control opening communicating with the conduit means to vary the amount of vacuum therein.

5. The device defined by claim 4, and further comprising a slideable closure member for said control opening.

6. The device defined by claim 1, wherein the fluid conduit means comprises:

- a. a fluid passageway formed within at least a portion of said one leg member;
- b. and a fluid connector member affixed to said one leg member and communicating with said passageway, the connector member being adapted for connection with a source of fluid pressure differential.

7. The device defined by claim 6, wherein the fluid passageway extends longitudinally through said one leg member and opens at the extreme end thereof to define said second fluid opening.

8. The device defined by claim 7, wherein said first fluid opening comprises a bore extending transversely through said one leg member and normal to the fluid passageway.

9. Surgical forceps of a tweezer-like configuration, comprising:

- a. first and second elongated movable leg members of essentially the same length and having functional ends defining essentially flat, fluid impermeable opposed inner faces and outer faces, the leg members being commonly affixed and projecting from the fixed point in cantilever fashion, the functional ends being normally biased apart with the essentially flat opposed inner surfaces cooperable to perform a forceps function;
- b. fluid conduit means associated with at least one of the first and second leg members and adapted for connection with a source of fluid pressure differential;
- c. said one leg member having a plurality of fluid openings formed on its inner face and disposed along a straight line extending between said fixed point and the extreme end of said one leg member, each of said openings communicating with said fluid conduit means to permit the transfer of fluid to or removal of fluid from a surgical area.

10. The device defined by claim 9, wherein the fluid conduit means comprises:

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- a. a passageway formed within at least a portion of said one leg member;
- b. and a fluid connector member affixed to said one leg member and communicating with said passageway, the connector member being adapted for connection with a source of fluid pressure differential.

11. The device defined by claim 10, wherein the fluid passageway extends longitudinally through a substantial portion of said one leg member.

12. The device defined by claim 10, wherein each of said plurality of fluid openings comprises a bore extending transversely through said one leg member and normal to the fluid passageway.

13. The device defined by claim 10, wherein the fluid connector member is adapted for connection to a source of vacuum, and further comprising a closeable control opening communicating with the passageway to vary the amount of vacuum therein.

6

14. The device as defined by claim 10, wherein the fluid connector member is tubular and terminates in a series of tapered segments constructed to receive and retain a resilient tube.

15. The device defined by claim 9, and further comprising:

a. second fluid conduit means associated with the other of said first and second leg members and adapted for connection with a source of fluid pressure differential;

b. said other leg member having a plurality of fluid openings formed on its inner face and disposed along a line extending between said fixed point and the extreme end of said other leg member, each of said openings communicating with said second fluid conduit means to permit the transfer of fluid to or removal of fluid from a surgical area.

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