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[54] **COLLECTION BOTTLE**

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[51] **Int. Cl.** **A61f 5/44**
[58] **Field of Search** 128/275–278

[56] **References Cited**

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[57] **ABSTRACT**

A collection bottle adapted for use in uterine aspiration systems. The bottle reduces the production of foam and splash, and prevents any foam, liquids, and solid material from passing from the collection bottle to a source of vacuum. Should the collection bottle become filled with liquid, the vacuum in the bottle will be stopped.

4 Claims, 3 Drawing Figures

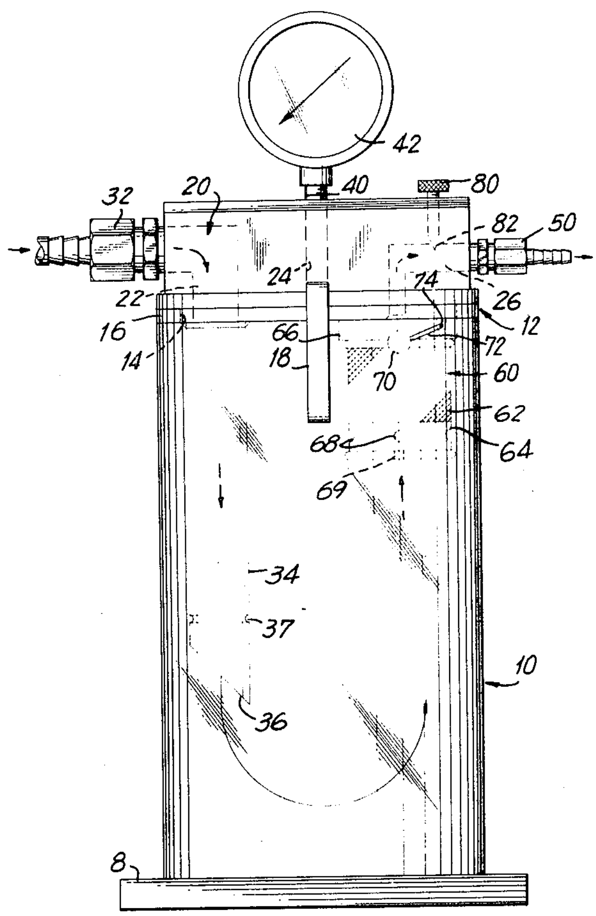
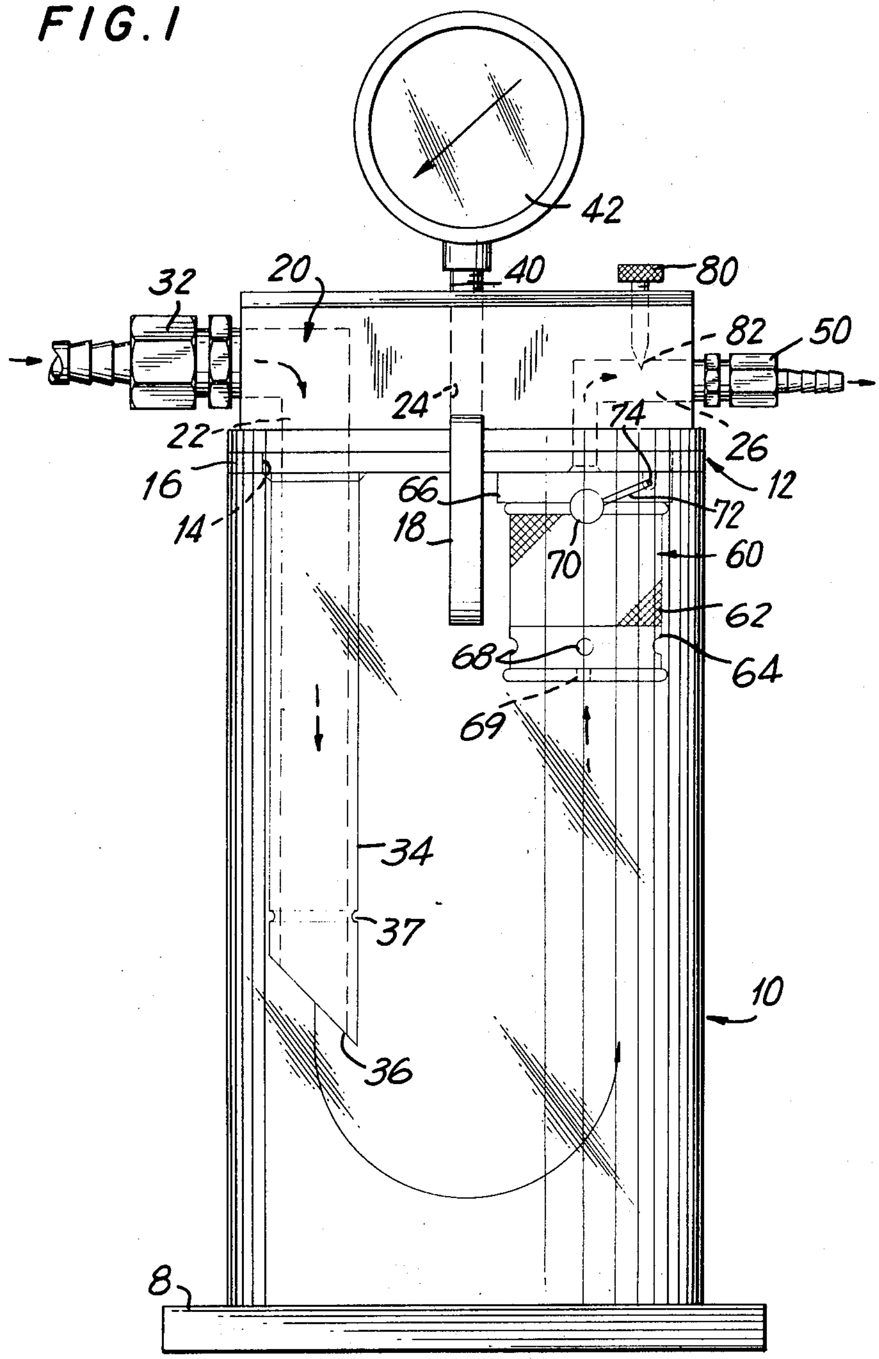


FIG. 1



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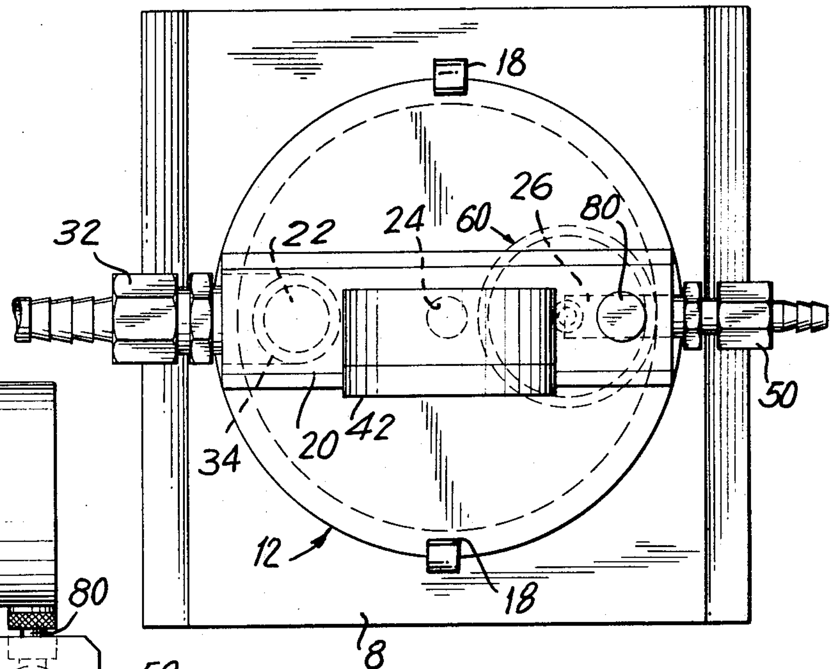

FIG. 3

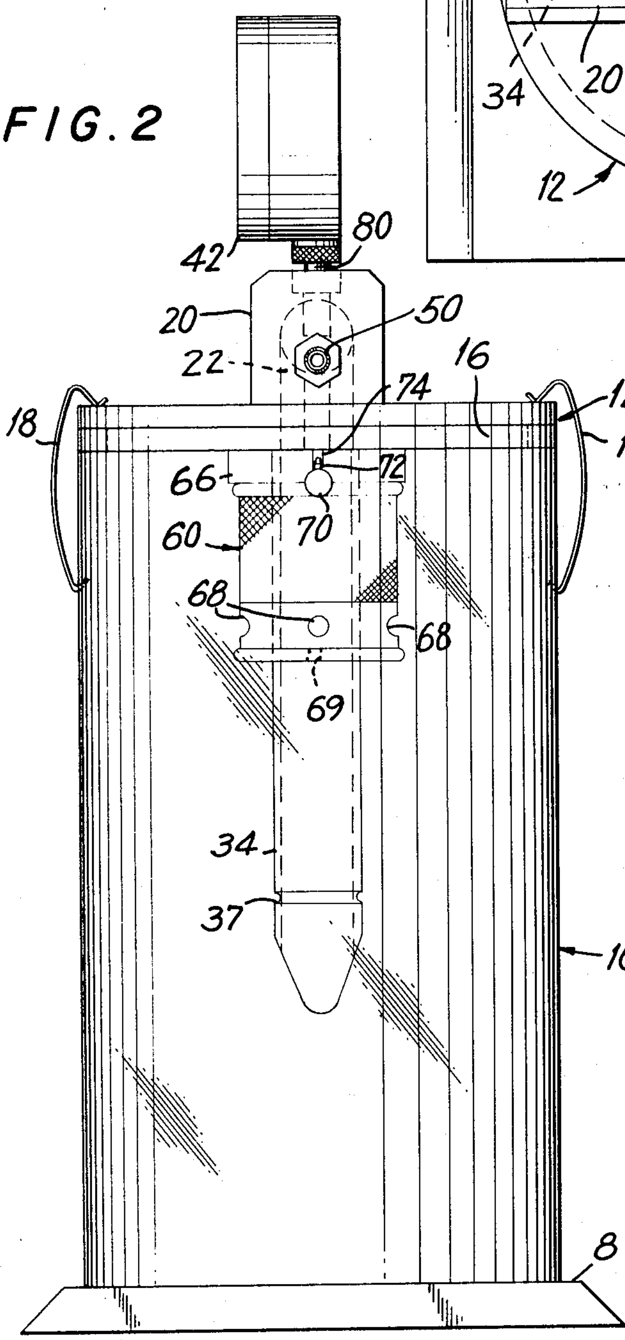

FIG. 2

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COLLECTION BOTTLE

The invention relates generally to medical equipment and particularly to equipment used in uterine aspiration.

Within the past 15 years, a technique called uterine aspiration or vacuum curettage has been developed for performing abortions during the early months of pregnancy. The earliest reference to this technique appeared in an article by Y. T. Wu and H. C. Wu, entitled "Suction in Artificial Abortion—**300** Cases" in the *Chinese Journal of Obstetrics and Gynecology*, Vol. 6, 1958, beginning at page 447. A recent survey of the subject appeared in an article by Kerslake and Casey entitled, "Abortion Induced by Means of Uterine Aspirator" in *Obstetrics and Gynecology*, Vol. 30, July, 1967, pages 35–45. Very briefly, the technique is to aspirate the conceptus from the uterus using a tube which has a flexible connection to a source of suction. A typical apparatus includes a suction curet having an oval mouth at its end, or on one side, and an air hole at the other end to control the suction. A rubber pressure tubing connects the curet to a glass container which in turn is connected to a suction pump. Aspiration of the uterine contents usually takes less than two minutes and the debris can readily be seen as it appears in the glass container.

The method employed may be very briefly reviewed. The perineum, vagina, and cervix are disinfected. The cervix is then drawn forward with a vulsella. The direction of the cervical canal and the depth of the uterine cavity are determined with a uterine sound. It is a common practice to dilate the cervix to allow easy insertion of the suction curet. However, dilation may be unnecessary in certain cases, and when not needed, an anesthesia generally is not used. When dilation is required, a local or general anesthesia is administered. The suction curet of appropriate diameter and design is inserted carefully into the cervix. The suction is then started. In a few seconds the suction reaches a working level which typically is at a mean level of 18 inches of mercury (relative). The suction curet is moved gently up and down over all aspects of the uterine cavity. The debris from the conceptus passes visibly into the glass container, either whole or piecemeal. The degree of suction can be controlled with some aspirators by putting a thumb over an airhole at the base of the curet as well as by using some device on the pump. During the aspiration process, the uterus reacts by contracting and decreasing in volume. Aspiration usually takes less than 2 minutes. It is thought to be complete when the uterine wall feels smooth and no further debris emerge.

A typical apparatus used for uterine aspiration consists of a curet connected by a hose to a collection bottle which in turn is connected by a second hose to a vacuum pump. There are certain difficulties associated with the use of the collection bottle and vacuum pump. One of the more serious ones has to do with carry-over, namely, the passage of liquid or foam or even small bits of tissue from the bottle into the mechanism of the pump. This may occur during the aspiration, or after the operation has been performed. Carry-over during aspiration may be due to a number of causes: for example, splashing of the effluent or the build up of foam inside the collection bottle. The carry-over produced after the operation is most often caused by careless handling of the collection bottle, carelessness in flushing wash water through the curet and hose, or failure to disconnect a hose leading from the collection bottle to the vacuum pump. It may also be caused by careless handling during disconnection. The consequences of introducing foam, liquids, or solid substance into the pump are two-fold. First, it will injure the pump which will have to be repaired, and in extreme cases, the pump's entire internal mechanism may have to be replaced. Second, and far more serious, should foreign matter get into and clog the pump during the course of an aspiration, (typically, foam builds up during this short interval of aspiration) the operation would have to be interrupted. The complications attendant upon an interrupted abortion are very serious — increased risk of infection; if no stand-by equipment is available the operation must be completed later and the interrupted operation is always more difficult; risk of hemorrhaging, increased pain, trauma, etc. Therefore, it is important that the collection bottle be so designed that there is no carry-over from the collection bottle to the vacuum pump.

Heretofore, a number of attempts have been used to avoid carry-over. These have included double collection bottles, complicated filters preceding the input to the pump, the use of water pumps which are not affected by seepage of foam, and the complete avoidance of a vacuum pump by a vacuum bottle technique.

The present invention is a single collection bottle which avoids the carry-over associated with prior art collection systems. It prevents a carry-over from the bottle to the vacuum pump during aspiration, as well as after the aspiration is completed. Furthermore, it reduces the possibility of interruption of the operation and the loss of vacuum during an operation, due to carry-over getting into the pump mechanism during aspiration. Should the level in the collection bottle rise, so that carry-over is imminent, the bottle of the invention will turn off the vacuum, and a replacement bottle can be put into the equipment.

The largest single source of carry-over is foam. It is produced by the liquid being drawn into the collection bottle. If the foam can be reduced or controlled, the chance of carry-over is reduced. In this application, there is shown a device for reducing the amount of foam initially produced and a device for controlling and preventing it from getting into the vacuum pump. This is achieved without substantial interference with the vacuum provided by the pump.

This application also describes an apparatus having a means for positively preventing the passage of liquid from the collection bottle to the vacuum pump. Should the collection bottle become filled with liquids up to the top, the system as described in this application will remove the vacuum from the collection bottle and at the same time bar the passage of liquid from the collection bottle into the tube leading to the vacuum pump.

This liquid-baring device is located in the collection bottle itself. After an operation, it will prevent the passage of liquid from the collection bottle to the tube leading to the hose, as may be caused by the accidental tipping over or rough handling of the collection bottle.

A collection bottle constructed in accordance with the teachings of this application has other features, such as ease of assembly and disassembly, and ease of cleaning. The bottle lends itself to easy and economical manufacture.

It is an object of the present invention to provide a single collection bottle for use in a uterine aspiration apparatus which prevents carry-over from the collection bottle to the hose leading to the vacuum pump.

It is another object of the present invention to provide a novel collection bottle for use in a uterine aspiration device wherein the production of foam is reduced.

It is a further object of the present invention to provide a novel collection bottle for use in uterine aspiration systems and in which the passage of liquid from the bottle to the tube connected to the pump is barred.

According to the invention there is provided a collection bottle for use in a vacuum curettage system having a bottle with a first port adapted to be connected to a curet, a second port adapted to be connected to a vacuum source, a dip tube extending into said bottle from the first port, and a trap mounted in the bottle at the second port whereby air is drawn from the second port to the vacuum pump passes from the trap.

The construction of an illustrative embodiment as well as further objects and advantages thereof, will become apparent when read in conjunction with the accompanying drawings wherein:

FIG. 1 is a front elevation of a collection bottle constructed in accordance with the invention.

FIG. 2 is a side elevation of the collection bottle of FIG. 1.

FIG. 3 is a top view of the collection bottle shown in FIGS. 1 and 2. The figures are three views of a single collection bottle, and in the drawings like elements bear like legends.

Referring now to the figures there is shown a collection bottle having a base **8**, round side walls **10**, and a cap **12**. The cap **12** has a solid round inner flange **14** extended downward from the cap towards the inside of the bottle. A gasket **16** provides a vacuum seal between the top of the wall **10** and the cap **12**. A pair of lock down clips **18** are shown schematically on either side of the bottle for securing the cap.

A manifold **20** is mounted on the upper portion of the cap **12** and has three apertures or ports, **22, 24,** and **26**, extending through the manifold and through the cap to the inner portion of the bottle. The first aperture **22**, at its outer end is connected to a ½ inch hose insert coupling **32** which is adapted to be connected to a flexible hose (not shown) that joins the collection bottle to the curet. The material collected during the vacuum aspiration will be introduced into collection bottle through this hose, and the aperture **22**. The inner end of aperture **22** is connected to a dip tube **34** which extends into the collection bottle. The dip tube **34** is mounted e.g. the lower portion of the cap; where it meets the aperture **22** it is of the same inside diameter as, and co-axial with, the inner end of the aperture **22**. To minimize the production of foam as the effluent enters the collection bottle through the dip tube, the dip tube should extend close to the bottom of the bottle. For example, a typical dip tube inside a bottle 9½ inches high is approximately 6 inches long, i.e. a ratio of 2:3. To further minimize foam and splash it is advisable to make the inside diameter of the dip tube fairly large, and an inside diameter of at least ¾ inch is recommended. The production of foam may be further reduced by beveling the lower end of the dip tube **34**. In FIG. **1**, the bevel **36** can be clearly seen; it has an angle of 45°. By a combination of these elements— a dip tube extending into the lower portion of the bottle, a wide dip tube with an enlarged aperture (e.g. beveled), the amount of foam and splash produced is reduced.

The bevel **36** at the end of the dip tube **34** serves a further purpose. It will be noted that the effluent is introduced through the aperture **22** at the left hand side in FIG. **1**. The aperture **26**, at the right hand side, is connected to a source of vacuum. The bevel **36** is faced toward the nearest wall, i.e. away from the aperture **26**. Should any splash occur, the bevel **36** facing the nearest wall directs the splash towards the adjacent wall rather than towards the aperture which is connected to the air pump.

A groove **37** is provided on the outside circumference of the dip tube near its lower end. This groove allows the anchoring of a porous specimen bag which traps the solid material extracted from the uterus.

The second aperture **24**, extends through the cap **12** and manifold **20** and has mounted at its upper end a threaded screw **40** on which is mounted a vacuum gauge **42**. The aperture **24** extends through the manifold and cap to the inner part of the collection bottle. Thereby the vacuum gauge provides an indication of the actual pressure inside the collection bottle.

The third aperture **26**, has at its manifold or outer end a ¼ inch hose insert type coupling **50** which is to be connected to a hose and vacuum pump (not shown). The other end of aperture **26** opens on to the inside of the collection bottle. Surrounding this opening is a trap **60**. The trap has two portions. One part is to prevent splash, foam, and air carried particles, from passing to the aperture **26** and to the pump. The other part of the trap is to close the opening to the aperture **26** in the event the liquid level approaches the top of the collection bottle.

The first portion of the trap which filters out elements that are mixed with the air, consists of a porous element filter **62**. The filter **62** is supported in the upper portion of a plastic jar **64**, which is attached to the underside of the cap **12** below the entrance to the aperture **26**. The jar **64** is secured to the lower wall of cap **12** by a threaded collar **66** which is securely mounted to the lower wall of the cap **12**. The jar **64** forms an airtight seal with the collar **66**. A rubber gasket (not shown) may be included where the threaded jar is joined to the collar. The lower portion of the jar is provided with four inlet holes **68** which are evenly spaced around the circumference of the jar. The bottom of the jar at its center is provided with a drain hole **69**. During vacuum aspiration the air is drawn through the trap and enters the lower portion of the jar **64** through the inlet holes **68** and **69** and passes through the porous element **62** and then through the aperture **26** to the vacuum hose and pump. Should splash or other liquid effluent be drawn into the trap it will tend, through gravity, to be drawn to the bottom of the jar and seep out through the drain hole **69**. Any effluent that is sucked upwards into the jar will be trapped by the porous element.

In the event of the liquid rising above the level of the inlet holes **68**, the vacuum would draw the liquid through the porous element **62** towards the top of the jar. As the liquid reaches the top of the porous element, a ball float **70** mounted on an arm **72**, which is connected to a pivot **74** on the lower wall of the cap **12**, is activated. Alternatively, a free floating ball may be used in place of the ball pivotally mounted on the arm. With the free floating ball, a dimple may be provided in the upper space of the porous element **62** to hold the ball in the center of the porous element. The ball will float on the liquid and be moved upwards, on the top of the liquid to close or stop shut the aperture **26** before the liquid reaches the aperture, thus baring the liquid from the passageway **26** to the vacuum pump. This cuts off the source of vacuum to the collection bottle momentarily interrupting the operation. It preserves the pump in good working order, and permits the insertion of a fresh collection bottle for the continuation of the operation. Without this expedient the pump would become fouled and rendered unusable for continuation of the operation.

The float inside the collection bottle serves an additional function in that after the operation is completed and the collection bottle is being moved, should the liquid contents be carelessly handled it will prevent them from spilling through the aperture **26**.

The vacuum introduced through the coupling **50** and the aperture **26** may be regulated by a vacuum control knob **80** which extends into the manifold **20** and joins the aperture **26** at a point shown by legend **82**.

A collection bottle has been constructed in accordance with the teaching of this application and the following dimensions for that bottle are set forth below:

It should be understood, however, that these dimensions are for purposes of example only, and variations may be made therefrom without departing from the spirit or scope of the invention:

Inside height — 9 ½ inches.

Outside diameter — 5½ inches. Inside diameter 5½ inches.

Dip tube total length — 6½ inches.

Dip tube inner diameter — ¾ inch.

Dip tube outside diameter — 1 inch.

Spacing between edge of dip tube and closest adjacent wall — ¼ inch.

Trap housing with collar — 2½ inches high by 1¾ inches in diameter.

Porous filter element ½ inch above the lower wall of trap.

Inlet and drain holes — ⅜ inch in diameter.

Inside diameter of entrance port where it joins dip tube — ¾ inch.

Inside diameter of exit port where it joins the inside of the bottle — ½ inch beveled.

Ball float — ⅞ inch diameter sphere.

Pivot arm — ¾ inch.

Total volume of collection bottle, approximately 3 liters.

In summary, it has been described a single collection bottle having an input port which is adapted to be connected to the curet, and an output port which is adapted to be connected to a vacuum source. By proper location, shape and dimensioning of a dip tube on the input port, splash and foam are reduced. By the addition of a trap on the output port, the passage of foam and excess splash are also reduced. This employs a porous air filter as well as a liquid trap having inlet holes and drain holes. Furthermore, a float is provided in the trap, and should the liquid level of the porous element start to be sucked into the pump, the float will close the exit port and simultaneously prevent the materials from being drawn into the pump and at the same time cut off the source of vacuum to the bottle.

The above description of the invention is intended to be illustrative only, and various changes and modifications in the embodiment described may occur to those skilled in the art. These changes may be made without departing from the scope of the invention, and thus it should be apparent that the invention is not limited to the specific embodiment described or illustrated in the drawings.

What is claimed is:

1. A collection bottle for use in a vacuum curettage system comprising a bottle having a first port adapted to be connected to a curet; a second port adapted to be connected to a vacuum source; a dip tube extending into said bottle from said first port; and a trap mounted in said bottle at said second port whereby air drawn through the second port to the vacuum source passes through the trap; said trap includes a porous element filter and a liquid filter; said liquid filter includes a jar having a drain at its lower portion and an intake on its side walls, and said porous element filter is mounted in said jar between the intake means and the entrance to second port.

2. A collection bottle for use in a vacuum curettage system comprising a bottle having first port adapted to be connected to a curet; a second port adapted to be connected to a vacuum source; a dip tube extending into said bottle from said first port; and a trap mounted in said bottle at said second port whereby air drawn through the second port to the vacuum source passes through the trap; said dip tube extends at least half-way into said bottle and has a beveled open end; said beveled end faces away from the trap; said trap includes a porous element filter, liquid filter and a ball valve mounted below said second port.

3. A collection bottle for use in a vacuum curettage system comprising a bottle having a first port adapted to be connected to a curet; a second port adapted to be connected to a vacuum source; and a trap including a porous filter element mounted in said bottle solely at said second port and cooperative therewith so that air and any matter drawn through the second port to the vacuum source must first pass through the trap; said trap including a jar secured at one end to said second port, and having at least one apperture at its other end, with said porous filter element therebetween; and a liquid valve means inside said jar between said porous filter element and said second port, for normally resting on said filter element and for stoppering said port when liquid enters said trap.

4. A collection bottle according to claim **3** wherein said valve means includes a ball valve.

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