

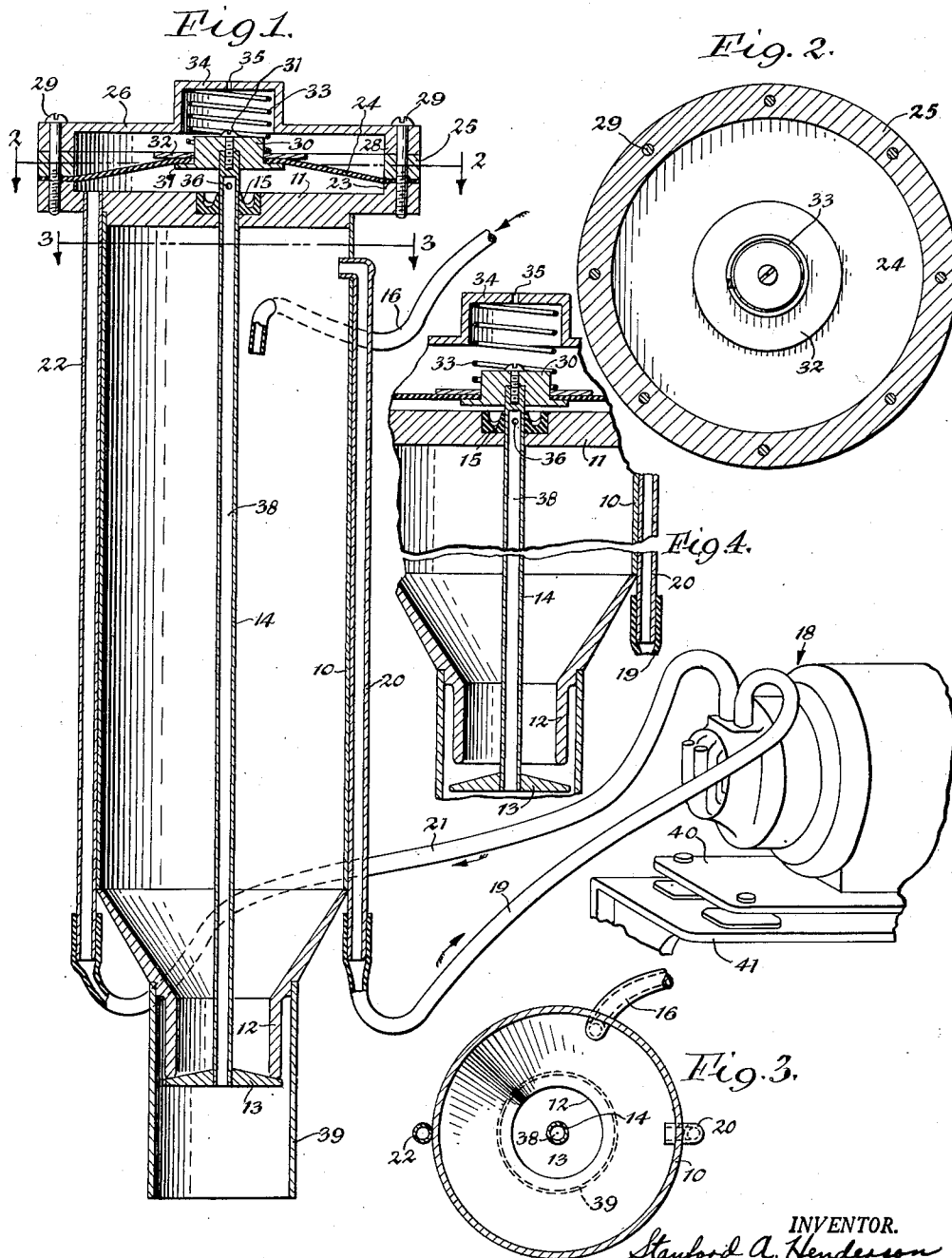
Aug. 21, 1956

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2,759,476

ASPIRATING APPARATUS

Filed Dec. 8, 1954



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ASPIRATING APPARATUS

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Application December 8, 1954, Serial No. 473,827

6 Claims. (Cl. 128—278)

This invention relates to improvements in aspirating apparatus used in medical and dental surgery to keep the operating field clean.

Heretofore aspirating apparatus of this type usually included a collecting bottle to which a suction pump was operatively connected, as well as an aspirating hose through which the liquid and semi-liquid waste materials removed from the operating zone were delivered into the bottle. After use for one patient, the collecting bottle was disconnected from the line leading to the suction pump and also from the aspirating hose and the contents of the bottle dumped. Thereafter the bottle and aspirating hose were flushed clean and reassembled in order to ready the apparatus for use with another patient. Even with one patient, if the waste materials to be collected exceeded the capacity of the collecting bottle it was necessary to stop the apparatus long enough to remove the bottle, dump its contents and reassemble the bottle, or at least to substitute another empty bottle, or put into operation a completely independent stand-by apparatus.

These disadvantages are obviated with the present invention and as well additional advantages are achieved.

More specifically, the primary purpose of the present invention is to provide aspirating apparatus of the character described which is permanently connected to the sewer system, thereby eliminating the need for periodic shut-downs, disassembling and reassembling the apparatus.

Another object is to provide such aspirating apparatus in which all odor of the waste material, which odor may be often very objectionable, is directed into the sewer system and is not discharged into the operating room. In this connection the present aspirating apparatus may be used as a means to remove objectionable odors or fumes from an operating field, without necessarily removing liquids, thereby functioning as a ventilating device.

Another object is to provide such aspirating apparatus which requires no disassembling for cleaning after use.

Further objects are to provide such aspirating apparatus which is simple in construction, relatively inexpensive to manufacture, and not likely to get out of order or require repairs.

Still further objects and advantages of the invention will be apparent from the following description and accompanying drawings in which

Fig. 1 is a view, partly in vertical section and partly in elevational perspective, of aspirating apparatus embodying the present invention and showing the same in position in which the dump valve is closed.

Fig. 2 is a transverse sectional view thereof, taken on line 2—2, Fig. 1.

Fig. 3 is a similar transverse sectional view thereof but at a lower level, this view being taken on line 3—3, Fig. 1.

Fig. 4 is a fragmentary sectional view similar to the sectional portion of Fig. 1 and showing the part of the apparatus involved in the position in which the dump valve is open.

In accordance with the present invention the aspirating

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apparatus shown in the drawing includes a vessel 10 closed at its upper end by a cover 11 and having its lower end progressively contracted to provide a relatively narrow depending tubular spout 12. The lower edge or rim of the spout 12 is shown as being rounded and is adapted to be engaged by the upper conical surface of a self centering dump valve 13. The dump valve 13 is carried on the lower end of a vertical rod or stem 14 the upper end of which slidably extends through a bore provided in the cover 11. The upper portion of the cover 11 surrounding the last mentioned bore is recessed to accommodate the sealing member 15 which is made of a flexible material such as rubber. This sealing member 15 closely but slidably embraces the periphery of the rod 14 and operates to seal against the passage of air in either direction past the engagement between this rod and sealing member.

With the dump valve 13 closed as shown in Fig. 1 it will be seen that the interior of the vessel 10 provides a closed chamber. An aspirating hose 16 is suitably connected to the interior of the vessel 10 adjacent the upper end thereof. As shown the end of the hose 16 passes through a closely fitting hole provided in the wall of the vessel 10. The opposite end of this aspirating hose is connected to a suitable type of nozzle (not shown) which is the instrument which is inserted into the place to be cleared of waste liquid or semi-liquid material or objectionable odors or fumes.

A subatmospheric pressure is adapted to be maintained within the vessel 10 by air pump 18 which is operatively associated with the dump valve 13 in a manner now to be described. The air pump 18 may be of any suitable construction but as shown the same comprises an electric motor driving a rotary pump having an inlet and an outlet. The inlet to this pump is connected by means of the flexible line or hose 19 to the lower end of a vertical tube or pipe 20 which is arranged along the outer surface of the vessel 10, the upper end of this pipe 20 having an elbow which extends through a closely fitting hole in the side wall of the vessel 10 adjacent its upper end and communicates with the interior of the upper vessel.

The outlet of the air pump 18 is connected by means of the flexible line or hose 21 to the lower end of a second vertical tube or pipe 22. The upper end of this pipe 22 extends through a closely fitting hole in the cover 11. The cover 11 is shown as being larger in diameter than the vessel 10 and as having an annular upstanding rib 23 at the peripheral margin of the cover 11. A flexible diaphragm 24 overlies the annular rib 23 and is held there-against by a washer 25 which in turn is clamped down by a cap member 26 having a depending annular rib 28 which rests upon the intermediate washer 25. The depending rib 28, washer 25 and upstanding rib 23 are shown as being of the same radial thickness and all are fastened together at circumferentially spaced places by screws 29.

The chamber so formed by the cap 26, washer 25 and cover 11 with its upstanding rib 23 provides a housing for the diaphragm 24. This diaphragm at its center is connected to the upper end of the rod 14. To achieve this, the upper end of the rod 14 is shown as projecting into a closely fitting recess in the bottom of a head member 30 and is held in this recess by means of the screw 31 which enters the solid end of the rod 14 axially from the upper end of the head member 30. This head members at its lower end has an annular flange 37 which projects radially outwardly and the central portion of the diaphragm 24 rests upon this flange, the center of the diaphragm being cut out to permit the main portion of the head member 30 to project upwardly through this opening. A washer 32 rests on top of that portion of the diaphragm immediately over the flange 37 on the head member 30,

This washer 32 is constantly urged downwardly so as to clamp the diaphragm 24 against the flange 37 by means of a helical compression spring 33. The central portion of the cap member 26 is shown as being formed to provide an inverted pocket 34 into which the upper portion of the helical spring 33 extends. A vent hole 35 is shown in the top wall of the inverted pocket 34 so as to vent the chamber provided between the diaphragm 24 and the cap member 26 to the atmosphere. The lower chamber provided between the diaphragm 24 and cover 11 is closed except for the constant connection with the upper end of the vertical tube or pipe 22 and also at times the connection with a restricted hole 36 in the upper end of the rod 14 immediately below the head member 39. The hole 36 extends radially into the hollow rod or stem 14 which is shown as having a bore 38 extending from a point slightly above the restricted hole 36 downwardly through the valve 13 and opening to the space therebelow.

The vessel 10 with the associated parts described mounted thereon is preferably attached to a fixed supporting surface such as a wall and this may be accomplished in any suitable manner as by a bracket (not shown).

A feature of the present invention is to provide a permanent connection of the vessel 10 with the sewer system of the building. For this purpose a sleeve 39 is shown as being suitably connected at its upper end to the vessel adjacent the juncture of its tapered section with the upper end of its tubular spout 12. The lower end of this sleeve 39 may be connected in any suitable manner with a pipe forming part of the sewer system. The sleeve 39 is spaced from the spout 12 so as not to interfere with the movements of the dump valve 13.

The motor driven air pump 18 may be arranged in any suitable location and as illustrated in the drawing, this pump is supported on a base plate 40 in turn suitably resiliently supported on a bracket 41. This bracket 41 may in turn be suitably mounted on the same wall on which the vessel 10 is mounted.

When the air pump is not operating the dump valve 13 is open, as shown in Fig. 4. When the valve is in this condition it will be noted that the diaphragm 24 is horizontal or substantially so.

When the air pump is operating air is being drawn toward the pump through the line 19 and is being discharged under pressure through the outlet line 21. Thus the atmosphere is tending to be extracted from the vessel 10 which places the aspirating hose 16 under suction. At the same time the pressurized air discharged by the pump is directed to the chamber below the diaphragm 24 by the lines 21 and 22. The pressure of the entering air as well as the area of the diaphragm are such that the central portion of the diaphragm is forced to move upwardly to the position shown in Fig. 1. In this position the valve head 13 is lifted upwardly to seat against the rim of the dump spout 12, this engagement serves to limit the upward movement of the diaphragm 24. With the hollow rod 14 so raised it will be noted that the restricted hole 36 adjacent the upper end of the rod is exposed to this chamber immediately below the diaphragm 24 to which pressurized air is being introduced. Some of this air of course enters the hole 36 which acts to bleed off air from this chamber. The size of this hole 36 is such that a sufficient pressure can be built up in the chamber between the diaphragm 24 and the cover 11 to maintain dump valve 13 closed notwithstanding the buildup of liquid and semi-liquid materials on top of this valve and for substantially the full height of the vessel 10. If desired, the size of the restricted hole 36 can be so designed that the resulting pressure established in the chamber between the diaphragm 24 and the cover 11 is insufficient to hold the dump valve closed when the contents of the vessel 10 rise to a predetermined level below the end of the discharge end of the aspirating hose 16.

At any other time when it is desired to dump the con-

tents of the vessel, this can be readily accomplished by turning off the motor which drives the air pump 18. So stopping the air pump permits the restricted hole 36 to bleed off the pressure in the chamber between the diaphragm 24 and the cover 11 with the result that the diaphragm 24 moves from its lifted condition shown in Fig. 1 to its lower or horizontal position shown in Fig. 4. This operates to unseat or open the dump valve 13 and the contents of the vessel are dumped into the sewer.

It will also be noted that the helical spring 33 serves two functions, one being to exert a force against the washer 32 so as to clamp the diaphragm 24 between this washer and the flange 31, and the other purpose being to constantly urge the dump valve 13 to an open position and thereby preventing this valve from sticking closed.

When the suction end (not shown) of the aspirating hose 16 is placed in an environment to ventilate a wound or incision, it will be noted that the odoriferous gases will be drawn into the vessel 10, thence into the pipe 20 and through the inlet line 19, through the pump 18, through the outlet line 21 and pipe 22 into the chamber between the diaphragm 24 and cover 11, and thence through the restricted hole 36 into the hollow rod 14 from whence the gases are discharged into the sewer system. Thus such odoriferous gases are not exhausted into the operating room but rather are carried away by the sewer system.

It is to be noted also that when the pump 18 is not operating so that the diaphragm 24 is in the position shown in Fig. 4 in which position the hole 36 in the hollow rod 14 is closed, sewer odors cannot back up into the line 22.

When it is desired to clean the aspirating apparatus, it is merely necessary to dip the suction end (not shown) of the aspirating hose 16 into water or any other suitable cleansing liquid and this will operate to flush out the hose 16 and wash the vessel 10. In this connection, the vessel 10 is preferably made of metal or at least some suitable opaque material so that the interior of this vessel 10 is not seen.

I claim:

1. Aspirating apparatus, comprising an air pump having an inlet and an outlet, a vessel having a dump opening arranged for connection to a sewer system, a valve arranged for opening and closing said dump opening, means operatively connected with said pump outlet for closing said valve, means connecting the interior of said vessel with said pump inlet, and an aspirating hose leading to the interior of said vessel.

2. Aspirating apparatus, comprising an air pump having an inlet and an outlet, a vessel having a dump opening arranged for connection to a sewer system, means connecting the interior of said vessel with said pump inlet, an aspirating hose leading to the interior of said vessel, a valve arranged for opening and closing said dump opening, and means arranged to operate said valve including a valve stem, a pneumatically movable member connected to said stem and means operatively associating said member with said pump outlet.

3. Aspirating apparatus, comprising an air pump having an inlet and an outlet, a vessel having a dump opening at its bottom arranged for connection to a sewer system and a cover at its top, means connecting the interior of said vessel with said pump inlet, an aspirating hose leading to the interior of said vessel, a valve arranged below said dump opening and movable upwardly to close the same, and means arranged to lift said valve to close said dump opening, including a stem connected at one end to said valve and having its other end extending through said cover, a diaphragm arranged above said cover and jointly forming therewith a chamber, means connecting said diaphragm to the upper end of said stem and means connecting said chamber to said pump outlet.

4. Aspirating apparatus, comprising an air pump having an inlet and an outlet, a vessel having a dump opening at its bottom arranged for connection to a sewer

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system and a cover at its top, means connecting the interior of said vessel with said pump inlet, an aspirating hose leading to the interior of said vessel, a valve arranged below said dump opening and movable upwardly to close the same, and means arranged to lift said valve to close said dump opening, including a stem connected at one end to said valve and having its other end extending through said cover, a diaphragm arranged above said cover and jointly forming therewith a chamber, means connecting said diaphragm to the upper end of said stem, means connecting said chamber with said pump outlet and spring means urging said valve stem toward said cover.

5. Aspirating apparatus, comprising an air pump having an inlet and an outlet, a vessel having a dump opening at its bottom arranged for connection to a sewer system and a cover at its top, means connecting the interior of said vessel with said pump inlet, an aspirating hose leading to the interior of said vessel, a valve arranged below said dump opening and movable upwardly to close the same, and means arranged to lift said valve to close said dump opening, including a stem connected at one end to said valve and having its other end extending through said cover, a pneumatically movable member arranged above said cover and connected to the upper end of said stem and jointly forming with said cover a chamber, means connecting said chamber to said pump outlet, and means arranged to bleed the gas in said chamber into said sewer system.

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6. Aspirating apparatus, comprising an air pump having an inlet and an outlet, a vessel having a dump opening at its bottom arranged for connection to a sewer system and a cover at its top, means connecting the interior of said vessel with said pump inlet, an aspirating hose leading to the interior of said vessel, a valve arranged below said dump opening and movable upwardly to close the same, and means arranged to lift said valve to close said dump opening, including a stem connected at one end to said valve and having its other end extending through said cover, a pneumatically movable member arranged above said cover and connected to the upper end of said stem and jointly forming with said cover a chamber, means connecting said chamber to said pump outlet, and means arranged to bleed the gas in said chamber into said sewer system, said last means including a port in that part of said valve stem which is arranged in said chamber when said valve is closed and also including a passage leading from said port and extending through said stem and opening to the lower surface of said valve.

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