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PULSATING STOMACH PUMPING APPARATUS AND THE LIKE

Filed March 20, 1958

2 Sheets-Sheet 1

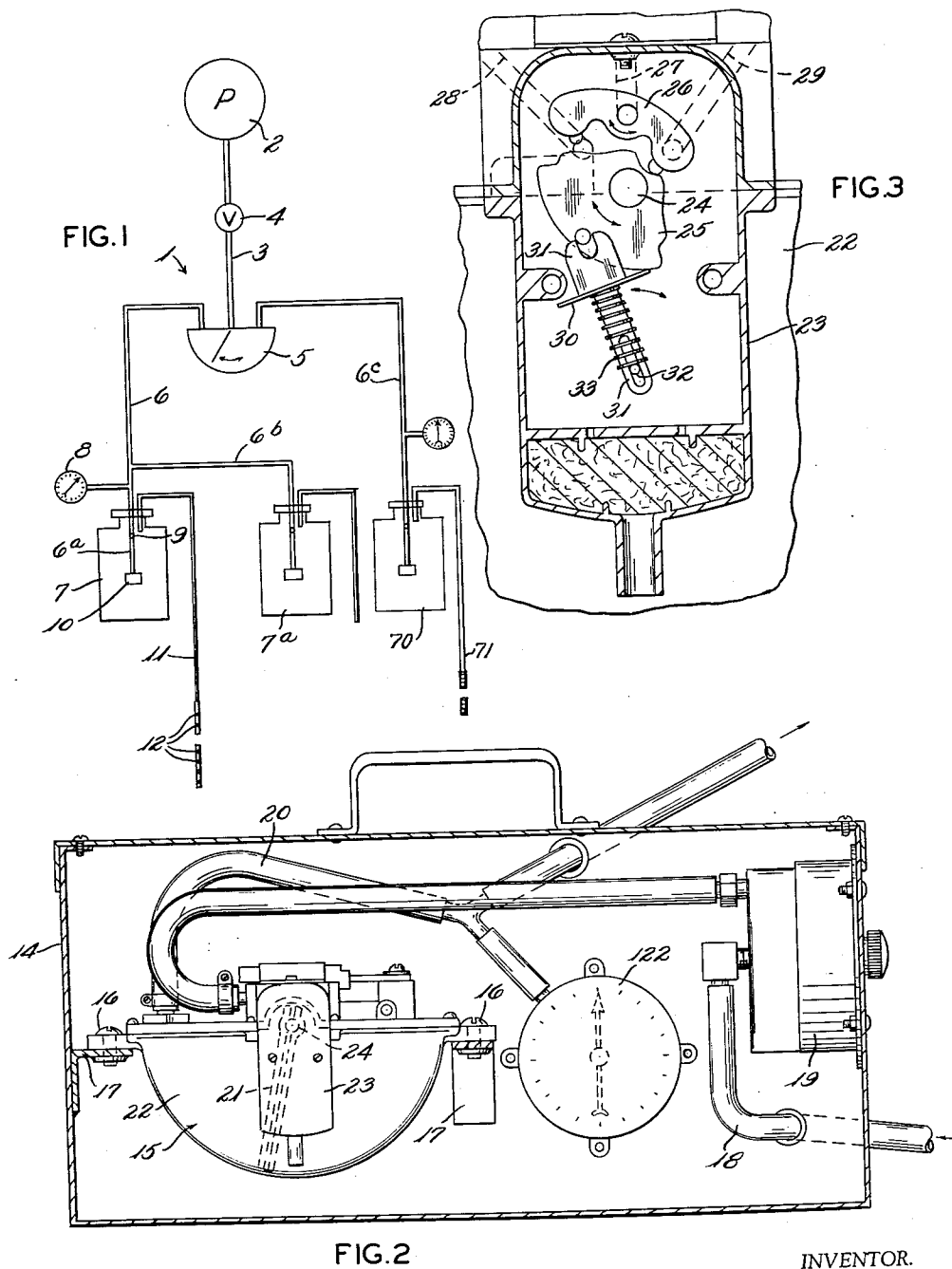


FIG. 2

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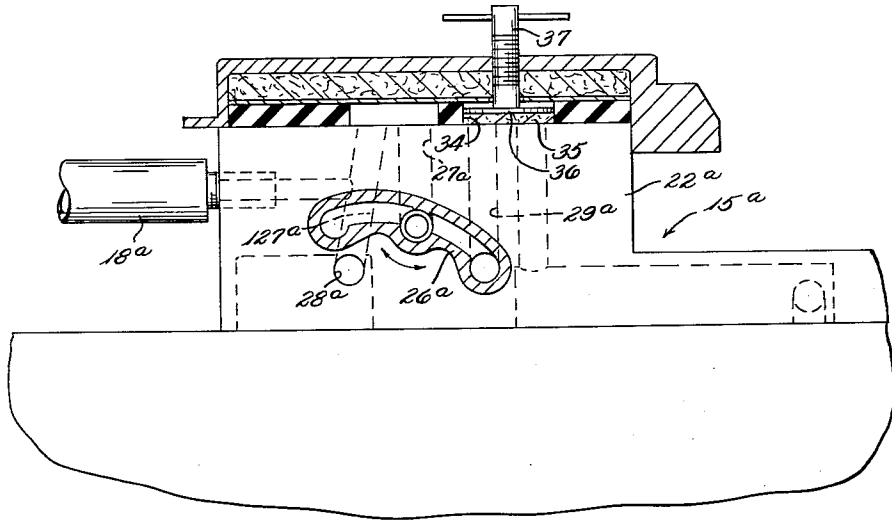


FIG. 4

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3,016,055 PULSATING STOMACH PUMPING APPARATUS AND THE LIKE

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This invention relates to pulsating vacuum stomach pumping apparatus or the like for providing regular but intermittent suctional pumping impulses.

Heretofore there have been various types of apparatus proposed for use in withdrawing or pumping fluids from a person's stomach, or for other actions such as for human or animal milking actions. These pulsating pumping devices provided heretofore have been relatively expensive, complicated structures in many instances, or the apparatuses may have had only infrequent, or non-uniform pumping pulses therein.

It is a general object of the present invention to provide a novel and improved stomach pumping apparatus or the like characterized by the provision of uniformly timed, but relatively rapidly repeated cycles of suctional pumping action in the apparatus.

Another object of the invention is to use relatively uncomplicated, commercially available products in apparatus for providing a pulsating vacuum in a flexible pumping tube adapted to be positioned, for example, in the stomach of a person.

Another object of the invention is to provide means in apparatus of the class described for controlling the degree of vacuum established in the outlet tube or pumping member of the apparatus to control the intensity of pumping action provided.

Further objects of the invention are to provide dependable low cost pumping apparatus, to provide apparatus adapted to operate a plurality of pumping means from a common control, and to use a multichamber vacuum pump to change a constant vacuum to an intermittent vacuum.

The foregoing and other objects and advantages of the invention will be made more apparent as the specification proceeds.

Attention now is particularly directed to the accompanying drawings wherein:

FIG. 1 diagrammatically shows apparatus embodying the principles of the invention;

FIG. 2 is a vertical section through a container including therein the pumping or pulsating vacuum production means of the invention with conduits extending therefrom for connection to the source of vacuum and to a receiver for pumped liquids;

FIG. 3 is an enlarged vertical section through control means for the vacuum circuit in the vacuum motor of the apparatus; and

FIG. 4 is a section, like FIG. 3, of a modified embodiment of a vacuum motor used in practice of the invention.

When referring to corresponding members shown in the drawings and referred to in the specification, corresponding numerals are used to facilitate comparison therebetween.

The details of the present invention will be made more apparent when reference is made to the accompanying drawings and apparatus of the invention is indicated as a whole therein by the numeral 1. This pumping apparatus includes a suitable source of a continuous vacuum, such as a vacuum pump 2. The vacuum pump 2 connects through a suitable conduit 3 to a control valve 4 that can be used to turn the pumping apparatus on or off, as desired. Of course, other types of control means can be provided, such as an electrical switch for running

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an electric motor that operates the vacuum pump 2 as another means for turning the pumping apparatus of the invention on and off. The conduit 3 connects to a two-chamber vacuum motor 5 that is continuously operated by the supply of a continuous vacuum thereto. The vacuum motor 5 is of the type that has two separate chambers therein and with the vacuum supplied to the motor and with atmospheric air pressure being alternately set up in a given chamber of the vacuum pump by the uniform operation of the vacuum pump 2.

Another conduit or tube 6 connects to the interior of one of the chambers in the vacuum motor 5 and extends to the interior of a suitable receiver 7. This receiver 7 may comprise a relatively large glass jar, or any other conventional member as desired. A vacuum gauge 8 is shown connected to the conduit 6 for indicating the pressure, or degree of vacuum set up within the conduit 6 and receiver 7. The conduit 6, or an extension 6a thereof, extends into the receiver 7 and has a discharge port or opening 9 therein. The conduit extension 6a usually is of a rigid or fixed construction and it carries a float 10 thereon. This float 10 is adapted to be supported on any liquid received in the receiver 7 and rise with increased level of such liquid. However, the lowest position of the float 10 usually is controlled by a lug or stop member on the extension conduit 6a, rather than by liquid in the receiver. Thus as liquid is collected in the receiver 7, the float 10 will rise and ultimately cover the discharge port or ports 9 to shut off further supply of vacuum to the interior of the receiver 7 and terminate the pumping action automatically.

A suitable pumping means or cannula, in this instance a resilient or flexible plastic or rubber tube 11, is provided and it has apertures 12 therein so that fluid can move into the tube 11 when the tube 11, for example, is inserted through the throat into a patient's stomach for pumping action therein. Such tube 11 is connected to the interior of the receiver 7 by a suitable conduit or other connector. Thus, the desired degree of vacuum and atmospheric pressure are alternately set up within the tube 11 to create the cyclic pressure and pumping action required for drawing liquids into the tube 11 and through the conduit to deposit them in the receiver 7.

FIG. 1 of the drawings shows that a plurality of receivers 7 can be connected to the conduit 6, for example, by means of an additional or supplemental conduit 6b extending from the conduit 6 to a secondary receiver 7a.

FIG. 2 of the drawings shows one typical commercial embodiment of the operative and control means of the invention, as positioned in a box or compartment 14. In this box 14, a two-compartment or chamber vacuum motor 15, like the motor 5, is suitably secured as by cap screws 16 engaging the motor 15 and engaging angles 17 on the box 14. The vacuum motor 15 connects to a source of continuous vacuum by a conduit 18 in which a vacuum control or regulator 19 is connected. This regulator 19 may be of any conventional construction and can be used for bleeding in atmospheric air to the vacuum supply for reducing the vacuum supply and keeping the degree of vacuum controlled within desirable operating limits.

It is necessary that the source of vacuum, such as the vacuum pump 2, be of sufficient size or power to supply the desired degree of vacuum and the volume or amount thereof with the rapidity as is required for operation of the apparatus. Thus the regulator 19 can always cut down the amount of vacuum being processed through the apparatus of the invention so that the pump 2, for example, should have excess capacity over that vacuum required for operation of the apparatus of the invention.

The vacuum motor 15 has an outlet conduit 20 connected to one chamber thereof and extending therefrom,

like the conduit 6 in FIG. 1, for connection to a suitable receiver and associated means for applying a desired degree of vacuum and atmospheric pressure thereto in alternate relationship to each other for pumping action.

The vacuum motor 15 has a valve plate 21 provided therein which divides the interior of the chamber provided in the vacuum motor into two compartments and with the source of vacuum being connected thereto in alternating relationship to such chamber or compartment being connected to the atmospheric air. The operation of the vacuum motor 15 is such that it has a quick recovery when pumping to change atmospheric air pressure over to vacuum. Hence, suction is rapidly provided to effect the desired pumping action in the apparatus.

The outlet conduit 20 has a pressure, or vacuum indicator meter 122 connected therein so that the operator can readily see how the apparatus is functioning. The conduit 20 then extends to receivers 7, or the like, as indicated in FIG. 1.

FIG. 3 shows additional details of a typical multi-chamber vacuum motor such as the motors 5 or 15 of FIGS. 1 and 2. Any desired number of chambers, but usually two, are provided in these motors and only one chamber of such motor is connected to a given receiver for pumping action. Thus in FIG. 3, there is shown a frame 22 for the vacuum motor and a valve box 23 is provided on a side portion of the frame 22. The frame 22 defines an air tight enclosure and with a valve plate 21 therein dividing such enclosure into two chambers at all times. A shaft 24 is journaled in the frame 22 and positions the valve plate 21 within the frame 22. An extension or end portion of the shaft 24 carries a cam plate 25 thereon. The cam plate 25 operates a control valve 26, which may be made from nylon, or other plastic, or other conventional low friction materials. The control valve 26 is substantially of C-shape in section and has one open side face and with the remainder of the valve being a closed, air-tight construction and with substantially air-tight engagement being obtained between the open side face of the control valve 26 and the portion of the frame 22 against which the control valve is secured when operatively positioned. A center bore 27 is used to supply a source of vacuum or to connect the control valve 26 to the vacuum inlet, or conduit 18. Outlet bores or ports 28 and 29 are also formed in the frame 22 or otherwise suitably associated therewith for connecting to the different compartments provided in the enclosure of the frame. The control valve 26 has two operative positions, in one instance connecting the vacuum supply center bore 27 to the outlet or connector bore 28, whereas in the other position the control valve 26 connects the center bore 27 to the transfer or outlet bore 29. When the control valve 26 is not in engagement with one of the bores 28 or 29, such bore is exposed to atmospheric pressure for flow of such pressure to the bore or chamber to which such bore connects.

A contact or follower plate 30 is maintained in contact with the cam surface of the cam plate 25 by a carrier arm 31 that extends through a center slot in the contact plate 30. The carrier arm 31 is pivotally secured to the cam plate 25 and is pivoted on a center pin, or shaft 32. A coil spring 33 is in telescopic engagement with the carrier arm 31 and is compressed between the pin 32 and the plate 30 with the spring continually urging the contact plate 30 against the cam plate 25. The carrier arm 31 is so positioned as to extend between the dead center position of the cam plate 25 with relation to the carrier or journal pin 32 so that a snap action is provided in the cam plate and thus for the control valve 26 as the cam plate is moved towards and then over its dead center position. Preferably the open side portion of the control valve 26 is larger than the diameter of the connection bores 28 and 29 so that some arcuate movement of the control valve about the inlet supply center bore 27 may be made before breaking the air or vacuum

flow circuit between one of the bores 28 and 29 and the center bore 27.

Suitable means (not shown) holds the control valve 26 against the frame 22 when the parts are operatively associated.

If desired, some lost motion connection means may be provided connecting the cam plate 25 to the positioning shaft 24 so that the cam plate 25 is only moved in the center portion of arcuate movement of the shaft 24, as the valve plate 21 is reciprocated within the frame 22.

FIG. 4 shows a modification of the vacuum motor 15 as vacuum motor 15a and wherein a slightly different type of a vacuum adjusting means is provided. In this instance, a vacuum inlet or conduit 18a connects to an inlet supply bore or conduit 27a provided in the vacuum motor. Outlet or transfer bores 28a and 29a are likewise provided in the frame 22a and connect to the different chambers or compartments provided within the vacuum motor. The control valve 26a is shown in section in this instance to bring out the hollow C-shape general contour of the valve which is of the same construction as the control valve 26 shown in FIG. 3.

In FIG. 4, the connecting bore 29a is of slightly different contour from that bore shown in FIG. 3, and such bore has a chamber 34 provided therein. This chamber 34 has a mass of fibers 35 received therein and with a pressure plate 36 being provided bearing on the fibers 35. The position of the pressure plate 36 is controlled by means of a threaded stud 37 in journaled engagement with the pressure plate 36 and suitably sealed in a tapped aperture provided in the enclosure or frame for the vacuum motor. Thus on rotation of the stud 37, the pressure plate 36 can provide more or less pressure on the fibers 35 to impair the passage of vacuum through such chamber, or else to ease the flow of air through the chamber so as to control the amount or degree of vacuum established in the outlet means of the apparatus of the invention.

A partition wall 127a separates the bore 28a and the inlet supply bore 27a.

FIG. 1 also indicates that another system for pumping action may be connected to the opposite chamber of the vacuum motor 5 with a conduit 6c being indicated extending therefrom and connecting to similar means, like the receiver 7. FIG. 1 thus shows a second receiver 70 connected to the vacuum motor 5 by the conduit 6c. Such receiver 70 has a cannula 71 connected thereto, like the tube 11, to extend to a patient for pumping action. The receiver 70 is of the same construction and operation as the receiver 7 but, when the conduit 6c and receiver 70 are used, both chambers of the vacuum motor 5 are put into service and more pumping actions and better efficiency of operation are available.

In setting up vacuum by the apparatus of the invention, any desired degree of vacuum can be established, but normally the operative vacuum range is from about 90 to 120 mm. of mercury. By use of the adjustment means provided, this vacuum range can be raised or lowered, as desired, depending upon the capacity of the apparatus.

The vacuum motors 5 and 15 are identical in construction and may basically comprise a windshield wiper motor or other conventional two compartment vacuum operated motor.

Any desired type of pumping means may be connected to the vacuum supply lines, such as the line or tube 11. Hence, human milking means may be connected to such tube 11 for controllable vacuum, automatically operated milking action.

From the foregoing it will be seen that an uncomplicated, pulsating pumping apparatus has been provided using substantially conventional components adapted to have long service lives with a minimum of maintenance so that the objects of the invention have been achieved.

While two complete embodiments of the invention have

been disclosed herein, it will be appreciated that modification of these particular embodiments of the invention may be resorted to without departing from the scope of the invention as defined in the appended claims.

I claim:

1. A regularly pulsating stomach pumping apparatus or the like comprising means to supply a source of vacuum, a two-chamber vacuum motor connected to said vacuum means for continuous operation thereof, said vacuum motor alternately connecting each chamber thereof to said vacuum means and to the atmosphere, a receiver, a conduit connecting one chamber of said motor to said receiver to alternately set up a vacuum and atmospheric air pressure therein, means operatively connecting to said conduit for controlling the degree of vacuum set up within said receiver, and a tube connected to the interior of said receiver and adapted to be associated with a person for pumping action by the intermittent vacuums set up within the tube.

2. A stomach pumping apparatus or the like comprising a vacuum pump, a two-chamber vacuum motor connected to said vacuum pump for continuous operation thereof; said vacuum motor including a frame defining an enclosure, a valve plate, a shaft positioning said valve plate in said enclosure to divide it into two chambers, a two-position control valve connected to said vacuum pump to distribute the vacuum supply therein, means connecting said control valve alternately to one of said two chambers dependent upon the position of said control valve, and means operatively connected to said valve plate for moving said control valve from one position thereof to the other with movement of said valve plate, said vacuum motor alternately connecting each chamber thereof to said vacuum pump and to the atmosphere; a receiver, a conduit connecting one chamber of said motor to said receiver to alternately set up a vacuum and atmospheric air pressure therein, a cannula, and a tube connected to the interior of said receiver and to said cannula for pumping action therein by the alternate pressures set up within said receiver.

3. A stomach pumping apparatus or the like comprising a vacuum pump, a two-chamber vacuum motor connected to said vacuum pump for continuous operation thereof; said vacuum motor including a frame defining an enclosure, a valve plate, a shaft positioning said valve plate in said enclosure to divide it into two chambers, a two position control valve connected to said vacuum pump, means connecting said control valve alternately to one of said two chambers dependent upon the position of said control valve, and means operatively connected to said valve plate for moving said control valve from one position thereof to the other with movement of said valve plate; said control valve alternately connecting each chamber of said vacuum motor to said vacuum pump and to the atmosphere, a receiver, a conduit connecting one chamber of said motor to said receiver to alternately set up a vacuum and atmospheric air pressure therein, float means in said receiver to shut off supply of vacuum thereto when said receiver is filled with liquid to a predetermined level, and a tube connected to the interior of said receiver and adapted to be positioned in a person's stomach for pumping action therein by the alternate pressures set up within the tube.

4. Apparatus as in claim 1 wherein said vacuum controlling means includes a fiber receiving compartment in said vacuum motor in the air flow circuit thereon, and means for compressing said fibers to control the ease of air flow therethrough to regulate the amount of vacuum provided to said receiver.

5. A stomach pumping apparatus or the like comprising vacuum means for providing a continuous vacuum, a two-chamber vacuum motor connected to said vacuum means for continuous operation thereof, said vacuum motor alternately connecting each chamber thereof to said

vacuum means and to the atmosphere, a plurality of receivers, conduit means connecting one chamber of said motor to said receivers to alternately set up a vacuum and atmospheric air pressure therein, a plurality of suction operated cannula, and tube means individually connecting the interior of one of said receivers to one of said cannula for pumping action by the alternate pressure and vacuum set up within said receiver.

6. A stomach pumping apparatus or the like comprising a continuous vacuum supply means, a two-chamber vacuum motor connected to said vacuum means for continuous operation thereof, said vacuum motor having a valve plate therein dividing it into two chambers and alternately connecting each chamber thereof to said vacuum means and to the atmosphere, a pair of receivers, conduit means connecting one chamber of said motor to one of said receivers and the other chamber to the other of said receivers to alternately set up a vacuum and atmospheric air pressure therein, and a pair of tube means connected to the interiors of said receivers and adapted to be individually positioned in a person's stomach for pumping action therein by the alternate pressure set up within the tube.

7. Apparatus as in claim 6 where vacuum control means are connected in said conduit means between said vacuum motor and one of said receivers to control the degree of vacuum set up in said receiver.

8. Apparatus as in claim 6 where a vacuum control means comprising a fiber receiving compartment in the air flow circuit for said vacuum motor and means for compressing said fibers to control the air flow rate thereto to regulate the amount of vacuum provided is connected to one chamber of said vacuum motor to control the amount of vacuum set up therein.

9. A stomach pumping apparatus or the like comprising a vacuum source, a two chamber vacuum motor connected to said vacuum source for continuous operation thereof, said vacuum motor alternately connecting each chamber thereof to said vacuum source and to the atmosphere, a pair of receivers, a conduit connecting one chamber of said motor to one of said receivers to alternately set up a vacuum therein and to supply atmospheric air thereto, a second conduit connecting the opposite chamber of said motor to the other of said receivers to alternately set up a vacuum and to release the vacuum by air supply thereto, a pair of pump means, and individual tubes individually connected to the interior of one of said receivers and to a said pump means for pumping action therein by the intermittent vacuum set up within said receiver.

10. A stomach pumping apparatus or the like comprising a vacuum pump, a two chamber vacuum motor connected to said vacuum pump for continuous operation thereof, said vacuum motor alternately connecting each chamber thereof to said vacuum pump and to the atmosphere, a pair of receivers, a pair of conduits individually connecting one chamber of said motor to one of said receivers to alternately set up a vacuum and atmospheric air pressure therein, a pair of pump means, and individual tubes individually connected to the interior of one of said receivers and to a said pump means for pumping action by the alternate vacuum and release of vacuum set up within said receiver.

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