May 25, 1948. J. A. BETTS 2,442,282

SUCTION APPARATUS

Filed Nov. 8, 1946 2 Sheets-Sheet 1

Fig. 1

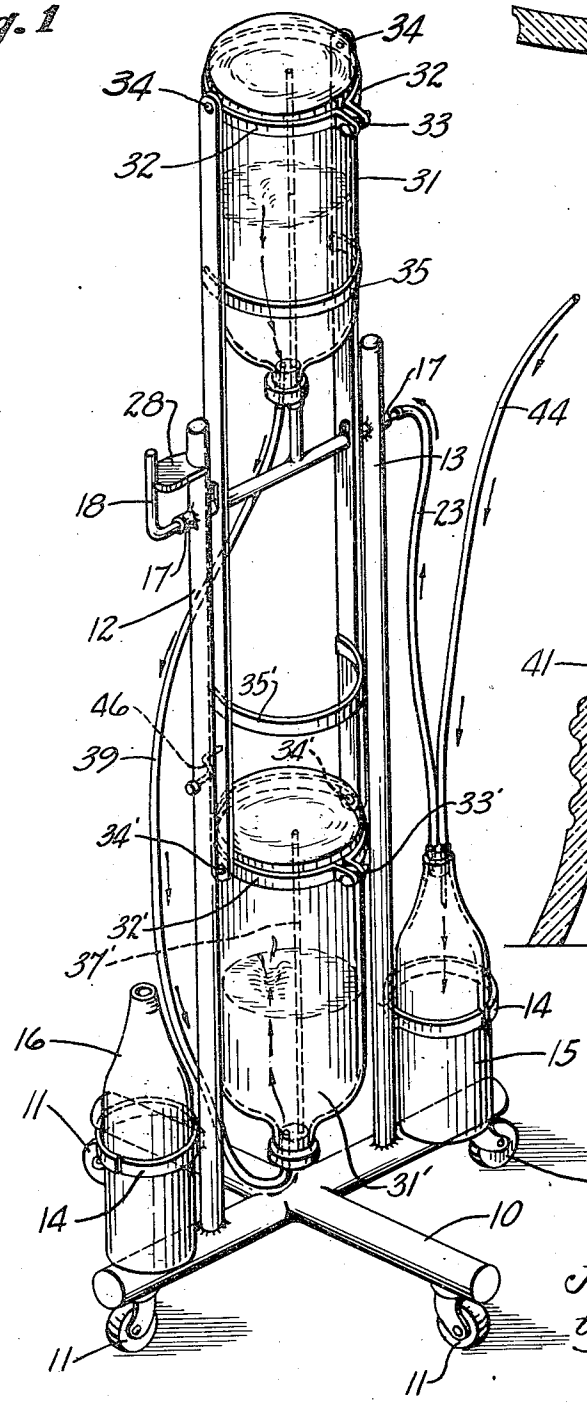


Fig. 6

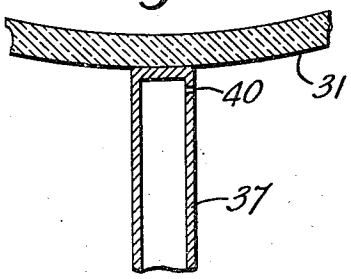
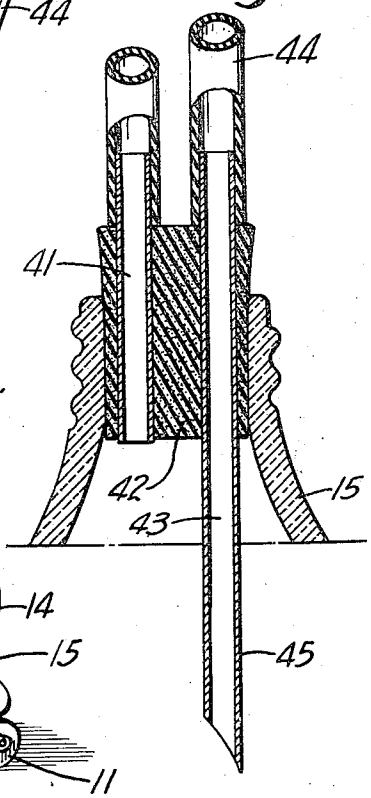


Fig. 3



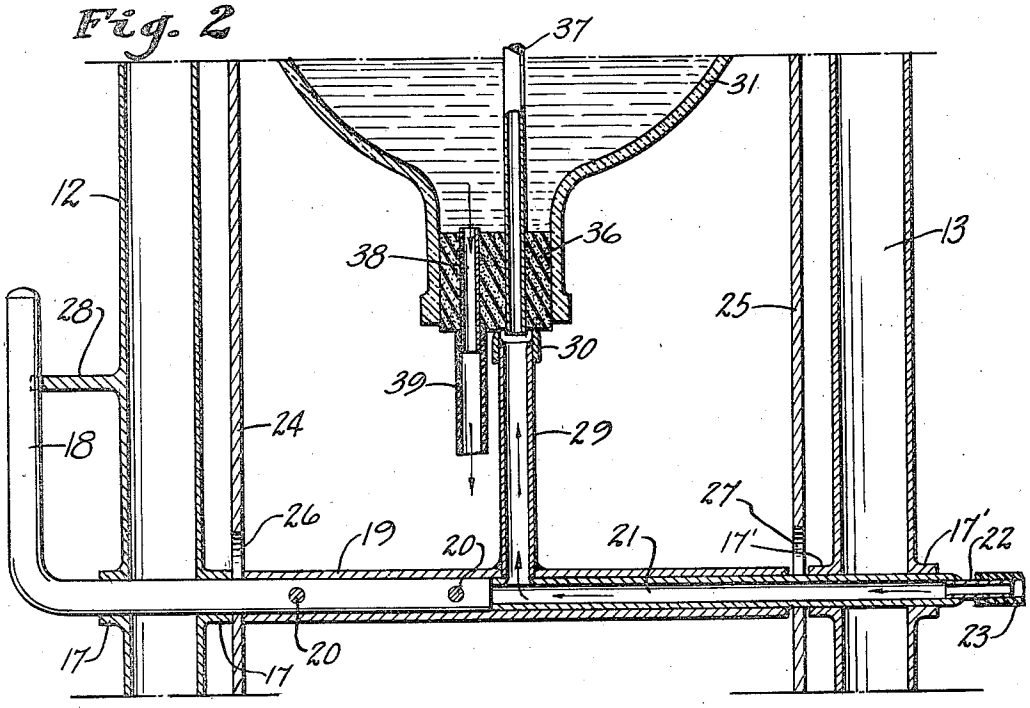
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SUCTION APPARATUS

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Fig. 2



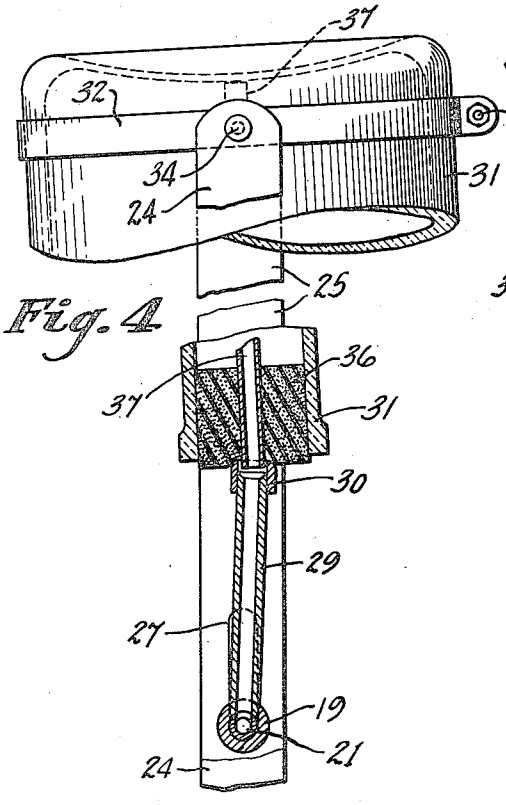


Fig. 4

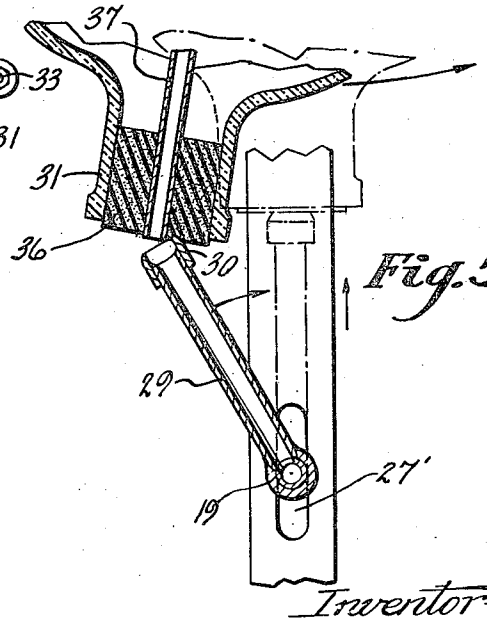


Fig. 5

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SUCTION APPARATUS

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14 Claims. (Cl. 230—75)

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My invention relates to suction evacuators and is primarily adapted to apparatus intended for irrigating or treating the human body.

I have found that common disadvantages of prior devices of this class reside in the use of complicated valve mechanism and in a tendency of the suction hose to rupture due to the continued reversals of the bottles in the same direction.

One object of my invention therefore is to provide an improved tiltable support for a pair of inverted liquid suction bottles.

A further object of my invention is to provide a suction bottle assembly having a tiltable frame alternately reversible 180° in opposite directions but immovable through an arc of more than 180° for any one reversal.

A further object of the invention is to provide an assembly wherein, regardless of reversal, the jars are at all times suspended in the same direction.

A still further object is to provide a suction connection and seal for the suction bottles which may be readily manipulated for connecting and disconnecting the bottles in and from the suction system and which entirely lacks the several disadvantageous features of the conventional valve.

A still further object is to provide a novel toggle action gravity seal for the aforesaid connection.

Further objects will be apparent from the specification and drawings, in which:

Fig. 1 is a perspective view of the suction evacuation apparatus constructed in accordance with my invention;

Fig. 2 is a cross section of a portion of the upper bottle in Fig. 1 and the adjacent framework;

Fig. 3 is an enlarged detail of the hose connections at one of the catch bottles;

Fig. 4 is an enlarged sectional detail of a part of the structure of Fig. 2 showing the toggle sealing connection between the suction bottle and the suction line;

Fig. 5 is an enlarged sectional detail similar to Fig. 4 except that the toggle action of the sealing structure of Fig. 4 is modified to show a gravity type sealing connection; and

Fig. 6 is an enlarged fragmentary detail showing the terminus of a suction tube inside a suction bottle.

Referring now to Fig. 1, the entire suction apparatus is mounted in a portable assembly comprising base member 10 mounted on casters 11 and having upright posts 12 and 13 welded thereto.

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Brackets 14 are welded to posts 12 and 13 and serve as receptacles to hold catch bottles 15 and 16, either while in use or for storage. Near the upper ends of supports 12 and 13 hollow bosses 17 and 17' are located for mounting the supporting cradle of the suction mechanism.

Referring now to Fig. 2, the cradle pivoting assembly consists of lever 18 bent at right angles and extending through bosses 17 and riveted to sleeve 19 by rivets 20. Secured to the other end of sleeve 19 is pipe 21 which extends through bosses 17' and has a suitable connection 22 for rubber tubing 23. Cradle frame members 24 and 25 are adapted to pivot on lever 18 and pipe 21 respectively by means of elongated slots 26 and 27 in the frame members. When lever 18 is in the upright position it is locked by means of a suitable notch in plate 28. This locking action imposes a lateral thrust on sleeve 19 through the shank of lever 18 which thrust compresses member 24 between inner boss 17 and sleeve 19 to secure it firmly in place. It will also be apparent that the force required to engage and disengage lever 18 from locking plate 28 will be dependent upon the clearance between boss 17, frame 24 and sleeve 19.

Located centrally of sleeve 19 and substantially in line with lever 18 is a short length of pipe or heavy tubing 29 which has a sealing collar 30 attached at its outer end. Tube or nipple 29 may be threaded or brazed to sleeve 19 which is suitably drilled to provide internal connection between nipple 29, pipe 21 and rubber tubing 23 as shown clearly in Fig. 2.

Frame members 24 and 25 extend to a length suitable for positioning gallon glass bottles 31 and 31' in the manner illustrated in Fig. 1. Straps 32 and 32' are clamped near the bottom of each bottle by means of clamps 33 and 33', and these straps 32 and 32' are pivotally attached to the respective ends of frame members 24 and 25 by means of riveted pins 34 and 34'. Semicircular brackets 35 and 35' help to position the bottles in the substantially vertical operative positions and function also in connection with the toggle sealing means for the bottles hereinafter described.

Each bottle 31 and 31' is thus securely clamped at the bottom and is held in inverted position at all times in the cradle. Each bottle has a permanently positioned rubber stopper 36 (Fig. 2) which is drilled to accommodate suction tube 37 and liquid tube 38, to which is attached rubber hose 39. The stopper devices for bottles 31 and 31' are identical.

Suction tubes 37 and 37' extend inside bottles 31 and 31' to abut the bottom (or top in the inverted position) of the bottles in order to prevent creeping of the tubes in stoppers 36 and 36'. Tubes 37 and 37' are sealed at their upper ends and have small orifices 40 (Fig. 6) drilled in the side wall of the tube just below the termini thereof. This construction permits the free passage of air or gas and at the same time prevents liquid from flowing from a bottle should it be tilted accidentally from a vertical position. Tubes 37 and 37' also protrude slightly beyond the outer faces of stoppers 36 and 36' in order to facilitate connection with nipple 29. Rubber tube 39 connects liquid tubes 38 and 38' with each other and provides a liquid connection between the bottles.

Rubber tube 23 is attached to glass tube 41 mounted in stopper 42 of catch bottle 15. Stopper 42 also contains a longer piece of glass tubing 43 to which rubber tube 44 is attached.

In operation a liquid, usually water, in upper bottle 31 (the cradle being in the position shown in Fig. 2) passes through tube 39 into bottle 31' by gravity. Bottle 31' is vented by means of tube 37' which is open to atmospheric pressure. This flow creates a partial vacuum in bottle 31 which is in turn transmitted through nipple 29, pipe 21, and rubber tube 23 to jar 15. In accordance with conventional practice, tube 43 is connected by way of rubber tube 44 to the stomach or other tube or device that may be utilized to meet the immediate requirement. Matter drawn through tube 44 will collect in bottle 15 until the lower end 45 of pipe 43 becomes submerged, at which time flow in hose 44 will be automatically terminated, thereby precluding passage of foreign matter into hose 23.

After liquid has drained from bottle 31 into bottle 31', continued suction is quickly obtained by pinching hose 39, disengaging the handle 18 from the notch in plate 28, and turning it in counterclockwise direction as viewed in Fig. 1. This causes the bottle 31 to pivot slightly on pins 34 and permits frame members 24 and 25 to move downward so that the upper ends of slots 26 and 27 may rest on the shank of bar 18 and pipe 21. The entire cradle is then pivoted to reverse the positions of bottles 31 and 31'. As the bottle 31' approaches the top, handle 18 is turned in a clockwise direction to the opposite side of plate 28 and the collar 30 engaged with the end of tube 37 as shown in Fig. 5. Handle 18 is then turned back in a counterclockwise direction until engaged by plate 28. Suction in line 23 now continues as before.

It will be apparent that catch bottles 14 and 15 may be alternated from a stored to operative position, either by exchanging the bottles or by shifting stopper 42 while hoses 23 and 44 are pinched to retain the vacuum in the upper bottle.

An important feature of my invention resides in the means by which an effective seal is made between the suction bottle and nipple 29. Referring to Fig. 4, this sealing means utilizes the weight of the bottles and cradle, as well as a toggle action involving pivots 34, sleeve 19 and nipple 29, the slots 26 and 27 and also the straps 35 and 35'. As engagement is made between the nipple 29 and stopper 36 (in Fig. 5), continued turning of handle 18 has the effect of raising the entire cradle with the bottles so that their weight is carried solely by collar 30. However, if the length of slots 26 and 27 is such that contact is made by the bottoms of the slots with the shank of lever 18 and pipe 21 before lever 18 becomes locked in plate 28, further turning has the effect of compressing rubber stopper 36 and maximum compression will of course take place in the dead center position, whereas a slight additional turning causes bottle 31 to pivot until it strikes limit strap 35 (Fig. 4). Considerable pressure is thus exerted against the bottoms of slots 26 and 27, collar 30, stopper 36 and pivots 34, insuring a tight, non-leakable seal between tube 37 and pipe 29.

If the length of slots 26 and 27 is such as to afford an adequate amount of force, the plate 28 may be eliminated, since the locking action obtained by forcing nipple 29 past dead center to the limit determined by the straps 35 and 35' should be entirely effective to hold the elements in position.

Fig. 5 in addition to illustrating the method by which pipe 29 is positioned to engage stopper 36 also shows in phantom a sealing action obtained by gravity alone. This result is achieved merely by providing longer slots 26 and 27 so that when nipple 29 is in the vertical position as shown in broken lines in Fig. 5, no contact is made between the bottoms of the slots 26 and 27 and the rod 18 and pipe 21. In this way the entire cradle is supported by nipple 29 and collar 30. The weight of the liquid, bottles and frames is sufficient to provide effective sealing. With this form, however, it is highly desirable that a locking device such as plate 28 be included in order to prevent accidental disengagement.

It will be apparent that a highly efficient seal is obtained either by means of gravity alone (Fig. 5) or by means of gravity in addition to the compressive force exerted by a toggle action (Fig. 4).

Stop 46 (see Fig. 1) prevents the cradle from turning through an arc of more than 180° and it will be noted that this stop pivots freely in post 12 and is also offset to accommodate the width of frame member 24. This feature insures vertical positioning of frame members 24 and 25 regardless of which bottle is in the uppermost position, since the stop is free to pivot when engaged by either end of frame member 24. Stop 46 also cooperates to maintain the sealing action by preventing the cradle from further turning when in the locked position.

While certain novel features of the invention are disclosed herein with considerable detail with respect to certain particular forms of the invention, it is not desired to be limited to such details since many changes and modifications may well be made without departure from the spirit of the invention in its broadest aspect.

Having thus described my invention, I claim:

1. A gravity suction apparatus comprising a base, a pair of upright posts secured to the base, a hollow rotatable cross member mounted on said posts, a reversible cradle having slots adapted to engage said rotatable member, a pair of necked bottles carried by the cradle, means for pivotally suspending said bottles in a constantly inverted position from said cradle, a suction tube positioned in each bottle neck and extending to the opposite end of the bottle, a liquid tube positioned in each bottle neck, means for positioning said suction and liquid tubes in the bottle necks, means for connecting the liquid tubes of each bottle to each other, a suction hose connected to one end of the rotatable cross member, and means for selectively connecting one of said suction tubes to the hollow member

upon rotation of the cradle to an upright position.

2. A gravity suction apparatus comprising a base, a pair of upright posts secured to the base, a hollow rotatable cross member mounted on said posts, a reversible cradle having slots adapted to engage said rotatable member, a pair of necked bottles carried by the cradle, means for pivotally suspending said bottles in a constantly inverted position from said cradle, a suction tube positioned in each bottle neck and extending to the opposite end of the bottle, a liquid tube positioned in each bottle neck, means for positioning said suction and liquid tubes in the bottle necks, means for connecting the liquid tubes of each bottle to each other, a suction hose connected to one end of the rotatable cross member, means for selectively connecting one of said suction tubes to the hollow member upon rotation of the cradle to an upright position, and locking means for said rotatable member.

3. A toggle sealing connection for tiltable suction apparatus comprising a cradle having a pair of slotted frame members, a hollow suction chamber pivoted to said cradle, the chamber having an orifice, means for limitng the pivotal motion of said chamber with respect to the cradle, a rotatable hollow member extending through the slotted frame members, means for rotating said hollow member with respect to said frame members, and a nipple carried by the rotatable member adapted to engage the orifice when the said chamber occupies a position wherein said orifice lies between and substantially in alignment with the said rotatable member and the pivotal axis of the chamber.

4. A toggle sealing connection for tiltable suction apparatus comprising a cradle having a pair of slotted frame members, a hollow suction chamber pivoted to said cradle, said chamber having an orifice, means for limiting the pivotal motion of said chamber with respect to the cradle, a rotatable hollow member extending through the slotted frame members, means for rotating said hollow member with respect to said frame members, and a nipple carried by the rotatable member adapted to engage the orifice when the said chamber occupies a position wherein said orifice lies between and substantially in alignment with the said rotatable member and the pivotal axis of the chamber, the length of said nipple being such that upon continued turning of the rotatable member a compressive force is exerted to seal the connection between the nipple and the orifice.

5. A toggle sealing connection for tiltable suction apparatus comprising a cradle having a pair of slotted frame members, a hollow suction chamber pivoted at each end of said cradle and adapted for alternate liquid flow to and from each chamber upon tilting the cradle so as to bring the chambers respectively into upper and lower positions, means for liquid connection between the chambers, means for venting the chambers, including a vent orifice, a rotatable hollow member extending though the slotted frame members, means for rotating said hollow member with respect to said frame members, and a nipple carried by the rotatable member adapted alternately to engage the chambers selectively at the vent orifice when the chamber occupies the said upper position.

6. A toggle sealing connection for tiltable suction apparatus comprising a cradle having a pair of slotted frame members, a hollow suction chamber pivoted at each end of said cradle and adapted for alternate liquid flow to and from each chamber upon tilting the cradle, means for liquid connection between the chambers, means for venting the chambers, including a vent orifice, means for limiting the pivotal motion of said chambers with respect to the cradle, a rotatable hollow member extending through the slotted frame members, means for rotating said hollow member with respect to said frame members, a nipple carried by the rotatable member adapted to engage the said orifice when the said chamber occupies a position wherein said orifice lies between and substantially in alignment with the said rotatable member and the pivotal axis of the chamber, the length of said nipple being such that upon continued turning of the rotatable member a compressive force is exerted to seal the connection between the nipple and the orifice, and means for locking the rotatable hollow member in sealing position.

7. A reversible double container vacuum pump comprising a base member having casters, a pair of vertically extending posts attached to said base member, a pair of receptacles attached to said posts for supporting drainage bottles, a hollow rotatable member extending transversely through said posts near their upper extremities, means for locking the rotatable member, a reversible cradle pivotally mounted on said rotatable member, a hollow vacuum chamber pivotally mounted at one end of said cradle, a second hollow vacuum chamber pivotally mounted at the other end of said cradle, said chambers being movable reversibly to upper and lower positions by a reversal of the position of the cradle on its pivot, stoppers for the vacuum chambers, a pair of tubes extending through each stopper, one of said tubes serving as a liquid tube and the other as a vent tube, means for connecting the liquid tubes of each stopper, an inner extension on said vent tubes abutting the inner surface of the hollow members and having an orifice near its terminus, a hollow suction nipple attached to the rotatable member, said nipple adapted to effect alternate sealing connection with the lower terminus of each vent tube when the associated chamber occupies the said upper position, and a suction hose attached to said rotatable member whereby an airtight connection is formed between the vent tube, the nipple and the hose.

8. A reversible double container vacuum pump comprising a base member having casters, a pair of vertically extending posts attached to said base member, a cradle having a pair of slotted frame members reversibly supported by said posts, a hollow suction chamber pivoted at each end of said cradle and adapted for alternate liquid flow to and from each chamber upon reversing the cradle, means for liquid connection between the chambers, means for venting the chambers, means for limiting the pivotal motion of said chambers with respect to the cradle, means for rotating the hollow member with respect to the frame members, a nipple carried by the rotatable member adapted to engage the chambers alternately upon reversal, means for locking the rotatable hollow member and a stop on the posts for the cradle.

9. A reversible double container vacuum pump comprising a base member having casters, a pair of vertically extending posts attached to said base member, a pair of receptacles attached to said posts for supporting drainage bottles, a hollow rotatable member extending transversely through said posts near their upper extremities, means

for locking the rotatable member, a reversible cradle pivotally mounted on said rotatable member, a hollow vacuum chamber pivotally mounted at one end of said cradle, a second hollow chamber pivotally mounted at the other end of said cradle, said chambers being movable reversibly to upper and lower positions by reversal of the position of the cradle on its pivot, stoppers for the vacuum chambers, a pair of tubes extending through each stopper, one of said tubes serving as a liquid tube and the other as a vent tube, means for connecting the liquid tubes of each stopper, an inner extension on said vent tubes abutting the inner surface of the hollow members and having an orifice near its terminus, a hollow suction nipple attached to the rotatable member, said nipple adapted to effect alternate sealing connection with the lower terminus of each vent tube when the associated chamber occupies the said upper position, a suction hose attached to said rotatable member whereby an airtight connection is formed between the vent tube, the nipple and the hose, and a stop on the posts for preventing passage of the cradle frame members between posts.

10. In a vacuum device of the character described, a frame, a cradle structure journaled at its midsection in said frame for rotary adjustments in a vertical plane to selectively elevate one end and simultaneously depress the other end of the cradle, a container pivotally suspended from each end of the cradle so as to maintain a predetermined gravity-induced position irrespective of the angular position of the cradle, a duct extending between and connecting the lower ends of said containers, a suction duct, and means arranged for coaction with the container in the elevated end of the cradle for connecting the suction duct with the upper end of said container.

11. A vacuum device as defined in claim 10 wherein means is provided for limiting the extent of the angular movement of the cradle so that the containers are confined in their movements to arcuate paths at opposite sides respectively of a vertical plane through the cradle journal.

12. A vacuum device as defined in claim 10 wherein the said means for connecting the container to the suction duct comprises a tube in the container extending from the upper end thereof to and through the lower end, and means adjustable in the frame for coupling the lower end of the tube to the suction duct.

13. A vacuum device as defined in claim 10 wherein the said means for connecting the container to the suction duct comprises a tube in the container extending from the upper end thereof to and through the lower end, and a nipple radially disposed with respect to the axis of the cradle journal and adjustable in the frame about said axis as a pivot so as to bring its outer free end into coupled engagement with the lower projecting end of said tube, said nipple constituting a terminal element of the suction duct exterior of the container and being arranged for toggle action with the latter affording a tight joint at said coupling.

14. A vacuum device as defined in claim 10 wherein the said means for connecting the container to the suction duct comprises a tube in the container extending from the upper end thereof to and through the lower end, a nipple radially disposed with respect to the axis of the cradle journal and adjustable in the frame about said axis as a pivot so as to bring its outer free end into coupled engagement with the lower projecting end of said tube, said nipple constituting a terminal element of the suction duct exterior of the container and being arranged for toggle action with the latter affording a tight joint at said coupling, and means affording play between the cradle and frame at the said journal so that when the nipple and container are brought into the coupled relation, the entire weight of the cradle and container assembly may be sustained by the nipple.

JAMES A. BETTS.

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