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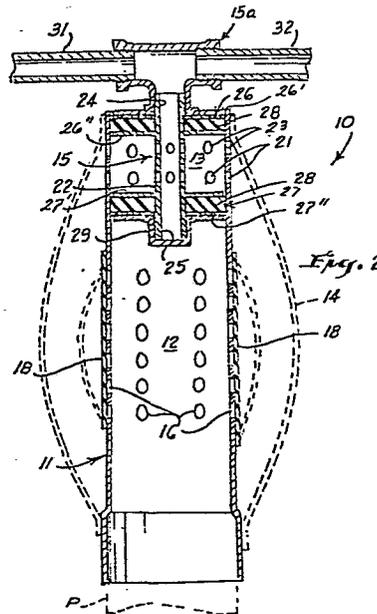
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**54** Liquid pump using negative pressure.

**57** The pump comprises a tubular main casing (11) defining a lower chamber (12) and separate upper chamber (13) which are enclosed by an outer expandable tube (14), the ends of which are tightly fixed to the casing (11). The upper ends of the chambers (12, 13) are closed by transverse discs (26, 27). The lower chamber (12) has vertical rows of slots (16) covered by expandable strips (18) of a rubber valve (17), surrounded by tube (14). By moving the pump up and down, while the lower end of a pipe extension (P) of the casing (11) is immersed in water, vacuum is created in and water drawn into the lower chamber (12) from where it is forced out through slots (16, 21, 23) into the outflow tube (15).



## TITLE MODIFIED

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A vacuum pump

The present invention broadly relates to pumping devices and more particularly to an inertia-type continuous discharge vacuum pump.

Actually, this invention is another modification or improvement of our Philippine Patent No. 13229 issued on February 14, 1980.

It is an object then of the invention to provide a vacuum pump which is manually operated by jogging rhythm or up and down stroke in drawing water at a certain height from the pump.

Yet another object of the invention is to provide a vacuum pump which is portable in structure and defining a lower vacuum chamber and an upper storage chamber which are enclosed by an expansible oblong-like tube which facilitates a continuous discharge flow of water.

Still another object of the invention is to provide a vacuum pump having completely detachable and repairable parts which could be made of locally available material and could be easily assembled without the aid of a tool assembly unit and operated at a desired site.

A further object of the invention is to provide a vacuum pump which is simple in structure and economically manufactured.

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Other objects and advantages of the invention will be fully comprehended upon a reading of the following detailed description of this specification in conjunction with the accompanying drawings forming a material part of  
5 this disclosure.

In the drawings:

Figure 1 is a perspective view of the vacuum pump embodying the invention;

10 Figure 2 is a longitudinal central cross-sectional view taken along line 2-2 of Figure 1, and

Figure 3 is an exploded view of the device.

Referring now in detail to the drawings, there is illustrated a vacuum pump generally designated as 10. This vacuum pump 10 essentially comprises an elongated  
15 tubular main casing 11 of circular configuration defining a lower vacuum chamber 12 and an upper storage chamber 13 which are enclosed by an outer expandable tube or casing 14. Disposed communicably within the storage chamber is an apertured outflow tube or unit 15 carrying on its  
20 upper portion a detachable and opposedly disposed combined handle and discharge pipe 15a.

The lower vacuum chamber 12 has a plurality of uniformly spaced apart vertical rows of slots 16 disposed on circumferential surface thereof. Suitably covering  
25 and/or seating on each row of slots is an expandable rubber valve unit 17 defined by a cylindrical rubber material having a plurality of uniformly spaced expandable strip 18 having an opposed end connected in an upper and lower supporting or securing ring members 19 and 20. This strip  
30 of expandable material 18 which is associated with said row of slots 16 is adapted to expand slightly away from said slots 16 and thereby allow water to flow out and be conveyed to the storage chamber 13.

The storage chamber 13 is also provided with a  
35 plurality of circularly spaced slots 21. Water emanating from the slots 16 of the vacuum chamber 12 is conveyed within the outer expandable casing 14 and into said slots 21 of the said upper storage 13.

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The upper and lower chamber 13 and 12 is substantially divided by the outflow tube 15 disposed within said upper storage chamber 13. This outflow tube 15 has an elongated main body 22 of substantially lesser diameter with that of the main casing 11 having a plurality opening 23 in communication with said storage chamber 13, opposedly extending in this main body 22 is an externally threaded upper and lower portion 24 and 25. Spacedly disposed and transversely extending the main body is a pair of circular plate or disc members 26 and 27, each carrying a rubber seal or washer 28 adapted to snugly engage within the wall of the storage chamber 13. Said disc member 26 has an upper washer 26' welded to the bottom flange of the T-fitting 30 and a lower washer 26" welded to the upper section of the main body 22. Said disc member 27 which is identical with said disc member 26 and secured in vertical alignment has an upper washer welded proxima to the lower section of the main body 22 and a lower washer 27" welded to the flange of the closure cap 29. Detachably secured on the lower externally lower end 25 is a closure cap 29 while on the upper externally threaded member 24 is detachable carried the combined handle and discharge pipe 15a.

Rubber being snag fit on inner wall of pipe will not slip, much more so when pressure is applied against it by both washers 26" and 27" on the opposite sides of the rubber ring. The welded washer 27" to the cup fitting is directly pressing towards the rubber therefore it will not also slip. Lubricant is applied on both upper and lower stoppers to insure slippage in both. To assemble, therefore, connect loosely all the parts as drawn, press down to the desired depth and turn the handle clockwise until tight. The operation completes the handle assembly.

To disassemble turn the handle counterclockwise and pull out of the pipe.

The valve assembly is likewise simple and easy. Cover the casing perforation with the valves and slip rubber bands around them at both valve ends. The valve

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assembly is completed.

The housing will have to be assembled with a screw driver to tighten the clamps on both ends.

The pipe connection will have to be slipped  
5 inside the swaged portion. For less accurate fittings a rubber tube has to be placed as a connector over the joint portion and tied on both ends.

To bring water above the outlet head a hose has to be fitted over the handle snugly or tie it with  
10 rubber band if it is loose. You may bring water 3 m higher.

This combined handle and discharge pipe 15a is defined by a T-fitting 30 having on its upper horizontal portion opposedly disposed outlet pipes 31 and 32.

On the lower part of the main casing 11, suitable  
15 tubular piping P could telescopically extendedly secured.

In operation, the lower portion of the extended pipe P is immersed in water. By simply moving the pump  
20 up and down in jogging rhythm, vacuum is created in the vacuum chamber 12 and water gradually rises and forcibly flows out from slots 16 of said chamber wherein the rubber valve 18 is slightly displaced and is conveyed within the outer expandable tube 14. Due to the compressive effect of the expandable tube 14, water is forced  
25 into the storage chamber 13 where it eventually flows into the outflow tube 15 and into the discharge pipe 15a.

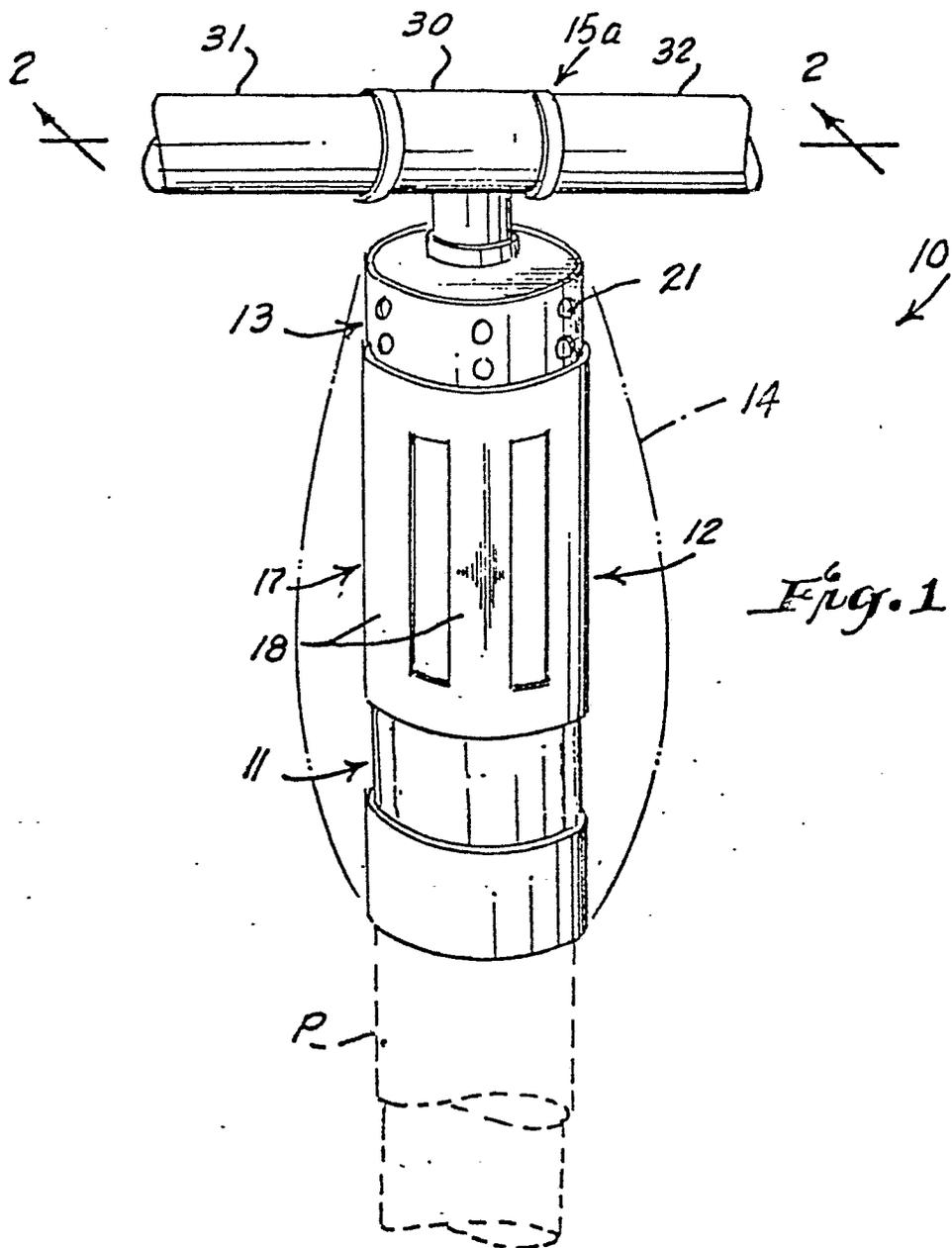
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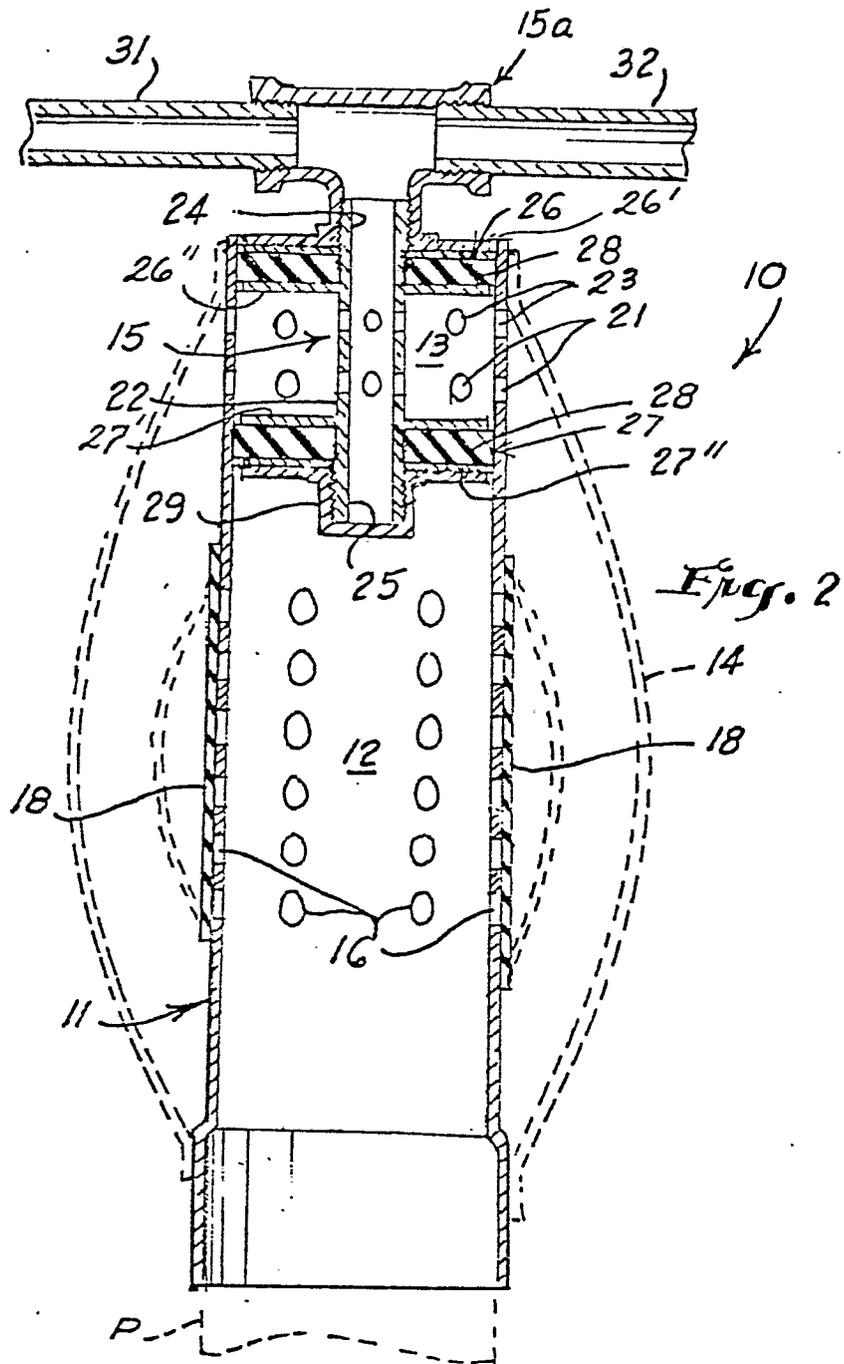
We claim:

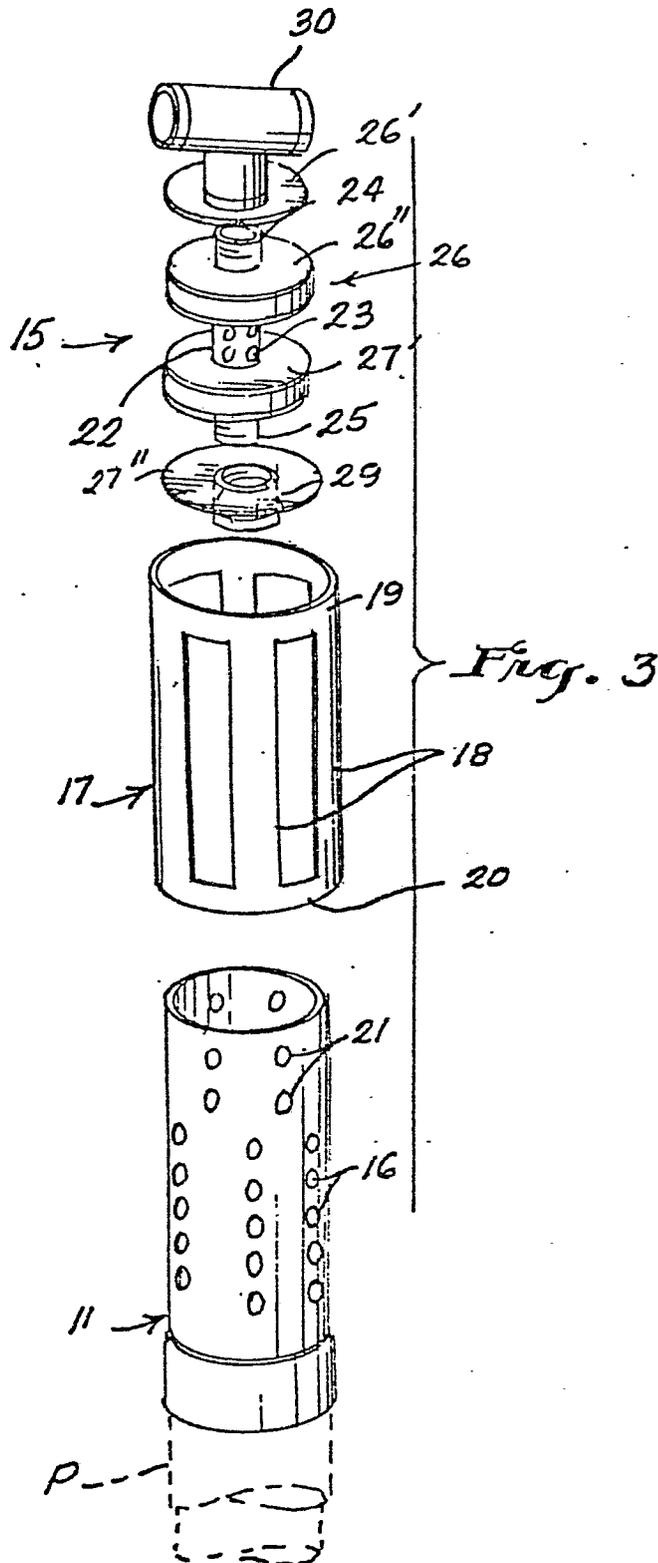
1. A vacuum pump having an elongated tubular main casing (11) defining an apertured lower vacuum chamber (12) associated with expandable valve strip (18) and an upper apertured storage chamber (13), said upper and lower chambers being enclosed by an expandable outer casing (14), an outflow unit (15) communicably disposed within said storage chamber, said outflow unit defining an apertured elongated main spacedly disposed centrally of said chamber having an externally threaded upper and lower ends (24, 25) and a pair of spacedly disposed transverse circular discs (26, 27) each carrying a rubber seal (28) adapted to be engaged within the wall of said chamber, a closure cap (29) removably secured on the lower end of said unit, and a combined handle and discharge pipe (15a) defining a T-fitting detachably carried on the upper portion of said outflow unit having opposedly disposed horizontal outlet pipes (31, 32).

2. A vacuum pump as in claim 1 wherein all the parts can be manually assembled without the aid of any tool assembly unit.

3. A vacuum pump as in claim 1 wherein said tubular main casing has a telescopically extended piping.









| DOCUMENTS CONSIDERED TO BE RELEVANT                               |   | CLASSIFICATION OF THE APPLICATION (Int. Cl.)  |
|---|---|---|
| Category  | Citation of document with indication, where appropriate, of relevant passages   | Relevant to claim   |
|   | <p><u>CH - A - 475 478 (CIBA)</u><br/>* Column 2, lines 16-26; figures 1-3 *</p> <p>--</p> <p><u>GB - A - 2 033 000 (SELWOOD)</u><br/>* Page 4, lines 10-34; figure *</p> <p>--</p> <p><u>GB - A - 677 076 (SHRUBSALL)</u><br/>* Page 1, lines 75-85; page 2, lines 9-18, 31-48; figure 2 *</p> <p>--</p> <p><u>DE - A - 1 755 495 (VDO)</u><br/>* Entire *</p> <p>--</p> <p><u>US - A - 2 657 899 (KOHLER)</u><br/>* Entire *</p> <p>-----</p> | <p>1</p> <p>1</p> <p>1,3</p>  |
|   |   | <p>F 04 F 7/00<br/>F 04 B 43/08</p>   |
|   |   | <p>TECHNICAL FIELDS SEARCHED (Int. Cl.)</p> <p>F 04 F<br/>F 04 B</p>  |
|   |   | <p>CATEGORY OF CITED DOCUMENTS</p> <p>X: particularly relevant<br/>A: technological background<br/>O: non-written disclosure<br/>P: intermediate document<br/>T: theory or principle underlying the invention<br/>E: conflicting application<br/>D: document cited in the application<br/>L: citation for other reasons</p> |
|   |   | <p>&amp;: member of the same patent family, corresponding document</p>  |
| <p>The present search report has been drawn up for all claims</p> |   |   |
| Place of search   | Date of completion of the search  | Examiner  |
| The Hague   | 10-11-1981  | HEINLEIN  |