Feb. 24, 1953 R. G. OLDEN 2,629,333

ROTARY COMPRESS PUMP

Filed July 1, 1950

Fig. 1.

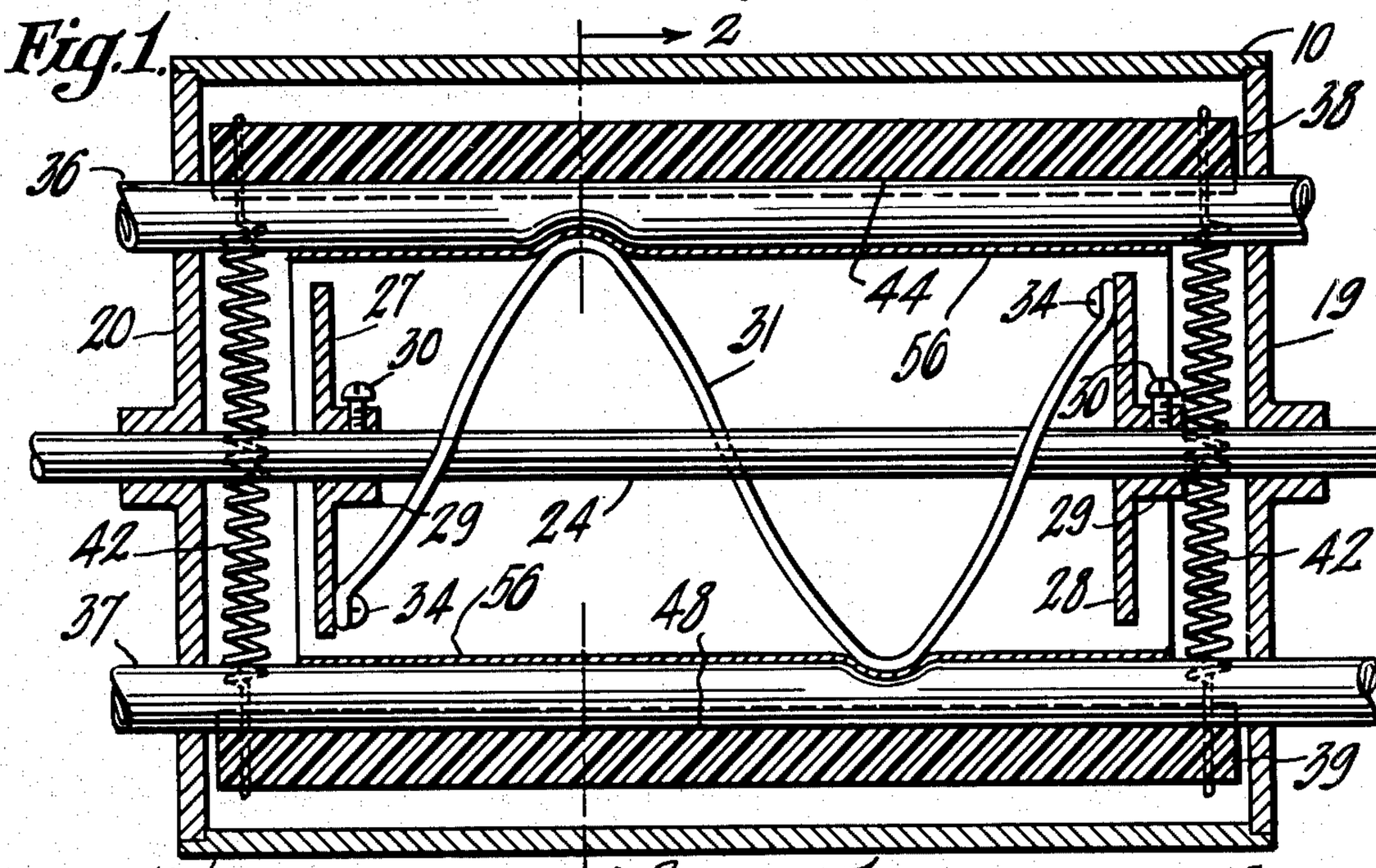
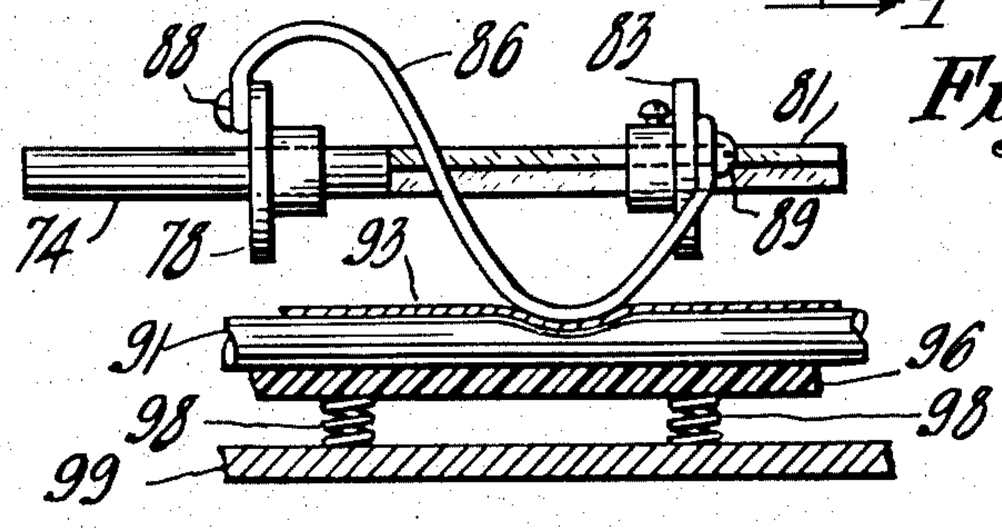


Fig. 2.

Fig. 3.



INVENTOR
Roger G. Olden
BY
George T. Craig
ATTORNEY

Patented Feb. 24, 1953

2,629,333

UNITED STATES PATENT OFFICE

2,629,333

ROTARY COMPRESS PUMP

Roger G. Olden, Princeton, N. J., assignor, by mesne assignments, to the United States of America as represented by the United States Atomic Energy Commission

Application July 1, 1950, Serial No. 171,634

4 Claims. (Cl. 103—149)

1

This invention bears on pumps, namely, but not exclusively, on the aspect of this subject as it concerns supplying one or more liquids in measured amounts.

This invention is useful in supplying a definite and uniform amount of one or more liquids to a point of moistening or wetting in electrolytic facsimile and similar applications. For this use, the quantity of liquid is small and amounts to about 1.9 cubic centimeters per minute of each of two solutions. Where pumping of small amounts of liquid is necessary, it is difficult, if not impossible, to use known pumps. If corrosive liquids are to be pumped, valves, pistons, and vanes of metal are to be avoided. Clearances should be large to avoid capillary spaces from which liquid might evaporate and leave a solid residue. A pump embodying the present invention satisfies all of the above-noted demands and has further advantages as will appear.

In accordance with the invention, a novel pump is provided which has a flexible tube together with mechanism for progressively constricting the tube to provide a pumping action. The invention also deals with a pump having two tubes and a common constricting device so that two liquids may be pumped. Uniformity of the amounts of liquids pumped is assured since the same device is used on both tubes. Discrepancies in formation of the device are cancelled.

The principal object of the invention is to provide a novel pump having a high degree of liquid metering accuracy for pumping small amounts of liquid.

Another object is to provide a multiple pump of novel construction.

A further object is to provide a novel metering pump which is readily adjustable to pump varying amounts of liquid.

Other objects and advantages of the invention will, of course, become apparent and immediately suggest themselves to those skilled in the art to which the invention is directed from a reading of the following specification in connection with the accompanying drawings in which:

Fig. 1 is a sectional elevation of a pump including features of the invention, the section being taken on line 1—1 of Fig. 2 as viewed in the direction of the arrows;

Fig. 2 is a sectional view of the pump of Fig. 1, the section being taken on line 2—2 as viewed in the direction of the arrows; and

Fig. 3 is a view in side elevation, partially in section, of an adjustable pump embodying the invention.

Figs. 1 and 2 of the drawing show a pump constructed in accordance with the invention which is capable of pumping two liquids simultaneously in measured amounts. This pump includes features of the invention which are equally useful in a pump for a single liquid. The pump of these figures comprises a rectangular casing 10 having walls 12, 14, 16, and 17 and end walls 19 and 20. The end walls provide bearing supports for the pump shaft 24. Any suitable mechanical device or motor may be employed to impart rotation to the shaft. One or both of the walls 19 and 20 is preferably detachable from the casing 10 so as to permit assembly and to afford access to the internal parts of the pump.

2

Two discs 27 and 28 are secured to the shaft 24. These discs have hubs 29 which are slidable onto the shaft for ease of assembly. Set screws 30 maintain the discs in position on the shaft. A helix 31 extends between the discs. In the illustrative example, this helix has approximately 1¼ turns. It may be made of stout wire and each end may be flattened so that it may be secured to its respective disc 27 or 28 by suitable means such as a screw 34. The diameter of the helix is preferably greater than the diameter of the discs 27 and 28 and the ends of the helix may be directed inwardly toward its axis to provide for securing it to the discs.

Fluids are conducted to and through the pump and pump action is obtained on tubes 35 and 37 which have elastic or flexible walls. The tubes may be continuous from a liquid containing vessel from which liquid is pumped to the point of discharge, or the tubes may be secured at each end to the end walls 19 and 20. If the latter construction is employed, it is necessary to provide any known means (not shown) for connecting intake and discharge lines to the tubes. Two blocks 38 and 39 are provided which float in the structure and are joined together by four tension springs 42. Two springs are located adjacent each end of the blocks. The block 38 is provided with a recess 44. The block 39 has a similar recess 48. These recesses are shown as being arcuate and the depth of each recess is such that the helix can compress the tube in the recess. The tube 36 is secured in position in the recess diametrically opposite the tube 37 with respect to the axis of the helix. Reference character 51 indicates a flexible sheet of material such as rubber which embraces the tube 36 and has its free ends cemented together. One of the free ends is cemented to the block 38. A similar structure including the sheet 53 serves to secure the tube 37 in position in the recess 48.

A canvas tube or belt 56 is stretched between

the periphery of the helix and the tubes **36** and **37** by means of metal bars **58** and **59** which extend for substantially the length of the blocks **38** and **39**. The bar **58** has a tapped hole **62** which receives a screw **64**. The head of the screw **64** engages the side wall **12**. Screw **66** is engaged in a similar manner in a tapped hole in the bar **59**. The screws **64** and **66** are used to tension the canvas sleeve **56**. This places a flexible member between each tube and the helix.

As the shaft **24** is rotated, the helix compresses the tube **36** and the tube **37**. The point of compression of the tube progresses along the axis of each tube pushing a plug of air before it. Since the helix bar is bent in more than a full turn, it is always in contact with both tubes and the air pushed out is not permitted to return. On the contrary, a low pressure area is created behind the helix bar which sucks in more air and later liquid. The amount of liquid moved depends on the pitch of the helix and the speed with which it turns. At constant speed, the amount of liquid pumped stays constant within a specified limit. The construction of the pump of Figs. 1 and 2, aside from being very compact, assures greater uniformity of the amounts of liquid pumped because the same helix is used on both tubes so that discrepancies in the formation of the helix cannot make themselves felt.

Fig. 3 of the drawing shows a modified pump which can be readily adjusted to pump variable amounts of liquid. A shaft **74** carries a disc or flange **78**. The flange **78** is secured to the shaft in any suitable manner. A portion of the shaft indicated by reference character **81** is square in cross-section. A disc or flange **83** is slidably mounted on the shaft portion **81**. The wire **86**, bent into a helix, is bolted to the flanges **78** and **83** by means of two screws **88** and **89**. By sliding the flange **83** on the square portion **81** of the shaft **74**, the pitch of the helix and therefore the amount of liquid transported at constant speed of the shaft can be varied. Since the diameter of the helix increases when the pitch becomes smaller, and vice versa, the flexible tubing **91** is movably mounted. A piece of canvas or the like **93** lies between the helix **86** and the tube **91**. It is placed under tension in any suitable manner as by being connected to the sides of the casing (not shown) for the pump. The tubing **91** is mounted on a block **96**. Compression springs **98** resiliently support the block **96** on a stationary portion **99** of the pump.

What is claimed is:

1. A pump for supplying a liquid in accurately measured amounts comprising, an elastic walled tube, means for supporting said tube, a rotatable helical member, and means to selectively vary the length of said helical member whereby to alter its pitch, said supporting means for said tube providing a backing for said tube whereby said helix progressively constricts said tube as said helix is rotated on its axis.

2. A pump for supplying a liquid in accurately measured amounts comprising: an elastic walled conduit for the liquid pumped, a backing member for supporting said conduit, a helical member adapted to peripherally engage said conduit, a rotatable shaft mounted substantially parallel to said conduit and adapted to support said helical member, one end of said helical member being fixedly mounted with respect to said shaft, and a member slidably mounted on said shaft, the other end of said helical member being attached to said slidable member, whereby the length of said helical member may be varied to alter its pitch, thereby varying the volume of liquid pumped per revolution of said shaft.

3. A pump as defined in claim 2 wherein means is provided for constantly resiliently urging said conduit and helical member into mutual engagement.

4. A pump as defined in claim 2 wherein a flexible member is disposed between said conduit and said helical member whereby to facilitate the progressive movement of said helical member with respect to said conduit.

ROGER G. OLDEN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,874,667	Wada	Aug. 30, 1932
1,988,337	Santiago	Jan. 15, 1935
2,015,123	Pennell	Sept. 24, 1935
2,434,802	Jacobs	Jan. 20, 1948
2,483,924	Moulinier	Oct. 4, 1949

FOREIGN PATENTS

Number	Country	Date
1,746	Great Britain	of 1854