Jan. 15, 1935. M. C. SANTIAGO ET AL 1,988,337

PUMP

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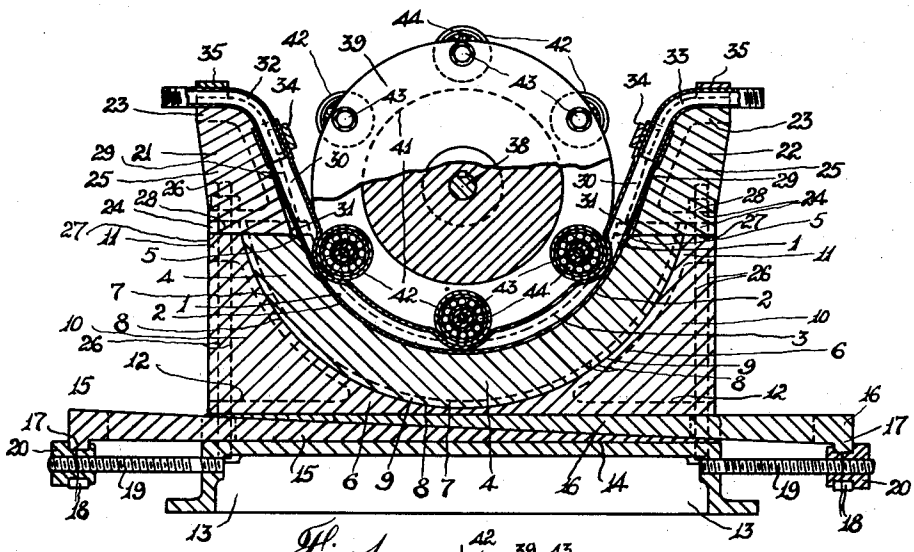


Fig. 1.

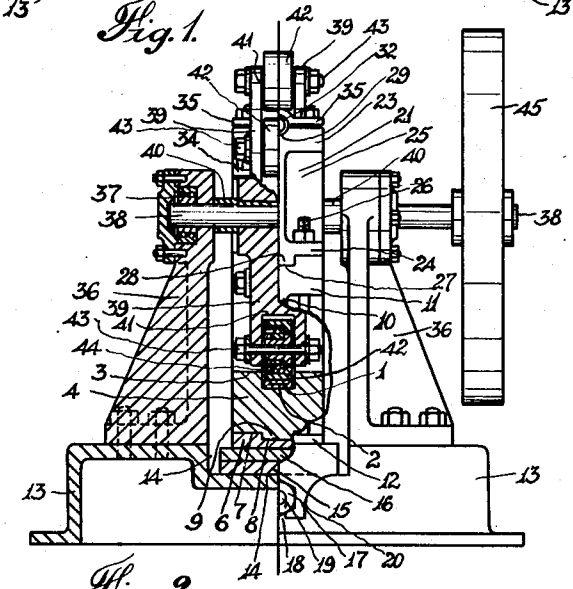


Fig. 2.

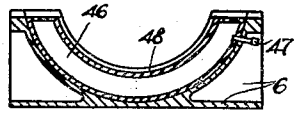


Fig. 3.

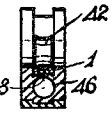


Fig. 4.

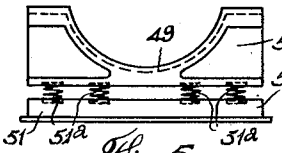


Fig. 5.



Fig. 6.

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PUMP

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6 Claims. (Cl. 103—149)

This invention consists of a new or improved pump or pumping means.

The object of the invention is to design and construct a pump or pumping means which will be of simple construction, efficient in operation, and cheap to manufacture, and one in which but little wear and tear will take place, and the parts when worn can be easily renewed.

A feature of a pump according to the invention is that no valves or packing means are employed in its construction.

According to the invention the pump or pumping means includes a stationary collapsible or resilient tube providing or communicating with the inlet or suction and outlet or discharge sides or branches of the pump, and a plurality of movable pressure bodies which are adapted to move and act successively upon the tube in the direction of the delivery side or branch, so as to collapse or compress the same in such a way that a partial vacuum is created, or tends to be created, in the tube successively behind each moving body, and the fluid thereby drawn into or entering the tube is expelled or discharged by the next succeeding pressure body.

The collapsible or resilient tube is supported opposite the moving pressure bodies preferably by resilient means. The supporting means for the collapsible tube is preferably adjustable relative to the pressure bodies, and said collapsible tube may be thickened in its upper portion which is engaged by said bodies.

The invention will be more fully described with the aid of the accompanying drawing, in which,

Fig. 1 is a central sectional side elevation of the improved pump.

Fig. 2 is a part-sectional end elevation of the pump.

Fig. 3 is a central sectional side elevation of an alternative form of the resilient supporting means for the collapsible tube.

Fig. 4 is a central sectional end elevation of Fig. 3, also showing the collapsible tube in section, and one of the pressure bodies in operative position.

Fig. 5 is a side elevation of a further form of the resilient supporting means for the collapsible tube, and

Fig. 6 is a transverse section of an alternative form of the collapsible tube.

Referring to Figs. 1 and 2 of the drawing, illustrating a practical embodiment of the complete pump, the numeral 1 denotes the stationary collapsible or resilient tube or hose-pipe, of soft or easily deformable rubber or rubber compound. In these figures the tube 1 is shown as a plain rubber tube of substantially uniform thickness, without reinforcement.

The tube 1 is arranged in a groove or channel 2, of rectangular shape in cross-section, and formed in a substantially semi-circular or arcuate face or upper surface 3 of a curved block, piece or bed 4 of rubber, which accordingly constitutes the direct support for the lower portion of the collapsible tube 1, against the action of the pressure bodies. The inner upper edges of the block 4 may, as indicated at 5, be slightly rounded.

The block 4 is arranged in a carrier 6, constructed with a semi-circular recess 7, in which a semi-circular groove 8 is formed. The block 4 is fashioned on the underside with a rib or projection 9, which engages in the groove 8 and operates to prevent any lateral displacement of the block 4 in the carrier 6. The carrier 6 is shown constructed at the ends with central vertical webs 10 between the upper portions 11 and the base portions 12.

The carrier 6 is adjustably mounted on a base or bedplate 13, which is constructed with a central longitudinal open-ended recess 14. In the recess 14 there is arranged a pair of oppositely tapered adjusting wedges 15, 16, on the upper one 16 of which the carrier 6 rests. The wedges 15, 16, permit of any desired adjustment of the carrier 6 in a vertical direction. For the purpose of moving the wedges to effect any desired adjustment they are each constructed at the outer end with a depending lug 17, in which is formed an open-ended slot 18; a stud 19 being fixed at one end in the base plate 13, and at the other end carrying a nut 20 which engages in the slot 18 in which it is free to rotate. By rotating the nuts 20 the wedges 15, 16, can be operated to effect any desired adjustment of the carrier 6.

On the upper end portions of the carrier 6 there are arranged brackets 21, 22, which are constructed with upper portions 23 and lower portions 24, joined by strengthening webs 25. The lower portions 24 rest upon the upper end surfaces of the semi-circular block 4, and on the upper portions 11 of the carrier 6. They are fixed in this position by means of studs 26, which serve also for fixing the carrier 6 in position upon the base plate 13. The upper portions 11 of the carrier 6 are each fashioned with a recess 27, and the bottoms of the brackets 21, 22, with a rib or projection 28, which engages in said recess 27. This keeps the brackets 21,

22, in the correct position on the block 4 and carrier 6.

In the inner inclined face of each bracket 21, 22, which is curved at the top, is formed a groove 29, in which the upper end portions 30 of the collapsible tube 1 fit. The inclination of the grooves 29 is such that a tapering space is left, as indicated at 31, to provide clearance for the tube 1 for some distance above the upper curved inner edges of the block 4.

The upper end portions 30 of the collapsible tube 1 are connected to curved rigid pipes or tubes 32, 33. These pipes or tubes 32, 33, are arranged in the upper portions of the grooves 29 in the brackets 21, 22, and serve for making connection with the inlet or suction, and outlet or delivery pipes—not shown—leading to and from the pump. The pipes 32, 33, are shown fixed to the ends 30 of the tube 1, in the grooves 29, by half clamps 34 fixed to the brackets 21, 22, at the sides of the grooves 29. The grooves 29 are shown recessed slightly to accommodate those portions of the tube 1 into which the pipes 32, 33, enter. The rigid pipes 32, 33, are further fixed in the grooves 29 by the half clamps 35.

On the base plate 13, at each side of the rubber block 4, there is arranged and secured a pedestal 36. These pedestals 36 are fitted with ball bearings 37, which rotatably support a driving shaft 38.

On the driving shaft 38, centrally between the pedestals 36, there is keyed a rotatable element or wheel 39, between the sides of which and on the shaft 38 are arranged distance pieces 40, which serve for keeping the wheel 39 in correct position relative to the groove 2 in the block 4. The element or wheel 39 is fashioned with a peripheral groove or recess 41. In the groove 41 there is arranged a suitable number—six are shown—of the movable bodies, shown in the form of rollers 42. These rollers 42, which are placed at equal distances apart, are mounted on spindle bolts 43, and are fitted with ball bearings 44. The width of these rollers 42 is slightly less than the width of the groove 2, so that as the wheel 39 is rotated said rollers 42 operate successively to collapse and compress the rubber tube 1 in the groove 2.

Either of the rigid pipes 32 or 33 may be used as the inlet or suction branch, according to the direction of rotation of the wheel 39. If the rigid pipe 32 constitutes the inlet or suction branch of the pump, and the rigid pipe 33 the discharge or outlet branch, then the wheel 39 will be rotated in an anti-clockwise direction—see Fig. 1—and cause the rollers 42 successively to engage and compress the collapsible tube 1 from the suction side to the delivery side.

The action of the rollers 42, by compressing the tube 1, is to cause or tend to cause a partial vacuum behind each roller 42, until the next succeeding roller 42 compresses the tube 1. The effect of this compression of the tube 1 by the rollers 42 is to draw the liquid through the inlet or suction branch. As each roller 42 successively engages and compresses the pipe 1, the liquid which is in said pipe or tube 1, between adjacent rollers 42, is forced along the stationary resilient pipe or tube 1 in the direction of and through the outlet or discharge branch, 33.

The wheel 39 can be rotated at a suitable rate of speed, by hand or power, by any suitable means. For this purpose a pulley 45 is shown fixed on the shaft 38, for operating the pump by mechanical power.

In order to ensure that the rollers 42 will pinch and completely close the tube 1, with the requisite degree of resilient pressure, as they pass successively over it, the adjusting wedges 15, 16, can be employed for raising and lowering the carrier 6 and the rubber block 4, to adjust the semi-circular or arcuate grooved face 3 of the rubber block 4 relative to the rollers 42.

In Figs. 3 and 4 we illustrate an alternative construction for the resilient block 4, in which an inflatable semi-circular block 46 is employed, fitted with a valve 47 for inflating the same to the required pressure. The block 46 is shaped on the underside to fit the carrier 6, and is constructed with the groove 48, shown curved transversely at the bottom, to receive the collapsible tube 1. In Fig. 4 one of the rollers 42 is shown of concave transverse peripheral shape to compress the tube 1 in the groove 48.

In the modification shown in Fig. 5 the resilient block is dispensed with and the collapsible tube is arranged in a semi-circular groove 49 formed in the carrier or support 50. Between the carrier or support 50 and a base plate 51 an arrangement of coiled metal springs 51*a* is placed to afford the requisite amount of resilient pressure of the rollers 42 on the collapsible tube 1 in the groove 49.

In Fig. 6 we illustrate a form of construction for the resilient collapsible tube 1. In this form the tube is made somewhat thicker, and is reinforced in the top or upper portion 52, where the rollers contact, by suitable longitudinal reinforcing material 53.

What we claim as our invention and desire to protect by Letters Patent is:—

1. A pump, including a collapsible resilient tube, a rotatable element, a plurality of rollers carried by said element, a resilient support for the tube having an arcuate surface on which the tube is arranged and against which it is pinched and closed by the action of the rollers, and means for adjusting the resilient support to vary the degree of resilient pressure exerted by the rollers on the tube, as set forth.

2. A pump, comprising a collapsible resilient tube, a resilient support for said tube, a carrier for said resilient support, means for adjusting the resilient support through said carrier, a rotating element, and a plurality of rollers carried by said element and adapted to engage and pinch, and then roll in contact with the tube in the pinching position, and thereby displace the fluid in the tube in front of them and draw the fluid into the tube at the back of them, as set forth.

3. A pump, comprising a collapsible resilient tube, a resilient support for said tube, a carrier for said resilient support, means for adjusting the resilient support through said carrier, a rotating element, a plurality of rollers carried by said element and adapted to engage and pinch, and then roll in contact with the tube in the pinching position, and thereby displace the fluid in the tube in front of them and draw the fluid into the tube at the back of them, rigid suction and delivery pipes detachably connected to opposite ends of the tube, and supports for said pipes, as set forth.

4. A pump, including a collapsible resilient tube, a rotatable element, a plurality of rollers carried by said element, a resilient support for the tube having an arcurate surface on which

the tube is arranged and against which it is pinched and closed by the action of the rollers, and means for adjusting the resilient support to vary the degree of resilient pressure exerted by the rollers on the tube, said latter means including a wedge positioned beneath the support and screw means for moving the wedge to raise and lower the support, as set forth.

5. A pump, including a collapsible resilient tube, a rotatable element, a plurality of rollers carried by said element, a support for the tube in the form of a resilient block having an arcuate surface on which the tube is arranged and against which it is pinched and closed by the action of the rollers, a carrier for the resilient block, a base portion for the carrier fashioned with a central recess, and means for adjusting the resilient support to vary the degree of resilient pressure exerted by the rollers on the tube including a pair of oppositely tapered wedges, positioned within the recess and between the carrier and base, and screw means for moving the wedges to raise and lower the resilient support, as set forth.

6. A pump, including a collapsible resilient tube made thicker in its upper portion, a rotatable element, a plurality of rollers carried by said element and engaging the thickened upper portion of the tube, and a resilient support for the tube having an arcuate grooved surface in which the tube is arranged and against which it is pinched and closed by the action of the rollers, as set forth.

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