A peristaltic pump including a readily replaceable tube with nipples affixed to the tube ends and which fit and are anchored by sockets in the pump casing, and a rotor disk provided with a tube guide for guiding a replacement tube into operative position in the casing.

5 Claims, 6 Drawing Figures
PERISTALTIC PUMP

This invention pertains to peristaltic pumps, and particularly to pumps useful for feeding chemicals at a controlled rate, such as for feeding liquid chlorine chemicals into swimming pools.

A general object of the invention is to improve the operation, simplify the construction, and simplify maintenance and repair procedures in peristaltic pumps.

A specific object of the invention is to simplify the replacement of the compressible pumping tube in a peristaltic pump.

The novel features which are believed to be characteristic of this invention are set forth with particularity in the appended claims.

The invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is an end view of the pump element, with the end cover removed, showing the pumping tube arranged for insertion into operative position in the pump element housing;

FIG. 2 is a similar view showing the tube partially in position;

FIG. 3 is a similar view showing the tube completely installed;

FIG. 4 is an end view of the cover element for the pump body;

FIG. 5 is a front exploded view of the pumping element housing showing the cover aligned for attachment to the body portion; and

FIG. 6 is a side elevation of a complete pump unit including the intermittent drive therefor, with certain parts broken away and partially in section.

As seen in FIGS. 1, 2, 3 and 4, the pump element body 1 includes a hollow cylindrical pumping chamber or cavity portion 2 in which a rotor assembly 3 is disposed. Rotor assembly 3 includes an outer disk 4, of which the outer surface 5 is substantially flush with the outer edge 6 of the cylindrical portion 2 of the housing. Mounted to and underlying the disk 4 are a plurality of rollers, such as rollers 7 and 8, which are freely rotatable on pins 9 and 10.

The compressible tube 11 includes a rigid nipple 12 fixedly attached to end 13 of the tube. The nipple 12 comprises a throat or groove portion 14 between its outer externally threaded end portion 15 and its inner end portion 16 which is of reduced external diameter, and the nipple nests in a socket generally identified at 17 formed in a boss 18 of the pump element body 1, whereby the discontinuous surfaces of the nipple and the socket include engaged shoulders in a tongue and groove connection retaining the nipple, and therefore the tube end 13, from being pulled into or pushed outwardly of the pumping chamber.

Disk 4 includes a guide finger or lip 19 bounding an open notch 20 which extends inwardly into disk 4 from its rolled edges. In order to position a tube 11 in the pumping chamber 2, nipple 12 is inserted into socket 17 into such a position that tube end 13 is inwardly of disk 4 and is generally aligned with the centers of rollers 7 and 8, with the major portion of tube 11 extending outwardly through notch 20. As the disk and roller assembly 3 is rotated in a counterclockwise direction as viewed in FIG. 1 from its position shown in that figure into the position shown in FIG. 2, tube 11 is guided by lip 19 down into the cylindrical pumping chamber or cavity 2 of the housing, with the tube passing along through notch 20, while roller 7 starts to roll along the tube in the cavity. Continuing rotation of the roller assembly 3 until notch 20 reaches a position opposite to a second socket 21 then permits the nipple 22, which is affixed to the opposite or output end 23 of tube 11, to be slipped into its respective socket 21 in the body.

The body 1, disk 4 and cap or cover 25 are each formed of a hard, transparent synthetic plastic material, whereby the tube is visible through the disk as it is being fed into position, as shown in FIG. 2, for example, and the interior of the pump can be seen during operation thereof. Leakage from the tube into the pumping chamber is thus visually detectable, and condition of the tube can be determined without disassembling the pump. Tube 11 is also transparent but is of a soft synthetic plastic material so as to be compressible into flattened shape by the rollers. Flow of liquid through the tube, during operation of the pump, is readily witnessed through the body 1, or through cap 25 and disk 4, and through the tube wall.

The inner face 26 of cover 25 is provided with two bosses 27 and 30 which are received, respectively, into sockets 17 and 21. Each of these bosses has an end surface such as shown at 29 on boss 27, for engagement with the portion of the tube end and the nipple portion which lie within the socket thereby to retain the nipples securely in their respective sockets when the cover is in place.

Centrally within the cover is a projection 30 containing a sleeve bearing 31 for a drive shaft 32 keyed to rotor assembly 3 by means of keys 33.

Turning now to FIG. 6, it will be seen that rotor assembly 3 comprises a barrel 34 carrying outer disk 4 and inner disk 35 at its opposite ends. The barrel and disks are attached rigidly together, such as by the use of a suitable cement. Rollers 8 and 7, preferably of hard phenolic material, are mounted for free rotation between the disks. Pin 9 is shown, for example, having its ends embedded in the respective disks and mounting roller 7.

Shaft 32 is rotatable in bearing 31 and in sleeve bearing 37 housed in inner wall portion 38 of the pump body 1. The shaft has an enlarged portion 39 extending into a roller over-running clutch 40 mounted in a main support housing 41. The clutch includes rollers or bearing needles 42 surrounding the shaft and permitting free rotation thereof in one direction in the manner of a needle bearing. The rollers or needles are arranged in individual eccentric cavities in the clutch, and, upon very slight rotation of the shaft in the opposite direction, the needles jam between the shaft and the fixed clutch housing 43 thereby preventing rotation of the shaft in said opposite direction. The shaft 32 mounts a drive disk 44 having a plurality of openings for receiving a pin 45 of an intermittent drive arrangement 46 of the type shown and described in U.S. Pat. No. 2,975,719 issued Mar. 21, 1961, to Samuel Kaufman.

The intermittent drive includes an adjustment knob 47 for adjusting arm 48, a spring loaded follower 49 including a sensing portion 50 for traversing groove 51 and carrying pin 45. Pin 45 and follower 49 are carried on a gear wheel 52 which is driven by a motor 53. A flexible land member 54 fills more or less of groove 51 and serves to force portion 50 generally outwardly of the groove, and thus to disengage pin 45 from disk 44.
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through a portion of each revolution of gear wheel 52.

While pin 45 is drivingly engaged with disk 44, shaft 32 is rotated with gear wheel 52. When pin 45 is disengaged, pressure in the tube 11 on the output sides of the pump rollers tends to rotate shaft 32 in the aforementioned opposite direction resulting in jamming of the clutch rollers 42 on the shaft and thereby preventing such opposite rotation of the shaft.

It will be noted that cover 25 is attached to body 1 by self tapping screws or bolts 55 and that the body is similarly attached to support housing 41 by screws or bolts 56.

It will be understood that the nipples 12 and 22 are attached to respective external inlet and outlet conduits for pumping of fluids through the tube 11. In replacing the pump tube, the cover 25 is removed, nipples 12 and 22 are detached from the external inlet and outlet conduits, and the motor is operated sufficiently to bring notch 20 into alignment with socket 14. The nipple 12 is now pulled out of its socket so that the tube extends through notch 20. With continued operation of the motor, and with a pull exerted on the nipple 12, the tube is gradually fed out of the chamber 2 until the notch 20 aligns with socket 21, at which time nipple 22 is removed. A new tube 11 is replaced by a similar procedure, first aligning notch 20 with socket 17 and inserting nipple 12 into this socket with the tube extending from its end 13 outwardly through the notch. As rotor 5 is now rotated, the tube is gradually fed into chamber 2 by lip 19 until the notch reaches socket 21, at which time nipple 22 is slipped into this socket. Replacement of cover 25 and reattachment of the nipples to the external conduits completes the replacement procedure.

While the invention has been described with respect to a certain specific embodiment, it will be appreciated that many modifications and changes may be made by those skilled in the art without departing from the spirit of the invention. It is intended, therefore, by the appended claims to cover all such modifications and changes as fall within the true spirit and scope of the invention.

What is claimed as new and what it is desired to secure by Letters Patent of the United States is:

1. In a peristaltic pump comprising a pump body with an internal generally cylindrical wall between an open front side to a back side of said body, said wall defining a generally cylindrical pumping chamber in said body, said body comprising a tube anchoring socket communicating with said chamber and an opening through said body into said chamber and said opening being laterally exposed through the front side of said body, said opening being peripherally displaced around said wall from said socket, a pumping tube, anchoring means at one end of said tube for anchoring engagement in said socket, a rotatable shaft coaxial with said cylindrical chamber, a tube compressing element carried by said shaft disposed within said chamber for traversingly compressing said tube against said wall upon rotation of said shaft, tube inserting guide means fixed to said shaft and rotatable therewith, said guide means comprising a finger portion extending generally radially from said shaft toward said wall and disposed between said socket and said open front side, said finger portion being adapted and arranged upon rotation of said shaft to feed said tube, when its said anchoring means is so anchored in said socket, into said chamber alongside said wall from said socket to said opening.

2. The combination according to claim 1 wherein said opening comprises a second socket and the other end of said tube is provided with anchoring means for anchoring engagement therein.

3. The combination according to claim 2 wherein said anchoring means and sockets include interfitting surfaces forming respective tongue and groove connections for retaining said tube ends against longitudinal movement therein.

4. The combination according to claim 1 wherein said guide means comprises a disk of which said finger portion comprises a lip of a tube-passing notch extending into the peripheral edge portion of the disk, and wherein said disk mounts said element and at least one additional tube compressing element.

5. The combination according to claim 4 wherein said body is provided with transparent front cover means removably attached thereto and wherein said disk is transparent.

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