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[54] **PERISTALTIC PUMP**

[76] Inventor: **Edouard Malbec,** Logis de Chalonne, Le Gond Pontouvre, France

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[51] **Int. Cl.** .. **F04b 43/08,** F04b 43/12, F04b 45/06

[58] **Field of Search** 417/477, 476, 475, 474

[56] **References Cited**

UNITED STATES PATENTS

2,696,173	12/1954	Jensen	417/477
2,899,907	8/1959	Becher	417/477
3,227,092	1/1966	Clark	417/477
3,403,631	10/1968	Tangeman	417/477 X
3,463,092	8/1969	Meyer	417/477
3,582,234	6/1971	Isreeli et al.	417/477
3,622,252	11/1971	Pickup	417/477
3,768,934	10/1973	Magerle	417/477

FOREIGN PATENTS OR APPLICATIONS

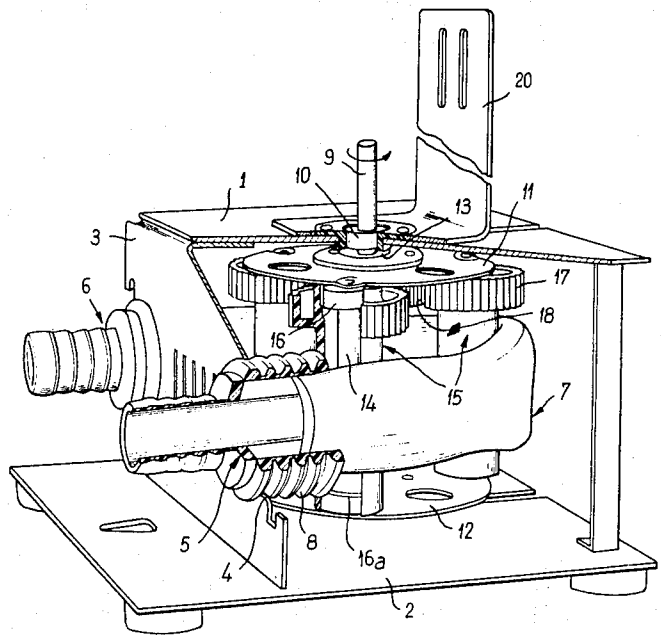
1,351,813	12/1963	France	417/477

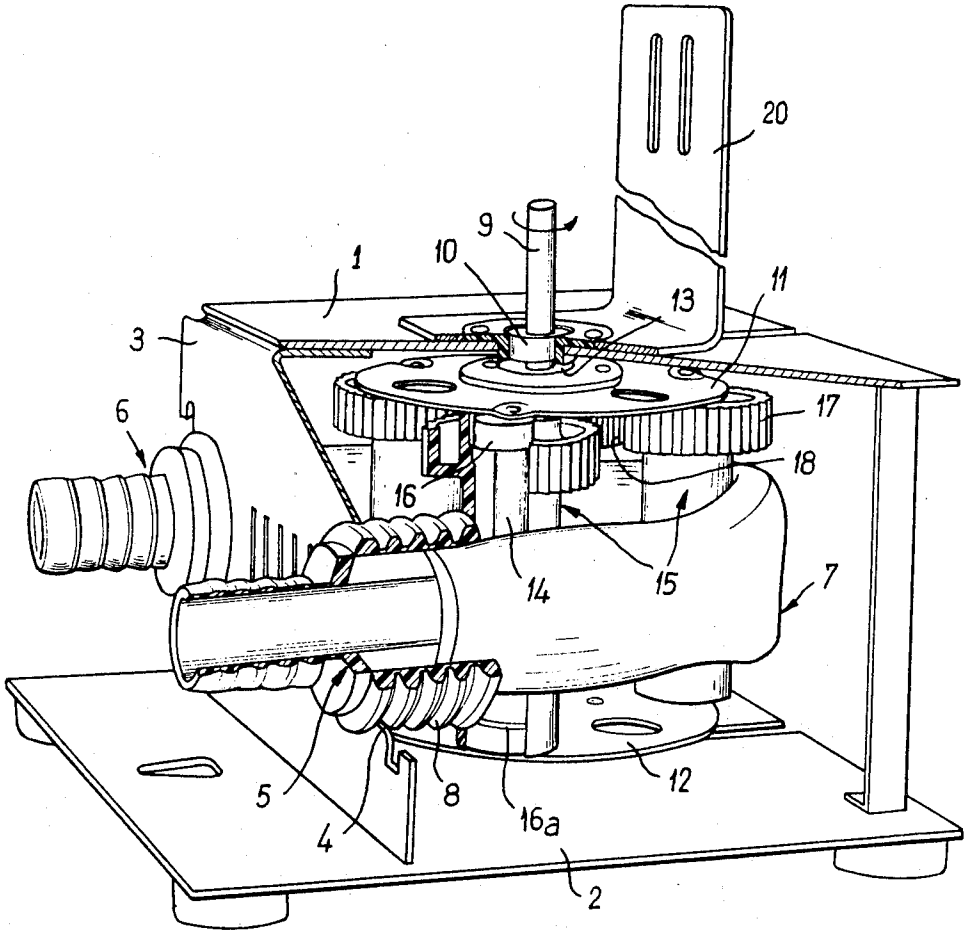
Primary Examiner—William L. Freeh
Assistant Examiner—Richard E. Gluck
Attorney, Agent, or Firm—Fleit, Gipple & Jacobson

[57] **ABSTRACT**

A peristaltic pump of the type having a deformable tube carrying a fluid and comprising a frame, a drive shaft mounted rotatably on the frame, a rotor having two axially spaced plates mounted rotatably about the drive shaft, rollers mounted rotatably between the plates and cooperating with the deformable tube, and a gearwheel provided at one of the ends of each of the rollers and connected thereto. The said gearwheel having a larger diameter than the roller, and a drive gearwheel connected to drive shaft and meshing with all the gearwheels connected to the rollers. The deformable tube is mounted on the rollers with an elastic tension such as to ensure its closure at the points of contact between the tube and the rollers.

2 Claims, 1 Drawing Figure




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PERISTALTIC PUMP

This invention relates to peristaltic pumps of the kind in which the pump body is formed by a deformable tube carrying the fluid which is to be pumped, rollers cooperating with said tube and being so driven as to subject the tube to periodic compressions over a part of its length.

To enable such pumps to be used satisfactorily with high-speed electric motors, which are of themselves advantageous, a reduction system must usually be employed in the line of drive, and this makes the pump expensive and complicates its construction.

One of the objects of the invention is to eliminate this disadvantage by means of a pump construction which is particularly advantageous due to its simplicity and good operation, and which can be driven by a conventional electric motor which the user will probably have available in his personal tool-kit, e.g. a hand drill motor.

In prior-art pumps, the tube is generally required to operate by deformation against an outer casing, and this results in stresses and rapid wear of the tube, and the mounting of the assembly is rendered complicated.

It is another object of the invention to obviate this disadvantage by means of a special mounting of the tube, for which the construction of the pump according to the invention is particularly suitable, and which enables the pump body to be readily and rapidly replaced, so that the pump is suitable for multiple use, it only being necessary to provide a plurality of pump bodies corresponding to the required uses.

Essentially, the peristaltic pump according to the invention comprises a frame, a drive shaft mounted rotatably on said frame, a rotor having two axially spaced plates mounted rotatably about the drive shaft, rollers mounted rotatably between said plates and cooperating with the deformable tube, a gearwheel formed at one of the ends of each of the rollers and connected thereto, said gearwheel having a larger diameter than the roller, and a drive gearwheel connected to the drive shaft and meshing with all the said gear-wheels connected to the rollers.

In addition, satisfactory long-period operation and the above-mentioned option of multiple use can be obtained simply by mounting the deformable tube on the rollers with an elastic tension such as to ensure its closure at the points of contact between the tube and the rollers.

One embodiment of a peristaltic pump according to the invention is described hereinbelow by way of example and with reference to the accompanying drawing, the single FIGURE of which is a perspective view of said pump with the frame being partially broken away.

The pump illustrated comprises a frame formed from two spaced plates **1** and **2**, the latter plate forming the base. The frame spacers comprise a plate **3** formed with two slots **4** adapted to receive two end junction portions **5, 6** of a deformable tube **7** which forms the pump body, at least one of said end portions being provided with spaced ridges **8** engaging the corresponding slot. The tube **7** is disposed around a rotor which is rotated from a drive shaft **9** mounted rotatably in the two plates **1, 2** through the agency of ball bearings **10.** The rotor comprises two plates **11, 12** spaced axially and

mounted to rotate about the drive shaft through the agency of ball bearings **13.** Rollers **15** are mounted on spindles **14** which space the plates **11, 12,** said rollers being rotatable through the agency of end ball bearings **16, 16*a***, the tube being mounted over these rollers so as to be stretched and pinched in contact therewith by the force-fit engagement of the ridges **8** of the end portions in the slots **4** of the plate **3.** In this case there are three rollers, but there could be four or even more.

A gearwheel **17** of a larger diameter than the roller is mounted at one of the ends of each of the rollers **15** and is connected thereto.

A drive gearwheel **18** is mounted on the drive shaft **9** and is connected thereto and meshes with all the gearwheels **17** of the rollers, these gearwheels forming planet gears around the drive gearwheel **18.**

In such an embodiment, the rollers **15** together with their gearwheel **17** may advantageously be produced from moulded plastics material and be used in the rough moulded form, and the same applies to the gearwheel **18,** which is formed with a hub which is keyed on the drive shaft **9.**

When the drive shaft **9** is rotated in the direction of the arrow in the drawing, the gearwheel **18** drives the gearwheels **17** and rollers **15** in the opposite direction, and as the rollers are driven by adhesion over the tube **7** they move along the same in the direction of rotation of the drive shaft. It will be apparent that as a result of the rollers **15** being driven by adhesion in contact with the tube they tend to push the tube towards the intake orifice and promote filling of the tube on the intake stroke, this being the opposite to what is the case in conventional solutions in which the tube is flattened and drawn towards the tube outlet orifice.

It will also be apparent that this embodiment enables a double speed reduction stage to be introduced between the drive shaft and the rotor, i.e., a first stage which is dependent upon the ratio of the radii between the gearwheel **18** and the gearwheels **17,** and a second stage which is dependent upon the ratio of the radii between the rollers **15** and the mean radius of the path that they cover in contact with the tube **7** (this latter stage is of course the larger).

This construction, which is without any appreciable operational friction, is particularly suitable for long-period operation, and has a very satisfactory overall efficiency.

The plate **1** of the frame is provided with a bracket **20** which in this case is intended for fixing a conventional portable electric drill body (not shown), the chuck of which will be clamped on the drive shaft **9** to drive the latter by means of the drill motor, although any other direct drive system may be utilized.

The skilled addressee will appreciate the constructional simplicity of such a pump and its multi-purpose use, because replacement of the pump body (the tube and end portions), which is simply mounted under elastic tension, is both rapid and simple, so that it will be possible to pump various fluids with a single pump and a plurality of specialized pump bodies, without any contamination.

What I claim is:

1. A peristaltic pump of the type having a deformable tube carrying a fluid, and comprising a frame, a drive shaft mounted rotatably on the frame, a rotor having two axially spaced plates mounted rotatably about the drive shaft, rollers mounted rotatably between said

plates, said deformable tube being mounted on the rollers with an elastic tension such as to ensure its closure at points of contact between the tube and the rollers, end junction portions are connected to the tube ends, each of said junction portions being provided with a series of ridges for engagement in retaining slots formed on the frame in order to adjust tension in said tube, a gearwheel provided at one of the ends of each of the rollers and connected thereto, said gearwheel having a larger diameter than the roller, and a drive gearwheel

connected to said drive shaft and meshing with all the said gearwheels connected to the rollers.

2. A peristaltic pump according to claim **1** wherein said deformable tube has adjustable end means adapted to be selectively positioned and mounted in said frame, said adjustable end means causing said deformable tube when positioned against said rollers to be stretched and pinched in contact with said rollers.

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