(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 722 606 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.10.2020 Bulletin 2020/42

(51) Int Cl.:
F04B 43/12 *(2006.01)* ***F04B 43/00*** *(2006.01)*

(21) Application number: **20166962.9**

(22) Date of filing: **31.03.2020**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **09.04.2019 IT 201900005422**

(71) Applicant: **Sedda, Mirko**
36045 Vicenza (IT)

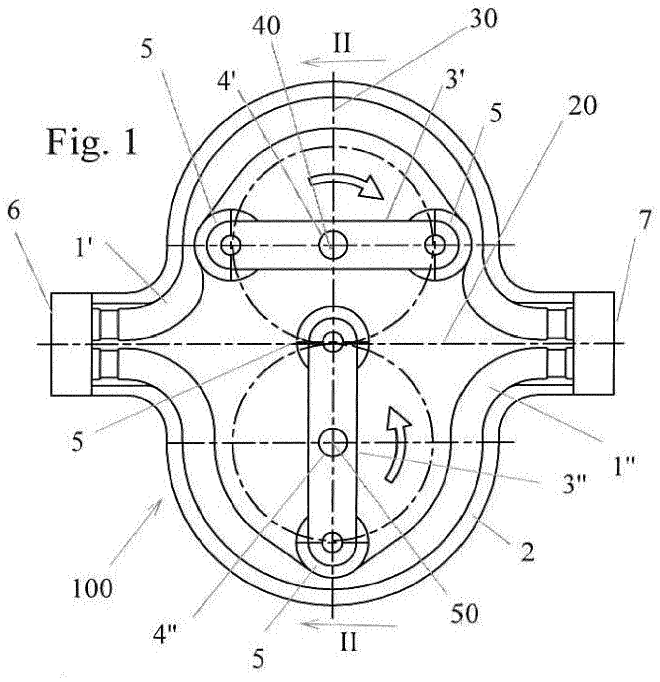
(72) Inventor: **Sedda, Mirko**
36045 Vicenza (IT)

(74) Representative: **Bettello, Pietro**
Via Col d'Echele, 25
36100 Vicenza (IT)

(54) **PERISTALTIC PUMP**

(57) The finding concerns a peristaltic pump (100), which discloses a suction inlet (6) and a delivery inlet (7), composed of two flexible tubular-shaped ducts (1', 1") housed inside a pump body (2), wherein two rotating members (3', 3") having at least two compression lobes (5) act, the rotation of each of said members (3', 3"), hinged to a rotating shaft (4', 4"), makes it possible that each compression lobe (5) causes the suction and advancement of the fluid present in the flexible ducts (1', 1"). Said pump body (2) has a symmetrical shape with respect to the two axis (20, 30), the first axis of which is longitudinal (20) and along which there are a suction manifold (6') and a delivery manifold (7'), while the second axis is transverse (30) and perpendicular to said first axis (20), where the rotation axis (40, 50) of the rotating members (3', 3") are aligned. Said shafts (4', 4") are counter-rotating at the same speed such as to avoid mutual mechanical interference. Said pump (100) **is characterized in that** on the first longitudinal axis the suction manifold (6') of the pump (100) is present and in that the two manifolds (6', 7') are arranged at the suction (6) and delivery (7) inlets of the pump thereof.

Fig. 1



EP 3 722 606 A1

Description

[0001] The invention relates to a peristaltic pump.

[0002] As is well known, the term peristalsis refers to a contraction and relaxation movement, in particular of a duct, with the effect of progressive advancement of the content in the duct itself.

[0003] In particular, peristaltic activity present in nature is known in different hollow organs of various living organisms, including mankind (esophagus, etc.); on the basis of this principle, so-called peristaltic pumps have been built for some time, in which the kinetic energy of the treated fluid is impressed by a restriction that runs along a tube.

[0004] In fact, the pump consists of a rotating member to which compression lobes are applied which, by rotating, restrict the tube, thus causing the fluid to advance. Naturally, the tube in which the fluid flows must be able to deform in an elastic and non-plastic way, so that it can regain its original size and therefore guarantee the suction capacity.

[0005] In fact, the peristaltic pump is intrinsically a "pulsating" pump, since its flow rate is not constant during a single revolution. This is one of the fundamental problems of peristaltic pumps and, in order to reduce this phenomenon, suitable compensators are used for this purpose.

[0006] Peristaltic pumps are mainly used in processes where it is not desired to bring the treated fluid into contact with the pump components, in particular for reasons of safety against contamination (for example in the food, pharmaceutical and medical industries) or because the fluid is aggressive or harmful to the pump members (typically in the case of solvents, chemical agents, fuels, corrosive substances and the like).

[0007] With this type of pump it is possible to accurately calibrate the flow rate and this makes it a very useful device especially in the case where accurate dosages and repeatability of the measurement are required, such as, for example, in chemical and pharmaceutical, biological, and similar laboratories.

[0008] In most cases, peristaltic pumps have a rotating member, which has two or more compression lobes, generally in the form of rollers or runners, which act on a single flexible duct to obtain the effect described above.

[0009] There are embodiments in which a number of compression lobes greater than two is provided, such as the DELASCO pump (1956) with three compression lobes (in this case compression rollers). Other documents of the state of the art are GB 2076476 A and WO 2009/073212 A1.

[0010] The most important document of the state of the art, however, is US 3935971 A. In this document a particular peristaltic pump with two rotating members is described which has a symmetrical shape with respect to two mutually perpendicular axes. This document corresponds to the general part of claim 1 of the present invention. In this document, this pump is expected to have a device suitable for mixing, with variable concentration ratios, two or more liquids. Therefore, it is in all respects a double pump to mix two or more substances. This necessarily determines a pump which intrinsically has considerable dimensions and encumbrance.

[0011] Main object of the present invention is to provide a peristaltic pump having the characteristics of the document mentioned above which is capable of moving a single liquid from upstream to downstream of the pump itself.

[0012] Further object of the invention is to provide a peristaltic pump which, with respect to the aforementioned, intrinsically has smaller dimensions and encumbrance.

[0013] This is achieved, according to the invention, by providing a peristaltic pump of this type with the characteristics of the characterizing part of claim 1.

[0014] Further characteristics of the invention are present in the dependent claims.

[0015] These and other characteristics of the invention will now be described in detail hereinafter with reference to some particular embodiments thereof, given solely by way of non-limiting example, with the aid of the attached drawings, wherein:

- figures 1, 2 and 3 represent a first embodiment of the pump according to the invention, respectively in an overall view with the open pump body, in a sectioned transverse view, taken according to the line II-II of figure 1 and in a side view;
- figures 4, 5 and 6 show overall views, with the open pump body, of said first embodiment of the invention, in three different operating phases;
- figures 7, 8 and 9 represent figures corresponding to those of figs. 1-3 of a further embodiment of the device according to the invention; in particular fig. 8 represents a sectioned transverse view, taken along the line VIII-VIII of fig. 7;
- figures 10, 11 and 12 represent figures corresponding to those of figs. 4-6 of a further embodiment of the device according to the invention.

[0016] As can be seen in figures 1-3 and 7-9 respectively, the peristaltic pump 100, according to the invention, represented in two different embodiments, as better specified hereinafter, comprises two flexible tubular ducts 1' and 1" housed inside a pump body 2. Two rotating members 3' and 3" act simultaneously and in sequence on said ducts. In figures 1 and 2 it can be seen that in the first embodiment said rotating members 3' and 3" have two compression lobes 5, while in the embodiment illustrated in figures 7 and 8 the compression lobes 5 are provided three in number.

[0017] In any case, each of the rotating members 3' and 3" is hinged to its own rotating shaft, respectively 4' and 4". In particular, it is provided that the rotation of said members 3' and 3" leads to the compression of each of the compression lobes 5 on the ducts 1' and 1", causing

in particular the suction and advancement of the fluid present in the duct itself, as represented in the sequence of figures, respectively, 4, 5 and 6, as well as 10, 11 and 12.

[0018] In particular, it is provided that the pump body 2 has a symmetrical shape with respect to two axes 20, 30. The first of these axes 20 is longitudinal and along which there are a suction inlet 6 and a delivery inlet 7 of said pump. Vice versa, the second symmetry axis 30 is transverse and perpendicular to said axis and where the rotation axes 40, 50, respectively, of the rotating members 3' and 3" are aligned and spaced out with respect to the longitudinal axis 20. According to the invention, as shown in particular in the figures, respectively 1, 4, 5 and 6, as well as 7, 10, 11 and 12, a first manifold 6' is provided for causing a subdivision of the duct into identical flexible ducts 1' and 1". The compression lobes 5, mounted on the rotating members 3' and 3", act on said flexible ducts 1' and 1".

[0019] It is in particular provided that the shafts 4' and 4" are counter-rotating at same speeds and the rotating members 3' and 3" hinged thereto rotate so as to avoid mutual mechanical interference.

[0020] It is also provided that said flexible ducts 1', 1" join downstream of the rotating members 3' and 3 ", at a second manifold 7'.

[0021] Finally, it is foreseen that in correspondence with said manifolds 6', 7' the suction 6 and delivery 7 inlets of the pump are present.

[0022] As visible in the sequence of figures from 4 to 6, it is evident that the contact between the lobes 5 and the flexible ducts 1', 1" causes the compression of different portions of fluid entering the manifold 6', causing the advancement thereof in the duct itself.

[0023] In the figures from 7 to 9 a variant embodiment of the pump according to the invention is illustrated in which, instead of just two compression lobes 5, arranged along the same axis and therefore angularly spaced by 180°, three compression lobes 5 are provided, hinged to the same rotating shafts 4' and 4" and, in this case, angularly spaced by 120°.

[0024] It is clear that, from a principle point of view, it is possible to provide an indefinite number of compression lobes 5, advantageously spaced out angularly in an equal way.

[0025] In any case, it is provided that these rotating members advantageously have a radial symmetry with respect to their own rotation axis.

[0026] Advantageously therefore the compression lobes will be angularly spaced by an angle α equal to α=360°/n, where n is the number of compression lobes 5 hinged to the same rotating shafts 4' and 4".

[0027] It is intuitive that the greater number of lobes 5 at the same rotating member will lead to an increase in the constancy of the pump flow rate.

[0028] On the other hand, it is clear that, from a mechanical and functional point of view, it is easier to deal with a reduced number of compression lobes, for example a number equal to 2 or 3, just like in the appended figures.

[0029] It is advantageously provided that the rotating shafts 4', 4", on which the two rotating members 3', 3" present in said pump 100 are hinged, are mutually connected by means of toothed wheels or toothed pulleys, to guarantee the fact that the rotating members 3' and 3" counter-rotate at absolutely same speeds.

[0030] From the foregoing, therefore, it can be seen how the device according to the invention is certainly capable of solving the problems indicated above and of satisfying the purposes also previously proposed in this regard.

[0031] It should be noted that the present invention may also take forms and aspects different from those described and illustrated in detail above, without prejudice to its essential characteristics, without thereby departing from the scope of the patent.

Claims

1. PERISTALTIC PUMP (100), which discloses a suction inlet (6) and a delivery inlet (7), of the type composed of two flexible tubular-shaped ducts (1', 1") housed inside a pump body (2), wherein two rotating members (3', 3") having at least two compression lobes (5) act simultaneously and in sequence, each one of said members (3', 3") being hinged to a rotating shaft (4', 4"), being provided that the rotation of said members (3', 3") makes it possible that each compression lobe (5) exerts a compression on the flexible ducts (1', 1") causing the suction and advancement of the fluid present in the ducts themselves (1', 1"), said pump body (2) having symmetrical shape with respect to the two axis (20, 30), the first axis of which is longitudinal (20) and along which there are a suction manifold (6') and a delivery manifold (7') of the pump (100) thereof, while the second axis is transverse (30) and perpendicular to said first axis (20), where the rotation axis (40, 50) of the rotating members (3', 3") are aligned and equally spaced out, with respect to the longitudinal axis (20), being further provided that said compression lobes (5) mounted on rotating members (3', 3") act on the flexible ducts (1', 1"), the shafts (4', 4") being counter-rotating at the same speed and rotating such as to avoid mutual mechanical interference, being further provided that said flexible ducts (1' 1") join downstream of the rotating members (3', 3"), at the delivery manifold (7'), said pump (100) **being characterized in that** on the first longitudinal axis the suction manifold (6') of the pump (100) is present and **in that** the two manifolds (6', 7') are arranged at the suction (6) and delivery (7) inlets of the pump thereof.

2. PUMP according to claim 1, **characterized in that** each of the rotating members (3', 3") has a radial

symmetry with respect to its own rotation axis (40, 50).

3. PUMP, according to claim 2, **characterized in that** it has a plurality of compression lobes (5), angularly equally spaced out.

4. PUMP, according to one or more of the preceding claims, **characterized in that** the rotating shafts (4', 4"), on which two rotating members (3', 3") present in said pump (100) are hinged, are mutually connected by means of toothed wheels or toothed pulleys.

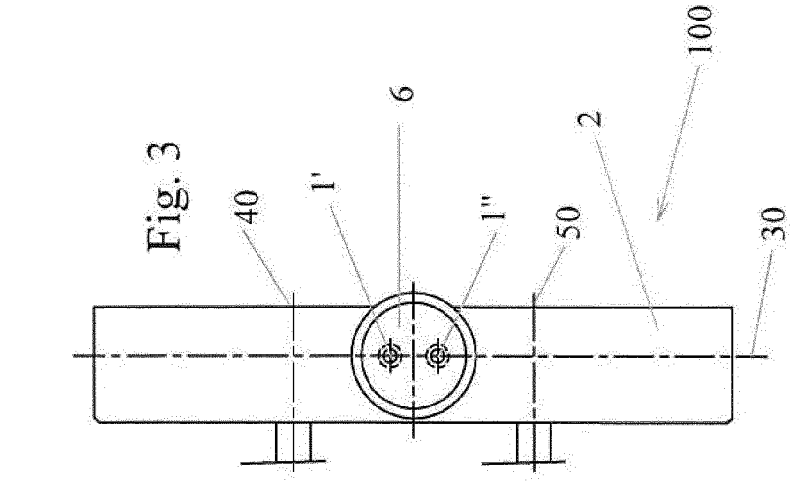


Fig. 3

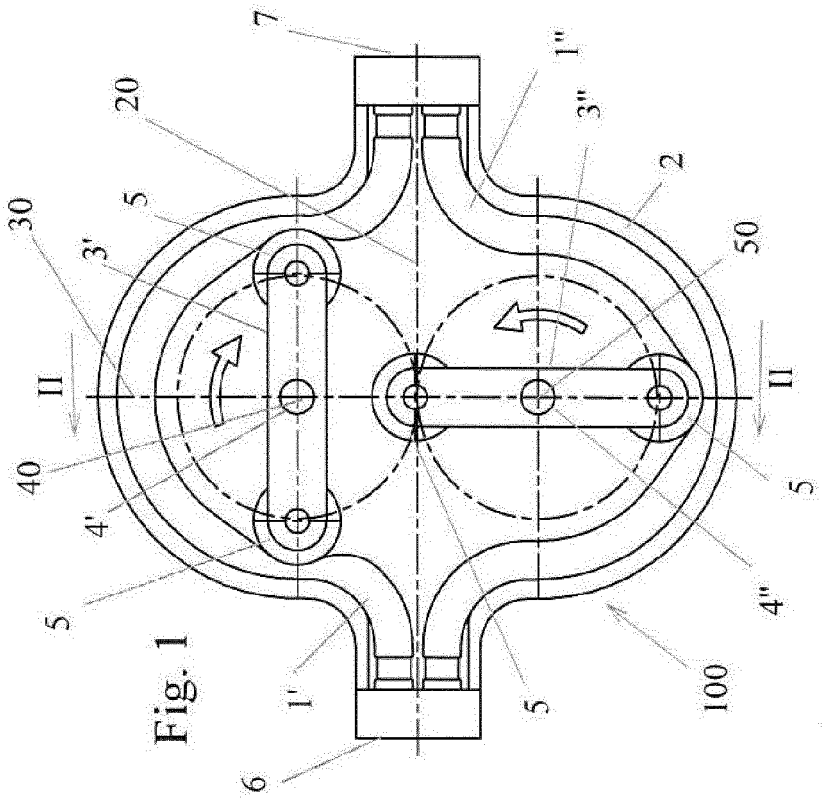


Fig. 1

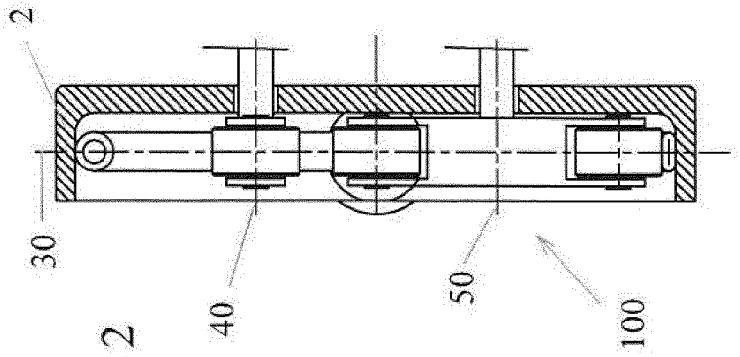


Fig. 2

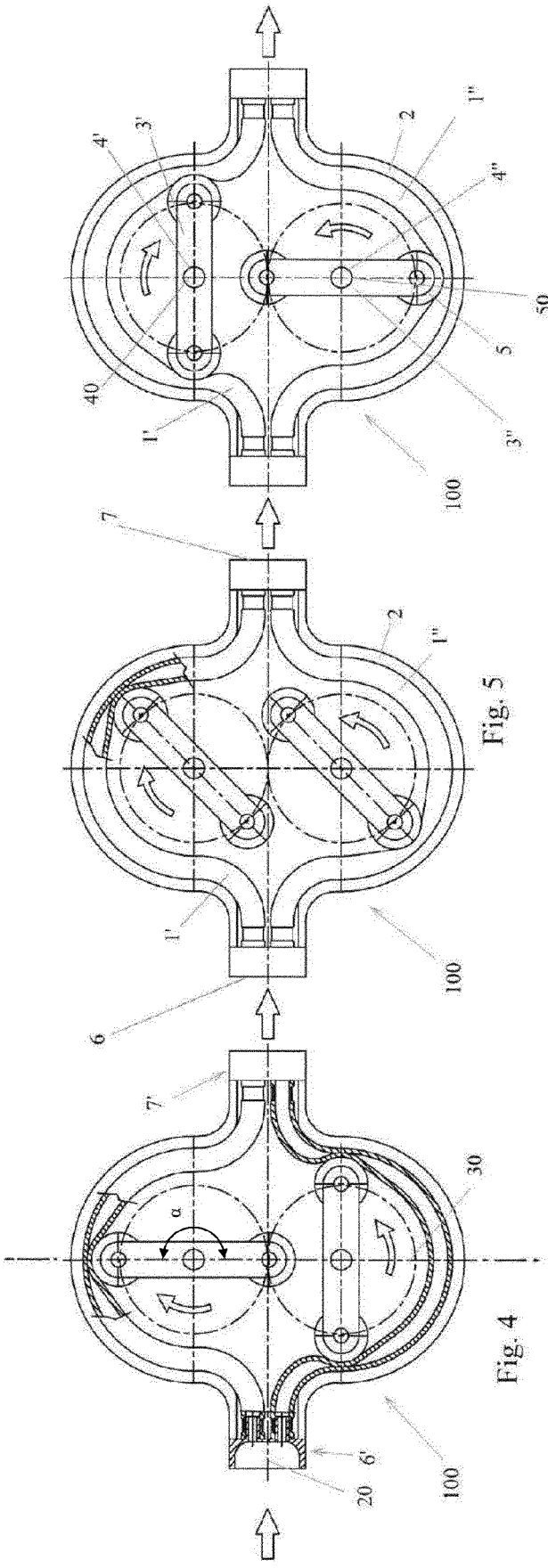


Fig. 6

Fig. 5

Fig. 4

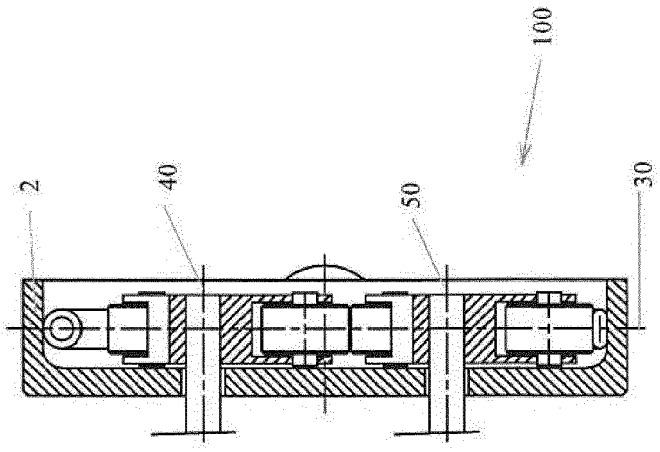


Fig. 8

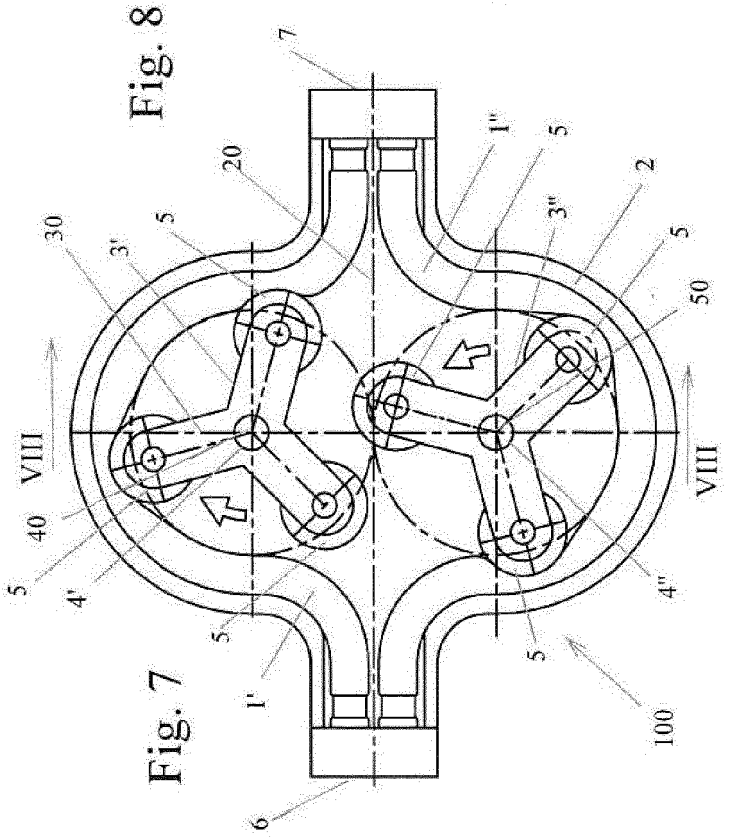


Fig. 7

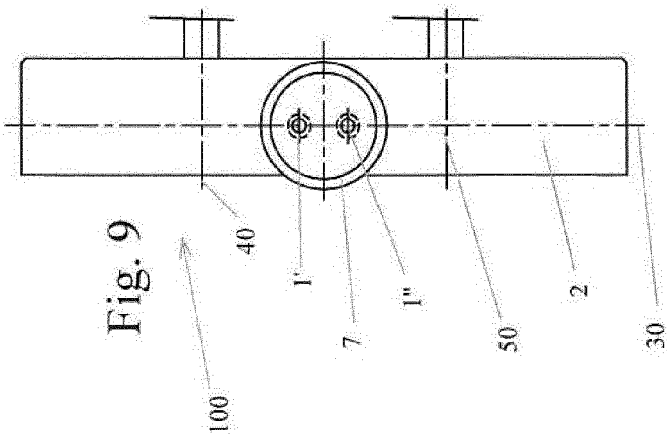


Fig. 9

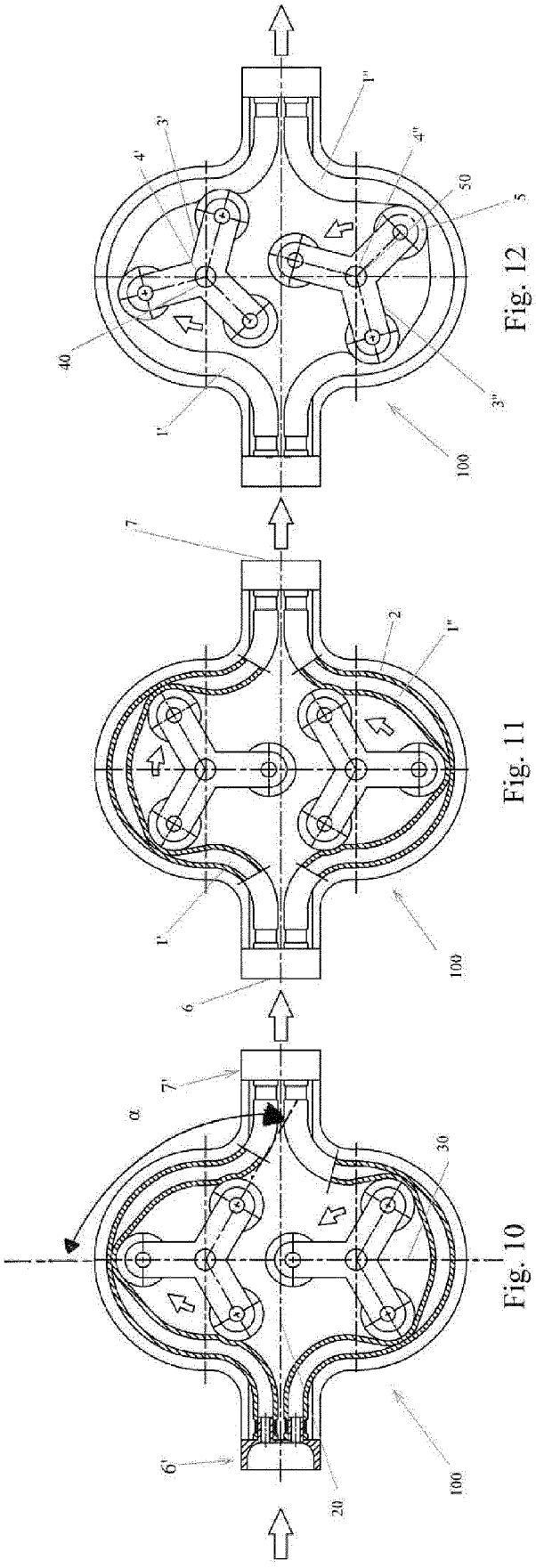


Fig. 12

Fig. 11

Fig. 10

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 20 16 6962

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 3 935 971 A (PAPOFF PAOLO ET AL) 3 February 1976 (1976-02-03) * column 2, line 58 - column 5, line 9; figures 1-7 * -----	1-4	INV. F04B43/12 F04B43/00
A	GB 2 076 476 A (WARNER LAMBERT UK LTD) 2 December 1981 (1981-12-02) * column 4, line 43 - line 49; figure 10 * -----	1-4	
A	WO 2009/073212 A1 (BUNN O MATIC CORP [US]; ALSTAD KNUTE [US] ET AL.) 11 June 2009 (2009-06-11) * paragraph [0046]; figure 4 * -----	1-4	

TECHNICAL FIELDS SEARCHED (IPC)

F04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 August 2020	Jurado Orenes, A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 20 16 6962

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

03-08-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3935971 A	03-02-1976	CH 580444 A5	15-10-1976
		DE 2425509 A1	02-01-1975
		GB 1478597 A	06-07-1977
		IT 989648 B	10-06-1975
		JP S5071357 A	13-06-1975
		JP S5749925 B2	25-10-1982
		NL 7407069 A	03-12-1974
		US 3935971 A	03-02-1976
GB 2076476 A	02-12-1981	NONE	
WO 2009073212 A1	11-06-2009	CA 2707831 A1	11-06-2009
		CN 101918714 A	15-12-2010
		EP 2232074 A1	29-09-2010
		US 2010301071 A1	02-12-2010
		WO 2009073212 A1	11-06-2009

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- GB 2076476 A **[0009]**
- WO 2009073212 A1 **[0009]**
- US 3935971 A **[0010]**