

(19) **DANMARK**

(10) **DK/EP 2171214 T3**



(12) **Oversættelse af
europæisk patentskrift**

Patent- og
Varemærkestyrelsen

-
- (51) Int.Cl.: **F 01 C 9/00 (2006.01)** **F 04 B 43/12 (2006.01)**
- (45) Oversættelsen bekendtgjort den: **2016-06-20**
- (80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2016-03-23**
- (86) Europæisk ansøgning nr.: **08779022.6**
- (86) Europæisk indleveringsdag: **2008-07-14**
- (87) Den europæiske ansøgnings publiceringsdag: **2010-04-07**
- (86) International ansøgning nr.: **NL2008050474**
- (87) Internationalt publikationsnr.: **WO2009011575**
- (30) Prioritet: **2007-07-13 NL 2000749**
- (84) Designerede stater: **AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR**
- (73) Patenthaver: **GJDtechnics B.V., Van Baerlestraat 2, 2802 GH Gouda, Holland**
- (72) Opfinder: **Droogers, Gerrit Jan, Van Baerlestraat 2, 2802 GH Gouda, Holland**
- (74) Fuldmægtig i Danmark: **NORDIC PATENT SERVICE A/S, Bredgade 30, 1260 København K, Danmark**
- (54) Benævnelse: **Maskine med oscillerende stempel**
- (56) Fremdragne publikationer:
DE-C- 97 907
DE-C- 466 916
JP-A- 50 023 014
US-A- 277 648
US-A- 958 408
US-A- 2 997 000

DESCRIPTION

[0001] The present invention relates to a machine for displacing fluid.

[0002] A machine of this type is known from US 958,404 which discloses a machine comprising a partition wall which is arranged between the displacement members which are connected to one another. This partition wall is a circular disc which is clamped between the halves of the housing which are divided by this separating plane. A dividing plate for sealing the annular chamber extends in a reciprocating manner through an opening in the dividing plate. It is very difficult to provide guidance for such a dividing plate and the structure which is produced as a result is complicated.

[0003] US 2,997,000 discloses a pump or motor in which a displacement body is connected to a support by means of a complicated bearing structure.

[0004] Document US277,648 is considered the closest prior art and its known features are included in the preamble of claim 1.

[0005] To date, such devices have not found widespread application.

[0006] This is partly due to their complicated design. It requires a very large number of machining steps and sealing the various parts forms a problem.

[0007] It is an object of the present invention to provide a relatively simple structure which can compete with other kinds of pumps or motors.

[0008] This object is achieved in an above-described machine with the features of Claim 1.

[0009] As the separating plane is at right angles to the partition wall and, more particularly, the separating plane comprises the axis of rotation of the drive (that is to say for the eccentric), it is possible to provide a particularly simple construction of the housing parts. More particularly, the partition wall between the displacement bodies is integral with a housing part each housing part is provided with a corresponding part of the partition wall. As a result thereof, it is simply possible to achieve automatic sealing of the partition wall parts when sealing the housing parts. In addition, the present invention makes it possible in a simple manner to provide space for the reciprocating sealing plate between the housing parts. This can be realized for one or both separating planes.

[0010] According to a particular embodiment of the invention, the inlets and outlets are arranged directly in the housing in a particularly simple manner. This means that it no longer requires complicated ducts to provide a connection between the first or second chamber and the surroundings. With the machine according to the invention, the chambers are connected in parallel in such a manner that a pulsing of the fluid stream into or out of the first chamber is compensated as much as possible by an opposite pulsing of the fluid stream into or out of the second chamber.

[0011] According to a further advantageous embodiment of the invention, the two displacement members are of symmetrical embodiment. According to an advantageous embodiment, the displacement body effectively consists of a single body provided with a central continuous groove.

[0012] According to a further advantageous embodiment, such a groove is tapering and extends towards the centre of the displacement body, that is to say the distance between the displacement members decreases near the centre of the displacement body.

[0013] The pivoting movement of the displacement body can be produced in many ways and/or it is possible to make effective use of the pivoting movement of the pivoting body in many ways. Thus, it is possible to arrange a number of actuators and/or generators along the outer periphery of the displacement body which produce the pivoting movement and/or take off the power generated in this way. According to an advantageous embodiment of the invention, the pivoting movement is produced by means of a rotary movement which is converted into a pivoting movement with an eccentric. With this advantageous variant of the invention, if the machine is operated as a motor, the pivoting movement is converted into a rotary movement by means of an eccentric.

[0014] According to a further advantageous embodiment, a coating which seals the chamber and/or the partition wall is arranged between the displacement member and the partition wall. Thus, after the fluid has been used or changed, it is possible to provide

optimum conditions without cleaning, only by replacing this coating. In addition, this coating may be embodied as a tube or hose, thus resulting in a peristaltic pump. In this case, such a hose may be bounded by two film/foil parts which are placed on top of one another. In order to carry out the peristaltic movement, it is important that the resultant tube or hose is either resilient or that said tube or hose is (temporarily) connected to a housing which is provided around the latter. This makes it also possible to displace sensitive fluids, such as blood, at a precisely controlled speed and without extreme pressure peaks. In addition, it is thus possible to displace other substances, such as nutrients. It is also possible to meter fluids very accurately. On the other hand, it is possible to drive the machine by means of relatively dangerous substances in order to use it as a generator.

[0015] According to a further advantageous embodiment of the invention, the inlet and/or outlet are provided near the partition wall of the chambers. In this way, the fluid stream can be supplied in a particularly compact manner.

[0016] It is possible to embody the displacement body as a sphere which moves inside a correspondingly spherical chamber. A continuous groove is then provided centrally in this sphere which, together with the above-described partition wall, delimits the respective chambers with variable volume. By using a sphere of this type, mounting and sealing can be provided in a particularly simple way.

[0017] It should be understood that the choice of sealing depends on the fluid to be displaced. Thus, it is possible to provide contactless sealing if various parts are produced with a very high degree of accuracy and a slight amount of leakage is acceptable.

[0018] It should be understood that the machine illustrated here can be embodied in many ways. It is possible for the housing to be fixed with respect to the outside world and the displacement body to pivot reciprocally or vice versa. A combination of both is likewise possible. The shape of the faces of the displacement members which roll along the partition wall can be chosen as desired and does not necessarily have to have the above-described conical shape.

[0019] The invention will be explained in more detail below with reference to exemplary embodiments illustrated in the drawing, in which:

Fig. 1 shows a plan view with the top removed of a first embodiment of a pump according to the invention;

Fig. 2 shows the image from Fig. 1 in perspective view;

Fig. 3 shows the pump from Figs. 1 and 2 without displacement body;

Fig. 4 shows the pump from Figs. 1-3 in side view;

Fig. 5 diagrammatically shows a perspective view of a further variant of the invention;

Fig. 6 shows the drive of the pump illustrated in Fig. 5;

Fig. 7 diagrammatically shows another variant of the invention in cross section;

Fig. 8 shows a partially cut-away view of the variant from Fig. 7.

[0020] Fig. 1 shows a pump which is denoted overall by reference numeral 1. It should be understood that the invention also relates to a motor, that is to say instead of displacing a fluid with the device, the displacement of a fluid by the device produces a mechanical movement.

[0021] The pump 1 comprises a housing composed of housing parts 2 and 3 (see also Fig. 4). These housing parts are separated horizontally by means of a separating plane 28 (see also Fig. 4), which makes simple assembly and, if desired, disassembly possible.

[0022] Inside the housing, a pivoting body 4 is accommodated which is pivotable about an axis 20 (Figs. 2 and 4) and also pivots with respect to this axis (arrow 44). The pivoting/tilting movement results from a shaft 16 being rotatably driven about axis 29. This shaft 16 is mounted in the housing by means of a bearing 17. An eccentric 15 is present, as a result of which the rotating movement is converted into a tilting pivoting movement. The presence of bearings 14 prevents the pivoting or displacement body 4 from co-rotating. This pivoting or displacement body only carries out a pivoting movement whereby it tilts to and fro.

[0023] The pivoting body 4 comprises two discs 5 and 6 which are located at a distance from one another and are fixedly

connected to one another by means of a core 10. The inner surfaces of the discs 5 and 6 are formed by substantially conical surfaces. The pivoting body effectively consists of a solid part which is provided with a V-shaped groove.

[0024] The core 10 is spherical and fits in the hollow part 26 which forms the free end of the partition wall 9, so that a seal can be provided with respect to a body/partition wall 9 which forms part of the housing.

[0025] Each of the discs 5 and 6 is provided at its periphery with an edge 27 which is embodied in such a manner that it is in sealing engagement with the inner wall 23 of the housing.

[0026] In addition, a sealing plate 11 is present which, as can be seen in Fig. 4, is fixedly retained between the housing parts 2 and 3 in the vertical direction 20. Lateral displacement, that is from the left-hand side to the right-hand side viewed in Fig. 1, is however possible.

[0027] Horizontal separation is understood to mean a separation as illustrated in the figures, that is to say that in which the partition plane of the housing parts is at right angles to (the centre plane of) the partition wall 9. More particularly, such a partition wall comprises a division, that is to say that the partition wall 9 comprises two partition wall parts being divided in accordance with the abovementioned separating plane.

[0028] A space is left in either one or both housing parts 2, 3 for sealing plate 11. As a result of the structure of the separating plane, the sealing plate may be situated close to the separation between the housing parts 2 and 3.

[0029] Reference numerals 21 and 22 denote chambers which are delimited between the respective conical faces of disc 5 and disc 6 and the partition wall 9 and more particularly the sides 24 and 25 thereof.

[0030] The figures show that the eccentric arrangement and the pivoting/tilting of the pivoting body 4, respectively, is performed in such a way that there is always line contact between disc 5 and 6, respectively, and the conical face. This line contact moves during the pivoting/tilting action, resulting in a displacement volume which results the desired pumping action. As a result of this rolling movement, the volume becomes increasingly smaller towards partition 21, as a result of which fluid is pressed out. The respective fluids are displaced by means of inlet 19 and outlet 18.

[0031] The drawing and more particularly Fig. 3 show that part of the housing (wall 23) has a spherical shape. This makes it possible to embody the pivoting body as a sphere in which a groove-shaped recess is provided.

[0032] Figs 5 shows a variant of the invention which is denoted overall by reference numeral 31 and also comprises a pump. In this exemplary embodiment, there are three housing pans 31, 32 and 33. The housing is in this case divided "vertically". The housing part 32 forms the above-described partition wall, while the housing parts 31 and 33 in each case accommodate a part 34 and 35, respectively, of the pivoting body. Coupling means, which are not shown in detail, are provided in order to connect the discs 35 and 36 to one another when the housing parts 31-33 are closed.

[0033] Reference numeral 36 denotes a double pack which in each case comprises two film/foil parts 37 and 38, in which a hose 39 is bounded between the film/foil parts. An opening 40 is present. Each pack 36 can be placed in the space between the housing parts 31, 32 and 32, 33, respectively. The dimensions of the discs 34, 35 with respect to the housing parts is such that there is sufficient space for accommodating this pack 36. After the pack 36 has been inserted and the pump is driven, the discs perform a sliding movement along "hose" 39, thus resulting in a kind of hose pump. The latter treats the pumped fluid particularly gently, which may come from container 43.

[0034] In contrast to the exemplary embodiment illustrated above, driving is not effected by means of rotation. As Fig. 6 shows, a number of drive coils 41 is provided on the exterior of the housing 33. By operating these in the correct order with a microprocessor, the desired pivoting movement of the disc 34 and thus of the disc 35 7 can be effected.

[0035] Figs. 7 and 8 show a further variant of the invention which is denoted overall by reference numeral 51 and is in principle constructed in the same manner as the structures which have been described above. However, the parts 54 and 55 of the pivoting body are of spherical design and the housing part 52 has been modified accordingly. As a result thereof, the housing can function as a bearing for the parts 54 and 55. The spherical shape makes it possible to produce a larger sealing surface, providing improved sealing and/or making the pump suitable for relatively high pressures.

[0036] In addition, in this embodiment, the eccentric drive is provided one-sidedly. A single input shaft 66 is present having a

single eccentric plate 65, as a result of which the rotating movement of said shaft is converted into a pivoting and tilting movement. Eccentric pin 71 is accommodated in pivoting body 54 and 55 so as to be slidably rotatable. The other end of the eccentric pin 71 is accommodated in eccentric 15 by means of a ball-and-socket joint. Shaft 66 is mounted in the housing 52 by means of a sliding bearing (if desired directly). Reference numeral 68 denotes a sealing ring. Arrow 70 denotes the flow of fluid in Fig. 8.

[0037] In a manner which is not illustrated in any more detail, the feed stream can be divided and the discharge stream from both outlets can be combined.

[0038] As is clear from the above, many variants of the present invention are possible. In addition to a pump or generator, the device can be constructed in many different ways. Those skilled in the art will immediately be able to think of further variants after reading the above description, which are all covered by the scope of the claims.

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

- [US958404A \[0002\]](#)
- [US2997000A \[0003\]](#)
- [US277648A \[0004\]](#)

PATENTKRAV

1. Maskine (1), der omfatter et hus med

- 5
- husdele (2, 3), der hviler mod hinanden ved hjælp af et adskillelsesplan (28), og et
 - forskydningslegeme (4), hvor huset og forskydningslegemet kan drejes i forhold til hinanden omkring en vippeakse (20) og ligeledes kan dreje i forhold til denne akse for at afgrænse et første kammer (21) med variabelt volumen,

10

hvor forskydningslegemet omfatter

- et første forskydningselement (5), der kan forskydes på en fluidtæt måde langs husets (2, 3) indvendige væg (23),

15

- et andet forskydningselement (6), der er fast forbundet med det første forskydningselement (5) og placeret i en afstand fra det første forskydningselement,

hvor huset omfatter en skillevæg (9), der er placeret mellem forskydningselementerne (5, 6),

20

hvor det første kammer (21) er afgrænset mellem det første forskydningselement og en første side (24) af skillevæggen og et andet kammer (22) er afgrænset mellem det andet forskydningselement (6) og en anden side (25) af skillevæggen, hvilken anden side er modsat den første side,

25

hvor skillevæggens forskydningselementer (5, 6) og sider (24, 25) samarbejder, således at forskydningselementerne kan udføre en rullende bevægelse med lineær tætning i forhold til siderne af skillevæggen,

30

hvor det første og det andet forskydningselement afgrænser en væg (23), der strækker sig over 360° med skillevæggen (9), og en tætningsplade (11), der strækker sig radialt, er placeret mellem det første og andet forskydningselement,

35

hvor hvert af kamrene (21, 22) i hvert tilfælde omfatter en indgang (19) og en udgang (18), hvilke indgange og udgange henholdsvis strækker sig direkte fra kamrene ind i huset og er direkte forbundet med hinanden,

- 5 kendetegnet ved, at adskillelsesplanet (28) er i rette vinkler i forhold til skillevæggen (9),
tætningspladen (11) holdes i et rum i enten én af eller begge husdele (2, 3) ved adskillelsesplanet,
skillevæggen (9) er i ét med en husdel (2, 3), og skillevæggen (9) omfatter skillevægsdele, hvis
adskillelse falder sammen med adskillelsesplanet (28).
2. Maskine ifølge krav 1, hvor adskillelsesplanet (28) omfatter midteraksen af maskinens roterende drev.
- 10 3. Maskine ifølge et hvilket som helst af de foregående krav, hvor det andet forskydningsselement (6), langs dets periferi, er placeret i en fast afstand fra periferien af det første forskydningsselement (5).
- 15 4. Maskine ifølge et hvilket som helst af de foregående krav, hvor forskydningsselementet på den side, der vender ind mod skillevæggen (9), tilspidses med den frie ende (26) deraf.
- 20 5. Maskine ifølge et hvilket som helst af de foregående krav, hvor der er tilvejebragt en roterende aksel (16), der strækker sig gennem huset og er udstyret med en mekanisme (15) til at omdanne en roterende bevægelse til en vippebevægelse.
6. Maskine ifølge et hvilket som helst af de foregående krav, hvor forskydningsselementet og/eller skillevæggen (9) er forsynet med en coating (39), der tætner kammeret.
- 25 7. Maskine ifølge et hvilket som helst af de foregående krav, hvor huset omfatter to husdele (2, 3) og adskillelsesplanet mellem delene bestemmes af et plan, der er i rette vinkler i forhold til vippeaksen (20).
8. Maskine ifølge et hvilket som helst af de foregående krav, hvilken maskine omfatter en motor.
- 30 9. Maskine ifølge et hvilket som helst af de foregående krav, hvilken maskine omfatter en pumpe.

DRAWINGS

Fig 1

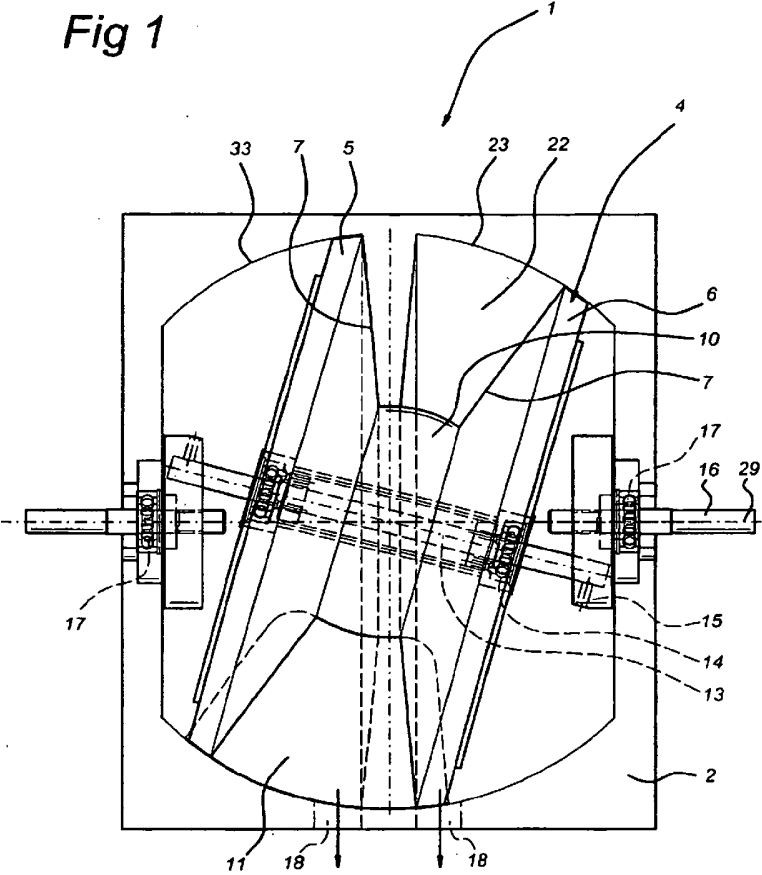


Fig 2

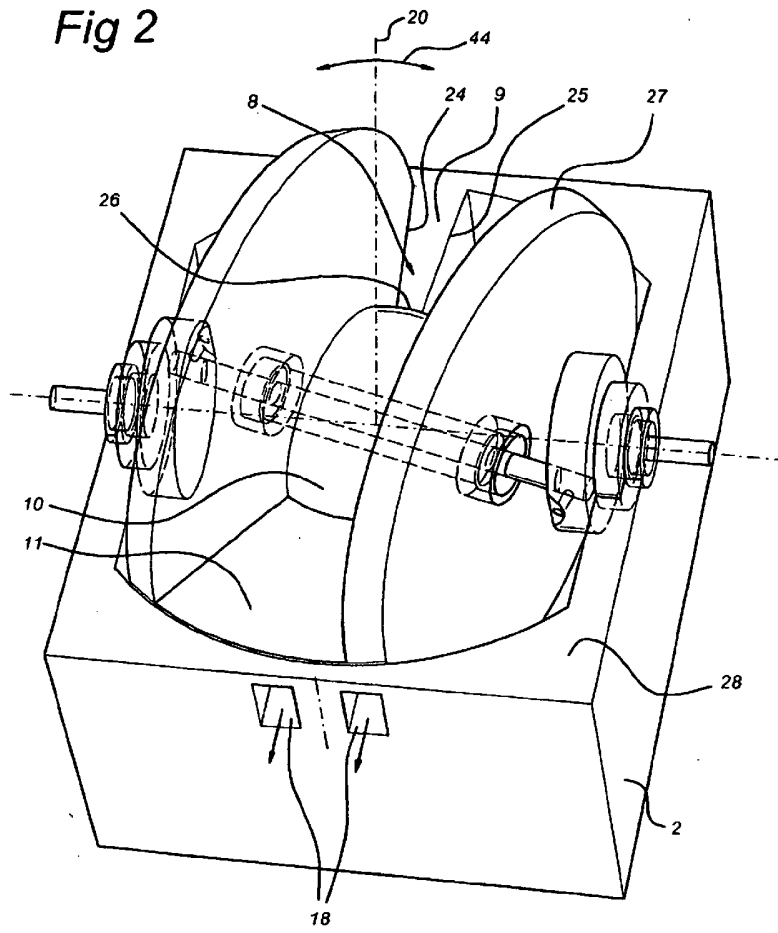


Fig 3

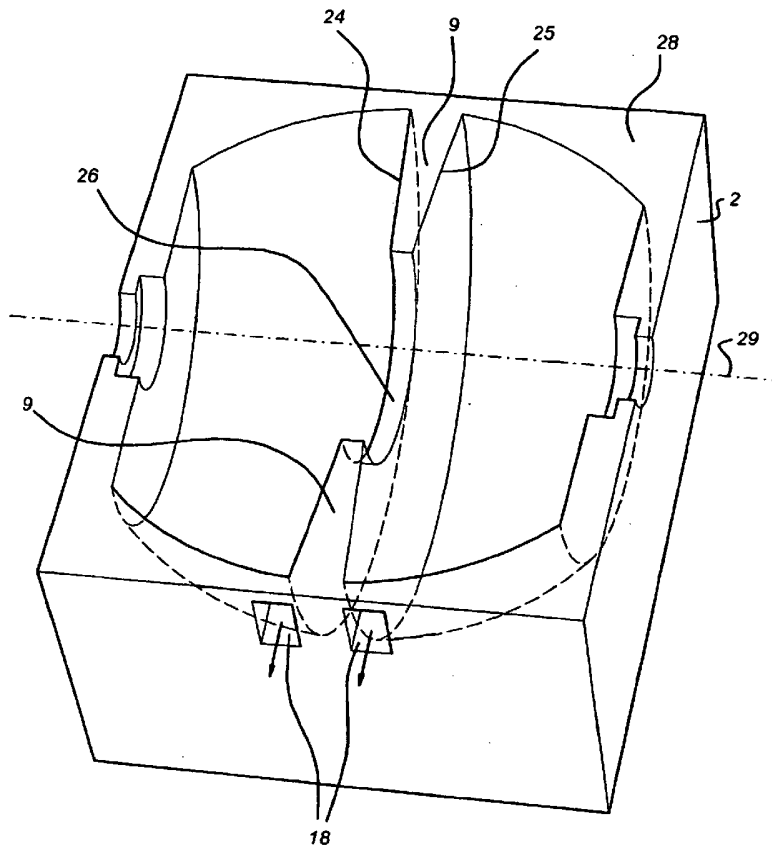
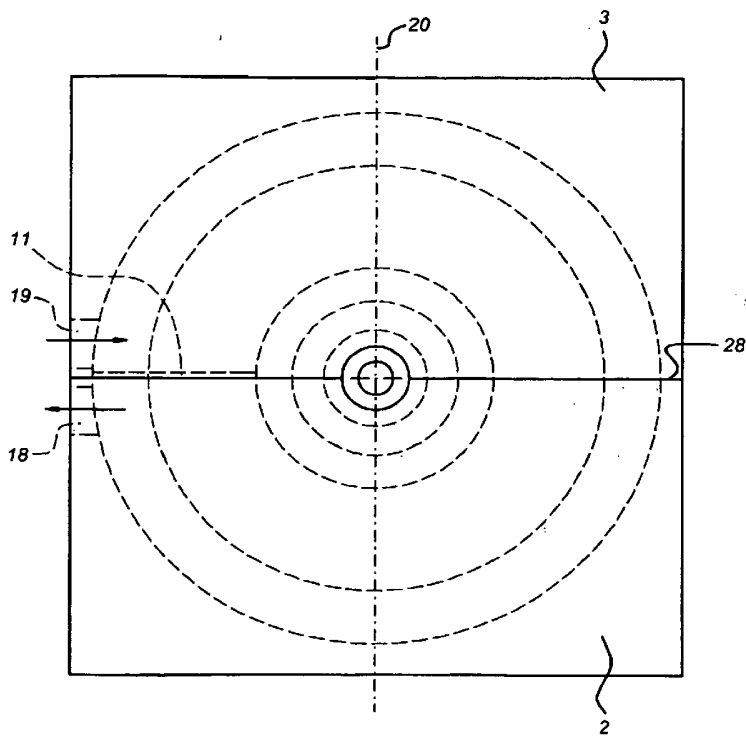


Fig 4



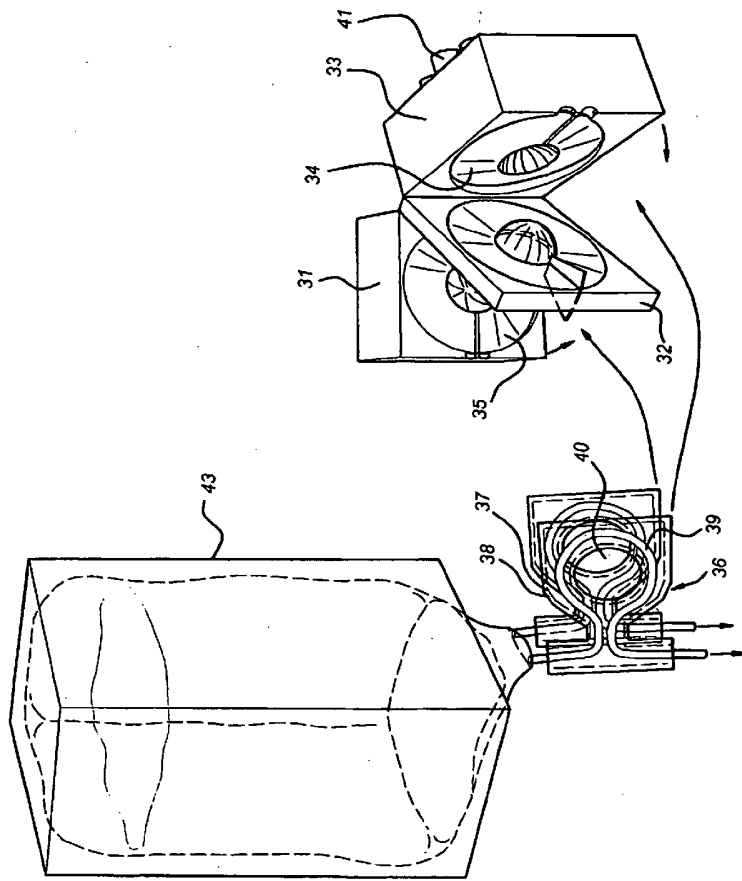


Fig 5

Fig 6

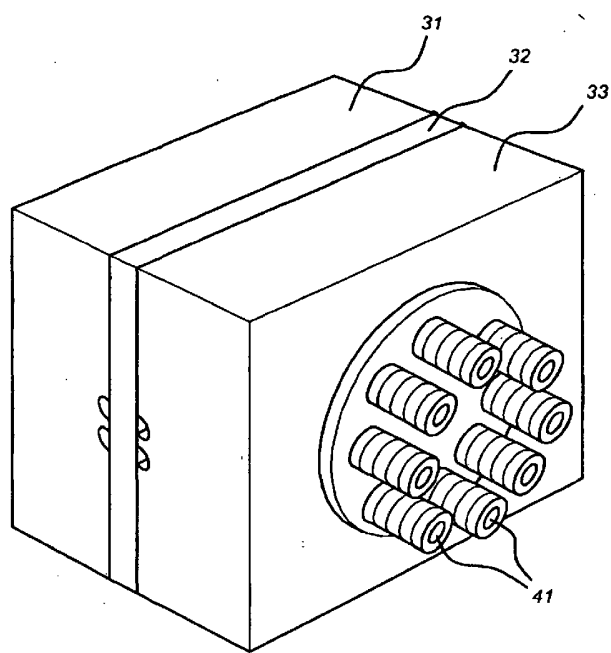


Fig 7

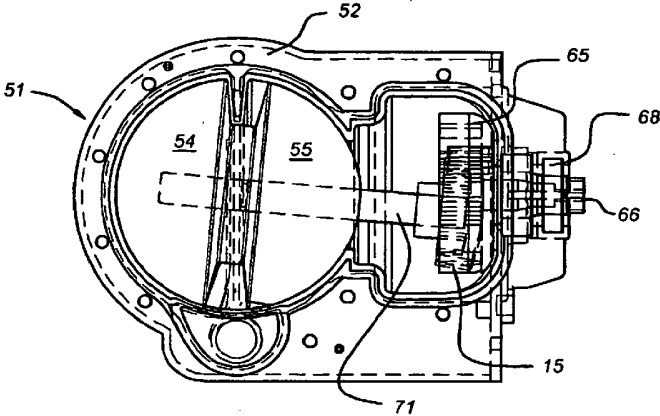


Fig 8

