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

(11) EP 0 933 500 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
27.08.2003 Bulletin 2003/35

(51) Int Cl.[7]: **F01C 3/02**

(21) Application number: **99300703.8**

(22) Date of filing: **29.01.1999**

(54) **Rotary piston machine**

Rotationsverdrängermaschine

Machine volumétrique à piston rotatif

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI NL PT SE

(30) Priority: **30.01.1998 GB 9801859**

(43) Date of publication of application:
04.08.1999 Bulletin 1999/31

(73) Proprietor: **Lindsey, Stephen Francis**
Sunbury-on-Thames, Middlesex TW16 6PD (GB)

(72) Inventor: **Lindsey, Stephen Francis**
Sunbury-on-Thames, Middlesex TW16 6PD (GB)

(74) Representative: **Lomas, Geoffrey Michael et al**
Barker Brettell
Medina Chambers
Town Quay
Southampton, Hampshire SO14 2AQ (GB)

(56) References cited:
DE-A- 19 509 913
DE-C- 4 200 146
FR-A- 334 055
FR-A- 2 660 364
GB-A- 1 068 067
GB-A- 2 104 154
US-A- 5 293 849

EP 0 933 500 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] This invention relates to rotary piston and cylinder devices which may be, for example, in the form of an internal combustion engine, or a pump such as a supercharger or fluid pump, or as an expander such as a hydraulic motor or turbine replacement.

[0002] The term 'piston' is used herein in its widest sense to include, where the context admits, a partition capable of moving relative to a cylinder wall, and such partition need not generally be of substantial thickness in the direction of relative movement but can often be in the form of a blade.

[0003] FR 2660364 discloses a rotary piston and cylinder device in which radially inwardly extending pistons are caused to move through an annular cylinder space. A shutter disc is provided which serves to partition the annular cylinder space twice. Such an arrangement is in practice difficult to realise so as to avoid the rotating disc impeding the passage of the pistons.

[0004] According to one aspect of the invention there is provided a rotary piston and cylinder device comprising a rotor and a stator, the stator at least partially defining an annular cylinder space, the rotor is in the form of a ring, and the rotor comprising at least one piston which extends generally radially inwardly from the rotor ring into the annular cylinder space, the stator being positioned internally of the ring, in use the at least one piston is moved circumferentially through the annular cylinder space on rotation of the rotor relative to the stator, the rotor body being sealed relative to the stator, and the device further comprising cylinder space shutter means which is capable of being moved relative to the stator to a closed position in which the shutter means partitions the annular cylinder space, and to an open position in which the shutter means permits passage of the at least one piston, the cylinder space shutter means comprising a shutter disc, the device being characterised in that the shutter disc passes through the cylinder space only once.

[0005] The stator may have portions which extend generally radially outwardly beyond the ring if desired.

[0006] Preferably the shutter disc presents a partition which extends substantially radially of the annular cylinder space.

[0007] Although in theory the shutter means could be reciprocable, it is much preferred to avoid the use of reciprocating components, particularly when high speeds are required, and the shutter means is preferably at least one rotary shutter disc provided with at least one aperture which in the open condition of the shutter means is arranged to be positioned substantially in register with the circumferentially-extending bore of the annular cylinder space to permit passage of the at least one piston through the shutter disc.

[0008] Preferably the at least one aperture is provided radially in the shutter disc.

[0009] Preferably the rotor is adapted to receive the shutter disc.

[0010] The shutter disc is preferably driven from the rotor through a suitable transmission means.

[0011] Preferably the axis of rotation of the rotor is not parallel to the axis of rotation of the shutter disc. Most preferably the axis of rotation of the rotor is substantially orthogonal to the axis of rotation of the shutter disc.

[0012] Preferably the piston is so shaped that it will pass through an aperture in the moving shutter means, without balking, as the aperture passes through the annular cylinder space.

[0013] The rotor body is preferably rotatably supported by the stator rather than relying on co-operation between the pistons and the cylinder walls to relatively position the rotor body and stator.

[0014] It will be appreciated that this is distinct from a conventional reciprocating piston device in which the piston is maintained coaxial with the cylinder by suitable piston rings which give rise to relatively high friction forces.

[0015] The rotor ring is preferably rotatably supported by suitable bearing means carried by the stator.

[0016] The annular cylinder space maybe divided into a plurality of annular cylinder spaces. Preferably there is at least one piston in each cylinder space.

[0017] Preferably the communication means is provided between the cylinder spaces which comprises at least one transfer passage.

[0018] The transfer passage or passages may be provided internally or externally of the stator, or internally or externally of the rotor.

[0019] At least one of the transfer passages may be valved by the shutter means.

[0020] In one embodiment the annular cylinder space is divided into two annular cylinder spaces by the inclusion of a circumferentially-extending central wall in the stator. A respective piston is provided in each cylinder space.

[0021] One annular cylinder space defines an induction/compression space, and the other cylinder space defines a combustion/exhaust space. The central wall has formed therein a transfer passage which provides a communication means between one annular cylinder space on one side of the shutter disc and the other annular cylinder space on the other side of the shutter disc. The transfer passage is shaped so that as the aperture of the shutter disc passes through the transfer passage, the aperture acts as a valve therein.

[0022] There are many advantages to such an engine design. The lack of a complex valve train and the fact that it has only two moving parts should reduce frictional losses. Since the induction/compression and combustion/exhaust stages are physically separated it is possible that the former could be cooled to a greater extent, and energy would be returned to the gas from the walls of the combustion side once the compressed gas had been transferred between the cylinder spaces.

[0023] Primarily this would increase the efficiency of

the cycle, but it would also assist with combustion side cooling. A relatively narrow transfer passage may act as a venturi, allowing direct injection of fuel into the compressed gas (from an injector on the combustion side of the transfer passage) at a lower pressure than would otherwise be necessary. Direct injection may allow a higher compression ratio to be used (and hence increase the engine efficiency). The energy expended in fuel pressurisation may be reduced by having a split injection system in which part of the fuel is injected into the inlet port (in which the gas that is injected into is around atmospheric pressure) and the rest of the fuel needed to form a combustible mixture is injected into the compressed gas in the transfer passage. This may improve fuel mixing and would still allow a high compression ratio to be used without the risk of pre-ignition that would occur if all of the fuel was added to the inlet port.

[0024] The circular geometry of the engine may cause fuel to be centrifuged outwards. In the combustion side, this could possibly be controlled with an injector design, or an aerodynamic device by the injector to control amount of mixing. This would allow variable charge stratification (and hence allow power output to be varied without throttling).

[0025] There are of course many modifications which could be introduced without deviating from the scope of the invention. For example, we may also provide one or more transfer passages extending externally of the stator. Such a transfer passage could be valved alternatively by, or in combination with, a suitable opening in the shutter disc. Yet a further possibility is that of providing a transfer passage in the rotor which would periodically come in to register with two static ports, the static ports providing communication between the different cylinder spaces.

[0026] Another possible modification would be the introduction of a second port on the induction/compression side to allow part of the induced air to be rejected. Control of the amount of air rejected would allow throttling of the device without the pumping losses associated with conventional throttles. Using this form of throttling, the compression ratio is effectively reduced, but the expansion ratio remains the same.

[0027] Preferably the stator comprises at least one inlet port and at least one outlet port.

[0028] Preferably at least one of the ports is substantially adjacent to the shutter means.

[0029] Preferably at least one of said ports is continuously open. Alternatively at least one of said ports may be valved.

[0030] Said ports maybe valved by the shutter means. Alternatively the ports may be valved by pressure-controlled valving means or other valving means.

[0031] Preferably each piston comprises sealing means.

[0032] Preferably the sealing means comprises at least one sealing strip.

[0033] Preferably each such sealing strip is attached to the piston by means of at least one resilient member.

[0034] The sealing means may, alternatively, comprise a spring seal.

[0035] Preferably the sealing strip and the piston device define a recess.

[0036] Preferably the piston and the sealing strip comprise angled front portions which encourage the accumulation of pressure in that region of the annular cylinder space which is adjacent to said front angled portions.

[0037] Preferably the ratio of the angular velocity of the rotor to the angular velocity of the shutter disc is 1:1.

[0038] In one preferred configuration the rotary piston and cylinder device is an internal combustion engine.

[0039] In another preferred configuration the rotary piston and cylinder device is a fluid pump.

[0040] In a further preferred configuration the rotary piston and cylinder device is a hydraulic motor/actuator.

[0041] The rotary piston and cylinder device may be a turbine replacement.

[0042] The rotary piston and cylinder device may be a compressor or expander.

[0043] The invention will now be further described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of an embodiment of a rotary piston and cylinder device in accordance with the invention in which the stator has been omitted for clarity,

Figure 2 is a front elevation of the embodiment illustrated in Figure 1 in which the stator is shown,

Figure 3 is a cross-sectional view of the embodiment illustrated in Figure 1 in which the piston has been omitted for clarity,

Figure 4 is a front elevation of the outer ring and piston for the embodiment illustrated in Figures 1 to 3, and

Figure 5 is a perspective view of another embodiment of a rotary piston and cylinder device in accordance with the invention in which the piston and stator have been omitted for clarity.

[0044] A rotary piston and cylinder device is shown in Figures 1 to 4. The device 31 illustrated comprises an outer ring 56, a shutter disc 58 and stator 60.

[0045] The stator 60 comprises a roof 62 and walls 64a and 64b. Said roof and said walls extend circumferentially around an axis of rotation Y-Y. The walls 64a and 64b comprise two ports 80 and 81, respectively, which are located adjacent to the shutter disc 58. The inlet port and the outlet port may equally be provided in the roof 62.

[0046] The outer ring 56 is rotatably mounted to said stator 60 by suitable bearing means. The outer ring 56 is provided with an inner surface 68 which is substantially arcuate in outline so as to accommodate the shutter disc 58. The inner surface 68 and stator 60 define an annular cylinder space 70. Said annular cylinder space is sealed by means of sealing rings (not shown). Said outer ring further comprises a piston 72 which extends generally inwardly of the outer ring 56.

[0047] The piston 72 is provided with inner surface portion 72a and is shaped so as to allow for the movement of said inner surface portion on the roof 62.

[0048] The shutter disc 58 is provided with an aperture 76 and the shutter disc is mounted within the outer ring 56 so that the shutter disc passes once through the annular cylinder space 70 as illustrated. The shutter disc has an axis of rotation X-X.

[0049] Suitable transmission means are provided (not illustrated) between the outer ring 56 and the shutter disc 58 so that they both rotate at the same angular velocity.

[0050] The piston is so shaped that when both the ring and the shutter disc rotate at (substantially) the same angular speed the piston is able to pass through the aperture without prohibiting interference. The effective size of the aperture is dependent on the thickness of the piston. However, the ratio of the angular velocities of the rotor to that of the shutter disc may be 1:2 if two diametrically opposed pistons were provided.

[0051] The embodiment described may be used as a pump with an inlet port 80 and an outlet port 81. In this case, the outer ring 56 would be driven by suitable driving means (not shown). During operation the outer ring 56 and the shutter disc 58 would rotate and the stator 60 would remain stationary.

[0052] As an alternative embodiment (not shown), the inlet and outlet ports may be provided in outer ring 56 and may be valved by openings provided in a static outer housing.

[0053] As a further alternative one or more of the inlet or outlet ports may be valved by a modification to the shutter disc 58. However other suitable valving means may be used.

[0054] As yet a further alternative the inlet and outlet ports may be provided in the outer ring 56 so that more conventionally the outer ring 56 remains stationary and the rotating shutter disc 58 and the stator 60 rotate inside the outer ring 56.

[0055] One advantage of the inventive rotary piston and cylinder is that of compactness.

[0056] The lack of reciprocating motions means that acceleration forces impose less of an rpm limit on the device.

[0057] The fact that there are only two moving parts may reduce frictional losses (increasing efficiency) and wear (increasing working life).

[0058] The rotary piston and cylinder device 31 could be adapted to be used as an hydraulic motor. Alternatively, if appropriate communication means were provided between different parts of the annular cylinder space 70, the device could be used as a combustion engine.

[0059] A further embodiment in accordance with the invention is shown in Figure 5. In this case the angle between the axis Y-Y of rotation of the rotor ring and the axis B-B of rotation of the shutter disc is 45°. One advantage of this is that the piston attached to the outer ring is less angled with respect of the axis of rotation of the outer ring which reduces the side thrust on the outer ring. Another advantage of the embodiment shown in Figure 5 is that the external dimensions are further reduced compared to the rotary piston and cylinder device 31.

[0060] The device could be used as a pump or hydraulic motor/actuator or as a compressor or expander with the addition of valving means.

[0061] As a further alternative, a number of the devices set forth could be combined, or the cylinder space divided to form multi-stage machines. These could take the form of a combustion engine, if appropriate valving and communication means were provided, or other machines such as multi-stage compressors.

Claims

1. A rotary piston and cylinder device (31) comprising a rotor and a stator (60), the stator (60) at least partially defining an annular cylinder space (70), the rotor is in the form of a ring (56), and the rotor comprising at least one piston which extends generally radially inwardly from the rotor ring (56) into the annular cylinder space (70). the stator (60) being positioned internally of the ring (56), in use the at least one piston (72) is moved circumferentially through the annular cylinder space (9) on rotation of the rotor relative to the stator (60), the rotor body being sealed relative to the stator, and the device further comprising cylinder space shutter means (58) which is capable of being moved relative to the stator to a closed position in which the shutter means partitions the annular cylinder space, and to an open position in which the shutter means permits passage of the at least one piston, the cylinder space shutter means comprising a shutter disc and the device being **characterised in that** the shutter disc passes through the cylinder space only once.

2. A rotary piston and cylinder device (31) according to claim 1 in which the shutter disc (58) presents a partition which extends substantially radially of the annular cylinder space (70).

3. A rotary piston and cylinder device (31) according to any preceding claim in which the shutter disc (58) is a rotary shutter disc provided with at least one aperture (76) which in the open condition of the

shutter means is arranged to be positioned substantially in register with the circumferentially extending bore of the annular cylinder space (70) to permit passage of the piston (72) through the shutter disc.

4. A rotary piston and cylinder device (31) according to claim 3 in which the at least one aperture (76) is provided radially in the shutter disc (58).

5. A rotary piston and cylinder device (31) according to claim 4 in which the axis of rotation of the rotor is not parallel to the axis of rotation of the shutter disc (58).

6. A rotary piston and cylinder device (31) according to claim 5 in which the axis of rotation of the rotor is substantially orthogonal to the axis of rotation of the shutter disc (58).

7. A rotary piston and cylinder device (31) according to any preceding claim in which the annular cylinder space (70) is divided into a plurality of annular cylinder spaces.

8. A rotary piston and cylinder device (31) according to claim 7 in which there is at least one piston in each cylinder space.

9. A rotary piston and cylinder device (31) according to either claim 7 or claim 8 in which communication means is provided between the annular cylinder spaces.

10. A rotary piston and cylinder device (31) according to claim 9 in which the communication means comprises at least one transfer passage.

11. A rotary piston and cylinder device (31) according to claim 10 in which the at least one transfer passage is provided internally of the stator (60).

12. A rotary piston and cylinder device (31) according to claim 10 in which the at least one transfer passage is provided externally of the stator (60).

13. A rotary piston and cylinder device (31) according to any one of claims 10 to 12 in which the at least one transfer passage is valved by the shutter means (58).

14. A rotary piston and cylinder device (31) as claimed in any preceding claim, which comprises an inlet port (80) and an outlet port (81) which are provided in the rotor ring (56).

15. A rotary piston and cylinder device (31) as claimed in claim 14, in which at least one of the inlet port (80) and the outlet port (81) are valved by openings in the stator.

16. A rotary piston and cylinder device (31) as claimed in any of claims 1 to 13, in which the device comprises a valved port.

Patentansprüche

1. Vorrichtung mit Kreiskolben und Zylinder (31), welche einen Rotor und einen Stator (60) aufweist, wobei der Stator (60) zumindest teilweise einen ringförmigen Zylinderraum (70) definiert, der Rotor in Form eines Ringes (56) ausgebildet ist und der Rotor mindestens einen Kolben aufweiset, der sich vom Rotorring (56) im Wesentlichen radial nach innen in den ringförmigen Zylinderraum (70) erstreckt, wobei der Stator (60) im Inneren des Rings (56) positioniert ist, im Einsatz der mindestens eine Kolben (72) nach Drehung des Rotors gegenüber dem Stator (60) in Umfangsrichtung durch den ringförmigen Zylinderraum (9) bewegt wird, der Korpus des Rotors relativ zum Stator abgedichtet ist, und die Vorrichtung des Weiteren eine Verschlusseinrichtung (58) zum Verschließen des Zylinderraumes aufweist, die relativ zum Stator in eine Schließstellung bewegbar ist, in welcher die Verschlusseinrichtung den ringförmigen Zylinderraum unterteilt, sowie in eine Öffnungsstellung, in welcher die Verschlusseinrichtung den Durchtritt des mindestens einen Kolbens ermöglicht, wobei die Verschlusseinrichtung zum Verschließen des Zylinderraums eine Verschlussscheibe aufweist, **dadurch gekennzeichnet, dass** die Verschlussscheibe nur einmal durch den Zylinderraum hindurch tritt.

2. Vorrichtung mit Kreiskolben und Zylinder (31) nach Anspruch 1, bei welcher die Verschlussscheibe (58) eine Trennwand aufweist, die sich im Wesentlichen in radialer Richtung, bezogen auf den ringförmigen Zylinderraum (70), erstreckt.

3. Vorrichtung mit Kreiskolben und Zylinder (31) nach einem der vorhergehenden Ansprüche, bei welcher die Verschlussscheibe eine drehbare Verschlussscheibe ist, die mit mindestens einer Öffnung (76) versehen ist, die im Öffnungszustand der Verschlusseinrichtung so angeordnet ist, dass sie im Wesentlichen deckungsgleich mit der in Umfangsrichtung verlaufenden Bohrung des ringförmigen Zylinderraums (70) so positioniert ist, dass sie den Durchtritt des Kolbens (72) durch die Verschlussscheibe gestattet.

4. Vorrichtung mit Kreiskolben und Zylinder (31) nach Anspruch 3, bei welcher die mindestens eine Öff-

nung (76) radial in der Verschlussscheibe (58) vorgesehen ist.

5. Vorrichtung mit Kreiskolben und Zylinder (31) nach Anspruch 4, bei welcher die Drehachse des Rotors nicht parallel zur Drehachse der Verschlussscheibe (58) verläuft.

6. Vorrichtung mit Kreiskolben und Zylinder (31) nach Anspruch 5, bei welcher die Drehachse des Rotors im Wesentlichen senkrecht zur Drehachse der Verschlussscheibe (58) verläuft.

7. Vorrichtung mit Kreiskolben und Zylinder (31) nach einem der vorhergehenden Ansprüche, bei welcher der ringförmige Zylinderraum (70) in eine Vielzahl von ringförmigen Zylinderräumen unterteilt ist.

8. Vorrichtung mit Kreiskolben und Zylinder (31) nach Anspruch 7, bei welcher mindestens ein Kolben in jedem Zylinderraum vorgesehen ist.

9. Vorrichtung mit Kreiskolben und Zylinder (31) nach Anspruch 7 oder Anspruch 8, bei welcher zwischen den ringförmigen Zylinderräumen Einrichtungen zur Strömungsverbindung vorgesehen sind.

10. Vorrichtung mit Kreiskolben und Zylinder (31) nach Anspruch 9, bei welcher die Einrichtungen zur Strömungsverbindung mindestens einen Durchlass zur Weiterleitung aufweisen.

11. Vorrichtung mit Kreiskolben und Zylinder (31) nach Anspruch 10, bei welcher der mindestens eine Durchlass zur Weiterleitung im Inneren des Stators (60) vorgesehen ist.

12. Vorrichtung mit Kreiskolben und Zylinder (31) nach Anspruch 10, bei welcher der mindestens eine Durchlass zur Weiterleitung außerhalb des Stators (60) vorgesehen ist.

13. Vorrichtung mit Kreiskolben und Zylinder (31) nach einem der Ansprüche 10 bis 12, bei welcher in dem mindestens einen Durchlass zur Weiterleitung die Verschlusseinrichtung (58) als Ventil fungiert.

14. Vorrichtung mit Kreiskolben und Zylinder (31) nach einem der vorhergehenden Ansprüche, welche eine Einlassöffnung (80) und eine Auslassöffnung (81) aufweist, die in dem Rotorring (56) ausgebildet sind.

15. Vorrichtung mit Kreiskolben und Zylinder (31) nach Anspruch 14, bei welcher zumindest für die Einlassbffnung (80) oder die Auslassöffnung (81) Öffnungen im Stator als Ventile füngieren.

16. Vorrichtung mit Kreiskolben und Zylinder (31) nach einem der Ansprüche 1 bis 13, bei welcher die Vorrichtung eine Öffnung mit Ventil aufweist.

Revendications

1. Dispositif à piston rotatif et cylindre (31) comprenant un rotor et un stator (60), le stator (60) définissant au moins partiellement un espace cylindrique annulaire (70), le rotor revêtant la forme d'un anneau (56), et le rotor comprenant au moins un piston qui s'étend généralement radialement vers l'intérieur depuis l'anneau de rotor (56) dans l'espace cylindrique annulaire (70), le stator (60) étant placé intérieurement par rapport à l'anneau (56), ledit au moins un piston (72) étant déplacé, en utilisation, de façon périphérique à travers l'espace cylindrique annulaire (9) lors de la rotation du rotor par rapport au stator (60), le corps du rotor étant monté de façon étanche par rapport au stator, et le dispositif comprenant en outre des moyens formant obturateur d'espace cylindrique (58) qui sont capables d'être déplacés par rapport au stator vers une position fermée dans laquelle les moyens formant obturateur définissent une partition de l'espace cylindrique annulaire, et vers une position ouverte dans laquelle les moyens formant obturateur permettent le passage dudit au moins un piston, les moyens formant obturateur d'espace cylindrique comprenant un disque d'obturateur, et le dispositif étant **caractérisé en ce que** le disque d'obturateur passe à travers l'espace cylindrique uniquement une fois.

2. Dispositif à piston rotatif et cylindre (31) selon la revendication 1, dans lequel le disque d'obturateur (58) présente une partition qui s'étend sensiblement de manière radiale par rapport à l'espace cylindrique annulaire (70).

3. Dispositif à piston rotatif et cylindre (31) selon l'une quelconque des revendications précédentes, dans lequel le disque d'obturateur (58) est un disque d'obturateur rotatif pourvu d'au moins une ouverture (76) qui, dans l'état ouvert des moyens formant obturateur, est agencée pour être positionnée sensiblement de façon calée avec l'alésage s'étendant de manière périphérique par rapport à l'espace cylindrique annulaire (70) pour permettre le passage du piston (72) à travers le disque d'obturateur.

4. Dispositif à piston rotatif et cylindre (31) selon la revendication 3, dans lequel ladite au moins une ouverture (76) est prévue de manière radiale dans le disque d'obturateur (58).

5. Dispositif à piston rotatif et cylindre (31) selon la revendication 4, dans lequel l'axe de rotation du rotor

n'est pas parallèle à l'axe de rotation du disque d'obturateur (58).

6. Dispositif à piston rotatif et cylindre (31) selon la revendication 5, dans lequel l'axe de rotation du rotor est sensiblement orthogonal par rapport à l'axe de rotation du disque d'obturateur (58).

7. Dispositif à piston rotatif et cylindre (31) selon l'une quelconque des revendications précédentes, dans lequel l'espace cylindrique annulaire (70) est divisé en une pluralité d'espaces cylindriques annulaires.

8. Dispositif à piston rotatif et cylindre (31) selon la revendication 7, dans lequel il existe au moins un piston dans chaque espace cylindrique.

9. Dispositif à piston rotatif et cylindre (31) selon la revendication 7 ou 8, dans lequel des moyens de communication sont prévus entre les espaces cylindriques annulaires.

10. Dispositif à piston rotatif et cylindre (31) selon la revendication 9, dans lequel les moyens de communication comprennent au moins un passage de transfert.

11. Dispositif à piston rotatif et cylindre (31) selon la revendication 10, dans lequel ledit au moins un passage de transfert est prévu à l'intérieur du stator (60).

12. Dispositif à piston rotatif et cylindre (31), selon la revendication 10, dans lequel ledit au moins un passage de transfert est prévu à l'extérieur du stator (60).

13. Dispositif à piston rotatif et cylindre (31) selon l'une quelconque des revendications 10 à 12, dans lequel ledit au moins un passage de transfert est pourvu d'un échappement constitué par les moyens formant obturateur (58).

14. Dispositif à piston rotatif et cylindre (31) selon l'une quelconque des revendications précédentes, qui comprend un orifice d'entrée (80) et un orifice de sortie (81) qui sont prévus dans l'anneau du rotor.

15. Dispositif à piston rotatif et cylindre (31) selon la revendication 14, dans lequel au moins un de l'orifice d'entrée (80) et de l'orifice de sortie (81) est pourvu d'un échappement constitué par les ouvertures dans le stator.

16. Dispositif à piston rotatif et cylindre (31) selon l'une quelconque des revendications 1 à 13, dans lequel le dispositif comprend un orifice à valve.

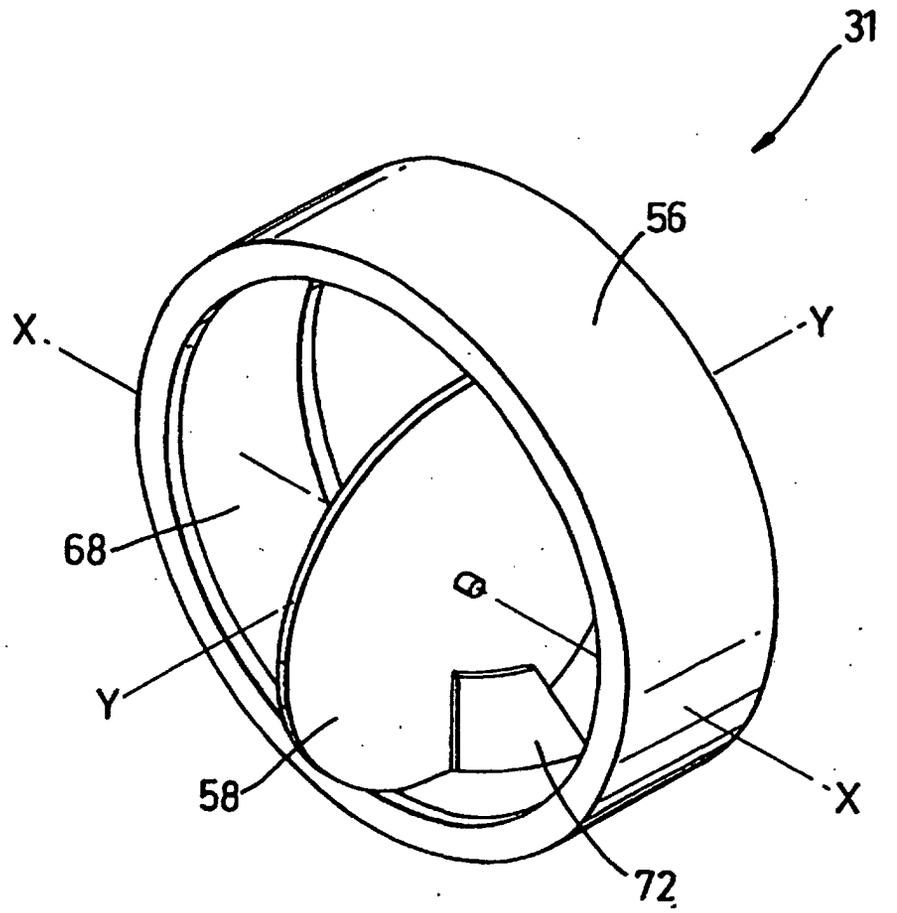

Fig. 1

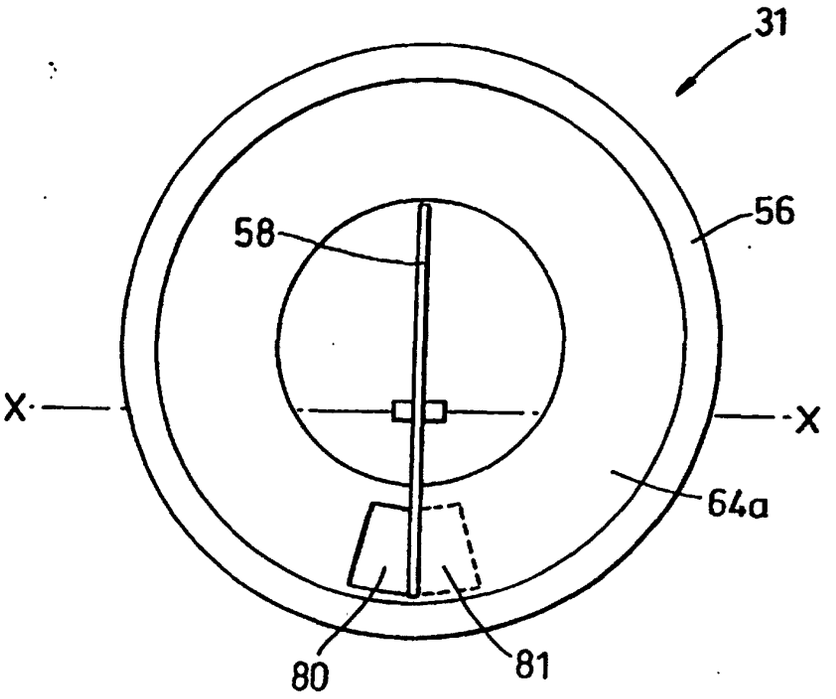

Fig. 2

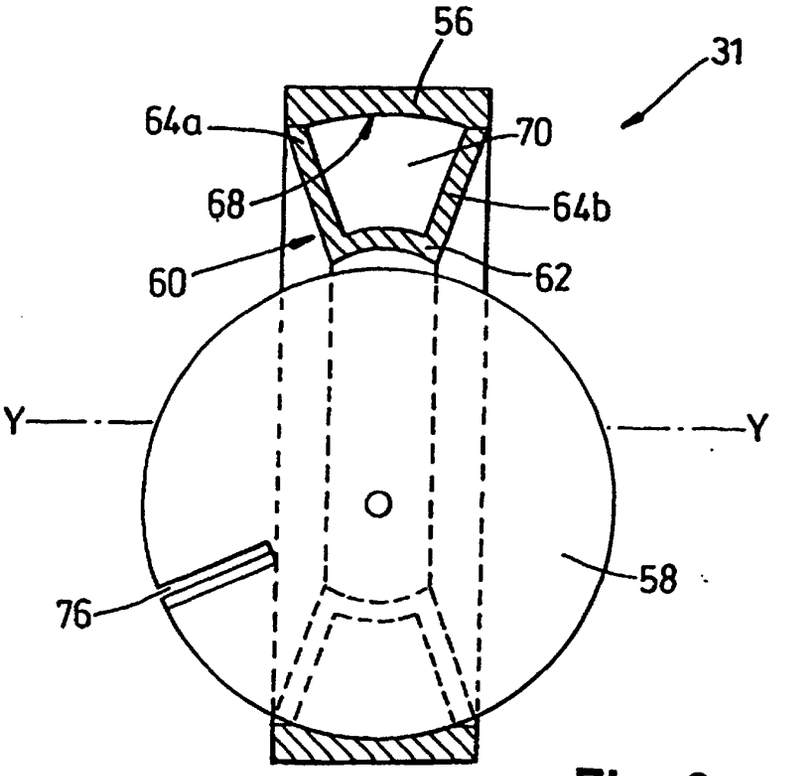

Fig. 3

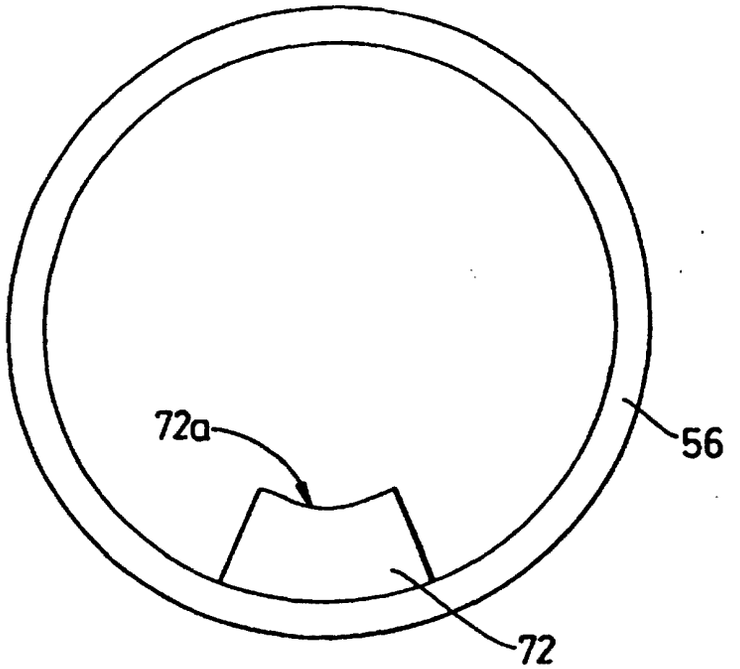

Fig. 4

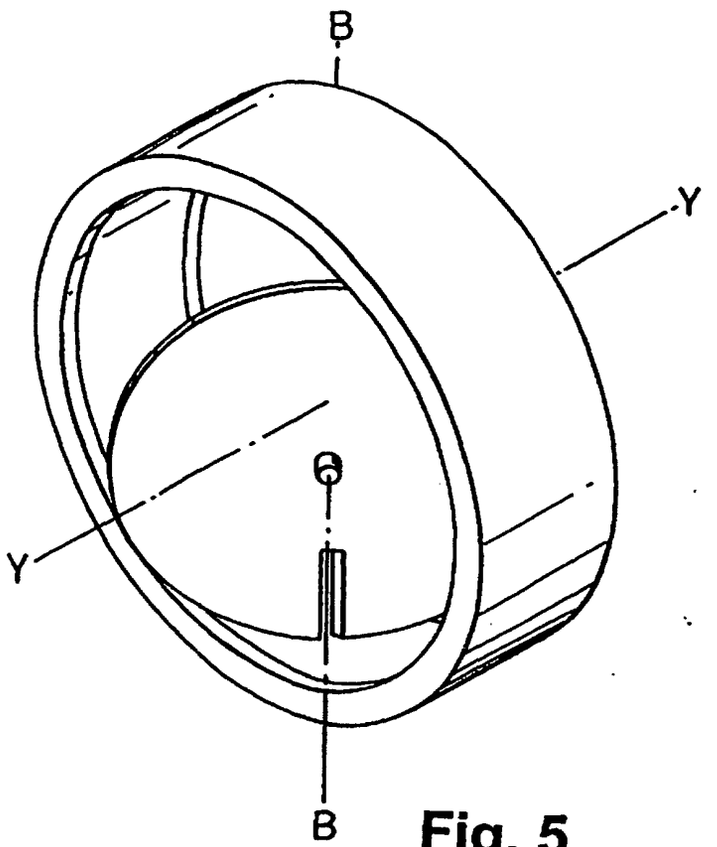

Fig. 5