FORM 1
REGULATION 9

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952–1973

APPLICATION FOR A PATENT

618021

We TOYODA KOKI KABUSHIKI KAISHA

of 1–1, Asahi–machi, Kariya–shi, Aichi–ken, JAPAN

hereby apply for the grant of a Patent for an invention entitled:

PRESSURE GENERATION AND RESPONSIVE MECHANISM

which is described in the accompanying complete specification. This Application is a Convention Application and is based on the Application(s) numbered: 62–243248 for a Patent or similar protection made in Japan on 28 September 1987.

Our address for service is:

GRIFFITH HACK & CO.
71 YORK STREET
SYDNEY N.S.W. 2000
AUSTRALIA

DATED this 27th day of September, 1988.

TOYODA KOKI KABUSHIKI KAISHA
By their Patent Attorneys

GRIFFITH HACK & CO.

TO: THE COMMISSIONER OF PATENTS
COMMONWEALTH OF AUSTRALIA

0394–A:rk

ASSIGNEE - APPLICANT

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

DECLARATION IN SUPPORT OF AN APPLICATION FOR A PATENT

In support of an Application made by: TOYODA KOKI KABUSHIKI KAISHA

for a patent for an invention entitled: PRESSURE GENERATION AND RESPONSIVE MECHANISM

I, Hiroaki Asano

of, 2-11-6, Umezono-cho Okazaki-shi, Aichi-ken, Japan

do solemnly and sincerely declare as follows:

1. I am authorised by the above mentioned applicant for the patent to make this Declaration on its behalf.

2. The name and address of each actual inventor of the invention is as follows:

Hiroaki Asano and Masaji Yamamoto

of 2-11-6, Umezono-cho, Okazaki-shi, Aichi-ken, JAPAN
and 1-25, Anada, Miai-cho, Okazaki-shi, Aichi-ken, JAPAN, respectively

and the fact(s) upon which the applicant is entitled to make this application are as follows:

Assignment dated September 15, 1987 assigning the invention from the inventors to the applicant.

3. The basic application as defined by Section 141 of the Act was made as follows:

Country Japan on 28 September 1987
in the name(s) Toyoda Koki Kabushiki Kaisha

4. The basic application(s) referred to in the preceding paragraph of this Declaration was (were) the first application(s) made in a Convention country in respect of the invention the subject of this application.

Declared at Kariya, Japan this 11th day of October 1988.

Signed: Hiroaki Asano

Position: Managing Director

GRIFFITH HACK & CO., SYDNEY, AUSTRALIA

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(56) Prior Art Documents
AU 37923/89 F16D 25/063
AU 605568 13786/88 F16D 47/06 13/54 35/00
US 4662499

(57) Claim

1. A combination of a pressure generation mechanism and a response member for generating a pressure in response to relative movement between first and second members so as to directly move said response member by the generated pressure comprising:

a closed space formed in one of said first and second member, said space extending in the direction of relative movement between said first and second members and having a predetermined width in a direction perpendicular to the direction of the relative movement;

blade means connected to the other of said first and second members and received within said closed space for movement therein, said blade means having a thickness substantially equal to the width of said closed space;

a high viscous fluid filled in said space and compulsorily displaceable by said blade means within said closed space for generating a pressure; and

an actuation member received within one of said first and second members as said response member to be moved when said high viscous fluid is compulsorily displaced within said closed space, an end surface of said actuation member being exposed in said closed space so

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that the generated pressure is directly applied to said actuating member.

4. A combination of a pressure generation mechanism and a piston member for generating a pressure in response to relative rotation between two shafts so as to directly move said piston member by the generated pressure comprising:

a first rotary shaft rotatable about an axis;

a second rotary shaft provided in axial alignment with said first rotary shaft and rotatable about said axis;

a cylinder housing secured to one end of said first rotary shaft in coaxial relation with said second rotary shaft and having a first end surface transverse to said axis;

a piston member received in said cylinder housing to be axially movable but non-rotatable relative to said cylinder housing and having a second end surface transverse to said axis, said second end surface facing said first end surface;

a rotor drivingly rotatable by said second rotary shaft and interposed between said first and second end surfaces, said rotor having at least two blades for defining at least two closed space sections partitioned in a circumferential direction, between said first and second end surfaces; and

a high viscous fluid filled within said at least two closed space sections for generating a pressure when compulsorily displaced by said at least two blades against its viscosity, said pressure serving to axially move said piston member.

10. A combination of a pressure generation mechanism and a piston member for generating a pressure in response to relative movement between a cylinder housing rotatable about an axis and a rotary shaft received by said cylinder housing for relative rotation about said axis so as to directly move said piston member by the generated

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pressure, wherein:

said cylinder has a first end surface transverse to said axis;

said piston member is received, as said response member, in said cylinder housing to be axially movable but non-rotatable relative to said cylinder housing and having a second end surface transverse to said axis, said second end surface facing said first end surface;

a rotor is interposed between said first and second surfaces and is rotated by said rotary shaft, said rotor having at least two blades for defining at least two closed space sections partitioned in a circumferential direction, between said first and second end surfaces; and

a high viscous fluid is filled within said at least two closed space sections for generating a pressure when compulsorily displaced by said at least two blades against its viscosity, said pressure serving to axially move said piston member.

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952 Form 10

COMPLETE SPECIFICATION

FOR OFFICE USE **618021**

Short Title:

Int. Cl:

Application Number:
Lodged:

Complete Specification–Lodged:
Accepted:
Lapsed:
Published:

Priority:

Related Art:

TO BE COMPLETED BY APPLICANT

Name of Applicant:	TOYODA KOKI KABUSHIKI KAISHA
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Complete Specification for the invention entitled:

PRESSURE GENERATION AND RESPONSIVE MECHANISM

The following statement is a full description of this invention, including the best method of performing it known to me/us:–

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TITLE OF THE INVENTION:

PRESSURE GENERATION AND RESPONSIVE MECHANISM

BACKGROUND OF THE INVENTION

Filed of the Invention:

The present invention relates to a pressure generation and responsive mechanism for operating an actuator by utilizing a pressure of fluid generated based on the relative movement between two members.

Discussion of the Prior Art:

In torque transmission devices of the type having a differential pump for use in a four-wheel drive vehicle, the rotational speed difference between two rotational shafts respectively connected to front and rear wheel axles causes the differential pump to operate, and an actuation piston responsive to a pressure which the differential pump generates in correspondence to the rotational speed difference brings a multiple disc clutch into an operating state to drivingly connect the two rotational shafts with each other, whereby a driving torque can be transmitted between the front and rear wheel axles.

Thus, in the torque transmission devices of this type, the differential pump has to be interposed between the front and rear wheel axles, and moreover, oil passages have to be formed to lead the discharge oil from the differential pump to the multiple disc clutch. This makes the device complicated in configuration and enlarged in size, thereby resulting in an increased manufacturing cost.

SUMMARY OF THE INVENTION

Accordingly, it is a primary object of the preferred embodiments of the present invention to provide a pressure generation and responsive mechanism suitable for use in a torque transmission device of, preferably, a four-wheel drive vehicle.

Another object of the preferred embodiments of the present invention is to provide an improved pressure generation and responsive mechanism which, in generating a pressure, does not utilize any variation in volume of a pressure generation space, but utilizes the viscosity of a high viscous fluid filled within the pressure generation space.

A further object of a preferred embodiment of the present invention is to provide an improved pressure generation and responsive mechanism of the character set forth above which is capable of excluding any fluid passage which may otherwise be required to apply a pressure generated in a pressure generation space to an actuation piston.

A still further object of a preferred embodiment of the present invention is the provision of an improved pressure generation and responsive mechanism of the character set forth above which is simple in configuration, reliable in operation and low in manufacturing cost.

According to one embodiment of the present invention there is provided a combination of a pressure generation mechanism and a response member for generating a pressure in response to relative movement between first and second members so as to directly move said response member by the generated pressure comprising:

a closed space formed in one of said first and second member, said space extending in the direction of relative movement between said first and second members and having a predetermined width in a direction perpendicular to the direction of the relative movement;

blade means connected to the other of said first and second members and received within said closed space for movement therein, said blade means having a thickness substantially equal to the width of said closed space;

a high viscous fluid filled in said space and compulsorily displaceable by said blade means within said closed space for generating a pressure; and

an actuation member received within one of said first and second members as said response member to be moved when said high viscous fluid is compulsorily displaced within said closed space, an end surface of said actuation member being exposed in said closed space so that the generated pressure is directly applied to said actuating member.

According to another embodiment of the present invention there is provided a combination of a pressure generation mechanism and a piston member for generating a pressure in response to relative rotation between two shafts so as to directly move said piston member by the generated pressure comprising:

a first rotary shaft rotatable about an axis;

a second rotary shaft provided in axial alignment with said first rotary shaft and rotatable about said axis;

a cylinder housing secured to one end of said first rotary shaft in coaxial relation with said second rotary shaft and having a first end surface transverse to said axis;

a piston member received in said cylinder housing to be axially movable but non-rotatable relative to said cylinder housing and having a second end surface transverse to said axis, said second end surface facing said first end surface;

a rotor drivingly rotatable by said second rotary shaft and interposed between said first and second end surfaces, said rotor having at least two blades for defining at least two closed space sections partitioned in a circumferential direction, between said first and second end surfaces; and

a high viscous fluid filled within said at least two closed space sections for generating a pressure when compulsorily displaced by said at least two blades against its viscosity, said pressure serving to axially move said piston member.

According to a further embodiment of the present invention there is provided a combination of a pressure generation mechanism and a piston member for generating a pressure in response to relative movement between a cylinder housing rotatable about an axis and a rotary shaft received by said cylinder housing for relative rotation about said axis so as to directly move said piston member by the generated pressure, wherein:

said cylinder has a first end surface transverse to said axis;

said piston member is received, as said response member, in said cylinder housing to be axially movable but non-rotatable relative to said cylinder housing and having a second end surface transverse to said axis, said second end surface facing said first end surface;

a rotor is interposed between said first and second surfaces and is rotated by said rotary snaft, said rotor having at least two blades for defining at least two closed space sections partitioned in a circumferential direction, between said first and second end surfaces; and

a high viscous fluid is filled within said at least two closed space sections for generating a pressure when compulsorily displaced by said at least two blades against its viscosity, said pressure serving to axially move said piston member.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

Various other objects, features and many of the attendant advantages of the present invention may be readily appreciated as the same becomes better understood by reference to the following detailed description of the preferred embodiments when considered in connection with the accompanying drawings, wherein like reference numerals designate identical or corresponding parts throughout the several views, and in which:

FIGURE 1 is a sectional view of a torque transmission device for a four-wheel drive vehicle which device incorporates a pressure generation and responsive mechanism according to the present invention;

FIGURE 2 is a cross-sectional view of the device taken along the line II-II in FIGURE 1;

FIGURE 3 is another cross-sectional view similar to that in FIGURE 2, but showing a modified form of a rotor used in the device shown in FIGURES 1 and 2.

FIGURE 4 is a sectional view taken along the line IV-IV in FIGURE 3;

FIGURE 5 is a front view of another modified form of the rotor;

FIGURE 6 is a sectional view of the rotor taken along the line VI-VI in FIGURE 5;

FIGURE 7 is a front view of still another modified form of the rotor;

FIGURE 8 is a sectional view of the rotor taken along the line VIII-VIII in FIGURE 7;

FIGURE 9 is a front view of a further modified form of the rotor;

FIGURE 10 is a sectional view of the rotor taken along the line X-X in FIGURE 9;

FIGURE 11 is a fragmentary sectional view of another pressure generation and responsive mechanism constituting another embodiment of the present invention;

FIGURE 12 is a fragmentary sectional view of the mechanism taken along the line XII-XII in FIGURE 11;

FIGURES 13 and 14 are explanatory views illustrating the operational principle of the pressure generation and responsive mechanism according to the present invention; and

FIGURE 15 is a sectional view of the mechanism taken along the line XV-XV in FIGURE 14.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings and particularly to FIGURE 13 thereof, there is illustrated a principle based on which a mechanism according to the present invention generates a pressure. When a viscous fluid flows passing through a relatively limited space with a width (b), a length (ℓ) and a clearance (h), under the pressure difference P, the flow volume Q and the pressure P can be calculated using the following equations (1) and (2), respectively.

$$Q = \frac{P \cdot b \cdot h^3}{12 \cdot \mu \cdot \ell} \quad ....(1)$$

$$P = \frac{12 \cdot Q \cdot \mu \cdot \ell}{b \cdot h^3} \quad ....(2)$$

Thus, as shown in FIGURES 14 and 15, where a rotor 3 with two radially extending blades is received within a cylindrical space 2 filled with a high viscous fluid 1 and where the rotor 3 is rotated about the axis of the space 2, the viscous fluid 1 filled within the space 2 is compulsorily displaced at a flow rate which corresponds to the rotational speed of the rotor 3, so that the viscous friction of the fluid 1 with two flat end walls causes a pressure to be generated within the space 2. Let it be now assumed that the rotor 3 rotates in the direction indicated by the arrow and that a rotationally preceding one of the two blades defining each of two semi-circular space sections is designated as A, while the other blade rotationally following is designated as B. Then, the pressure generated within each space section becomes the highest at the point B and the lowest at the point A, as represented by the pressure distribution chart in FIGURE 14, and the pressure so generated is in proportion to the rotational speed of the rotor 3. The pressure can be utilized as the power to move an actuation piston not shown.

Description will then be made with embodiments of the present invention which are applied to a torque transmission device for a four-wheel drive vehicle.

Referring now to FIGURE 1, a torque transmission device is shown having a first rotary shaft 12 connectable to front wheels of the four-wheel drive vehicle and a second rotary shaft 20 connectable to rear wheels. One end of the first rotary shaft 12 has secured thereto an end cap 31, to which a cylinder housing 32 is secured at one end thereof in co-axial relation with the first rotary shaft 12. Another end cap 33 is secured to the other end of the cylinder housing 32. The end caps 31 and 33 rotatably support one end portion of the second rotary shaft 20 in axial alignment with the first rotary shaft 12.

A plurality of outer clutch plates 37 are spline-engaged with an internal surface of the cylinder housing 32, while a plurality of inner clutch plates 38 are spline-engaged with an outer surface of the second rotary shaft 20. The outer and inner clutch plates 37, 38 are disposed in alternate fashion to constitute a multiple disc clutch 40. Also within the cylinder housing 32, an actuation piston 36 bodily rotatable with the cylinder housing 32 is slidably disposed between the multiple disc clutch 40 and the end cap 31 and is moved responsive to a pressure applied thereto so as to pressure the clutch discs 37, 38 on one another. As a result, the rotational torque applied to the cylinder housing 32 through the first rotary shaft 12 is transmitted to the second rotary shaft 20 through the multiple disc clutch 40. However, the rotational torque transmitted to the second rotary shaft 20 is varied depending upon the pressure acting on the actuation piston 36.

At one axial side of the actuation piston 36, an axially narrow cylindrical space 43 is defined between the actuation piston 36 and the end cap 31. A rotor 41 which is slightly smaller in axial width than the cylindrical space 43 is rotatably received within the cylindrical space 43 and is in friction or sliding engagement with the opposing flat end surfaces of the actuation piston 36 and the end cap 31. As shown in FIGURE 2, the rotor 41 is spline-engaged at its center portion with the outer surface of the second rotary shaft 20 and is formed with a plurality (two in this illustrated embodiment) of blades 42 which radially outwardly protrude at diametrically opposite sides. Preferably, the number of the blades 42 may be in the range of two through four. Radially outer end surfaces of the blades 42 are in sliding engagement with an internal surface of the cylinder housing 32 to constitute sealing portions. Thus, the cylindrical space 43 between the actuation piston 36 and the end cap 31 is circumferentially divided by the blades 42 into two sector space sections. Each of these space sections 43a, 43b are filled with a high viscous fluid 44 such as silicon oil.

In operation, when relative rotation occurs between the first and second rotary shafts 12 and 20, the rotor 41 is rotated within the cylinder housing 32. The viscous fluid 44 filled in the space sections 43a, 43b is compulsorily displaced by the blades 42 through between the two flat end surfaces of the end cap 31 and the actuation piston 36 at a flow rate corresponding to the rotational speed difference. In this event, the viscous friction of the fluid 44 with the flat end surfaces of the end cap 31 and the actuation piston 36 causes the fluid 44 to remain, whereby a pressure proportional to the rotational speed difference is generated within each of the space sections 43a, 43b. Because the flat end surface of the actuation piston 36 defines the space 43, the pressure so generated is directly exerted upon the actuation piston 36, which is hence axially moved to pressure the clutch discs 37, 38 upon one another. Consequently, the rotational torque acting on the first rotary shaft 12 is transmitted to the second rotary shaft 20 through the multiple disc clutch 40.

Other embodiments of the present invention will be described hereafter with reference to FIGURES 3-10.

These embodiments feature various modifications of the rotor 41 with the blades 42, and thus, same reference numerals are used to designate those parts which perform the identical or corresponding functions.

In a modification shown in FIGURES 3 and 4, the rotor 41 received within the space 43 is formed to take a generally disc-like shape. Two semi-circular or sector cavities 143 which are circumferentially partitioned by the blades 42 are formed at each axial ends of the rotor 41 except for a pair of edge portions which extend circumferentially between the blades 42. The high viscous fluid 44 is filled in each of the sector cavities 143.

In another modification shown in FIGURES 5 and 6, the rotor 41 is different from that shown in FIGURE 3 in that two sector through holes 243, 243 which are circumferentially partitioned by the blades 42 are formed in the rotor 41.

In still another modification shown in FIGURES 7 and 8, the rotor 41 is modified by removing such a pair of circumferential edge portions as provided in the modification shown in FIGURE 3.

In a further modification shown in FIGURES 9 and 10, two step-down spaces or cavities 343, 343 of V-shape in section whose depth gradually varies in the rotational direction are formed at the axial opposite ends of the rotor 41. In this particular instance, two bottom surfaces 343A of each cavity 343 which are slanted towards the circumferential mid portion between the blades 42, 42 act to compulsorily displace the viscous fluid.

The torque transmission devices with these modifications shown in FIGURES 3 through 10 perform substantially the same function as that shown in FIGURES 1 and 2. However, the devices incorporating those modifications shown in FIGURES 3, 7 and 9 are particularly advantageous in that the pressures generated at axial opposite sides of the rotor 41 act to hold the same at an axial position where they are balanced.

Referring then to FIGURES 11 and 12, there is shown another mechanism which generates a pressure to operate an actuation member by utilizing linear relative motion between two members.

More specifically, a first sliding member 120 mounts thereon a second sliding member 200 which is slidable relative thereto in the left-right direction as viewed in FIGURE 11. The first sliding member 120 is formed with a shallow oblong groove 210 at its sliding surface, while the second sliding members 200 has secured to its sliding surface a plurality (three in this particular embodiment) of blades 420 which are received in the oblong groove 210 to extend in a direction (i.e., vertical) transverse to the sliding direction of the sliding members 120, 200. The blades 420 divide the oblong space defined by the sliding members 120, 200 into four oblong space sections, of which the middle two sections 430 are each filled with a high viscous fluid 440 such as silicon oil. Further, the other sliding member 200 is formed therein with a cylinder hole 220 which opens to both of the oblong space sections. An actuation piston 360 is slidably fit in the cylinder hole 220.

In operation, the high viscous fluid 440 filled in the middle two oblong space sections 430 is compulsorily displaced by the blades 420 through the two adjacent flat surfaces, whereby a pressure which corresponds to the speed of the relative linear motion of the sliding members 120 and 200 is generated to operate the actuation piston 360.

Obviously, numerous modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the present invention may be practiced otherwise than as specifically described herein.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A combination of a pressure generation mechanism and a response member for generating a pressure in response to relative movement between first and second members so as to directly move said response member by the generated pressure comprising:

a closed space formed in one of said first and second member, said space extending in the direction of relative movement between said first and second members and having a predetermined width in a direction perpendicular to the direction of the relative movement;

blade means connected to the other of said first and second members and received within said closed space for movement therein, said blade means having a thickness substantially equal to the width of said closed space;

a high viscous fluid filled in said space and compulsorily displaceable by said blade means within said closed space for generating a pressure; and

an actuation member received within one of said first and second members as said response member to be moved when said high viscous fluid is compulsorily displaced within said closed space, an end surface of said actuation member being exposed in said closed space so that the generated pressure is directly applied to said actuating member.

2. A combination of a pressure generation mechanism and a response member as set forth in claim 1, wherein:

said first and second members are relatively rotatable about a common axis; and

said blade means is provided to be rotated within said space when said first and second members are relatively rotated.

3. A combination of a pressure generation mechanism and a response member as set forth in claim 1, wherein:

said first and second members are reciprocatively slidable relative to each other; and

said blade means is provided to be reciprocatively moved within said space when said first and second members are reciprocatively slidden relative to each other.

4. A combination of a pressure generation mechanism and a piston member for generating a pressure in response to relative rotation between two shafts so as to directly move said piston member by the generated pressure comprising:

a first rotary shaft rotatable about an axis;

a second rotary shaft provided in axial alignment with said first rotary shaft and rotatable about said axis;

a cylinder housing secured to one end of said first rotary shaft in coaxial relation with said second rotary shaft and having a first end surface transverse to said axis;

a piston member received in said cylinder housing to be axially movable but non-rotatable relative to said cylinder housing and having a second end surface transverse to said axis, said second end surface facing said first end surface;

a rotor drivingly rotatable by said second rotary shaft and interposed between said first and second end surfaces, said rotor having at least two blades for defining at least two closed space sections partitioned in a circumferential direction, between said first and second end surfaces; and

a high viscous fluid filled within said at least two closed space sections for generating a pressure when compulsorily displaced by said at least two blades against its viscosity, said pressure serving to axially move said piston member.

5. A combination of a pressure generation mechanism and a piston member as set forth in claim 4, wherein:

said rotor is formed with at least two sector cavities at each of axial opposite ends thereof.

6. A combination of a pressure generation mechanism and a piston member as set forth in claim 4, wherein:

said rotor is formed with at least two sector through holes which are circumferentially partitioned by said at least two blades.

7. A combination of a pressure generation mechanism and a piston member mechanism as set forth in claim 4, wherein said rotor includes:

said at least two blades extending in radial outward direction at diametrically opposite sides of said rotor; and

a pair of sector partition walls respectively bridging said at least two blades at an axial mid portion of said rotor in the circumferential direction of said rotor, each of said sector partition walls having a uniform axial width which is thinner than said blades so as to provide a sector space between itself and one of said first and second end surfaces facing thereto.

8. A combination of a pressure generation mechanism and a piston member mechanism as set forth in claim 4, wherein said rotor includes:

said at least two blades extending in radial outward direction at diametrically opposite sides of said rotor; and

a pair of sector partition walls respectively bridging said at least two blades at an axial mid portion of said rotor in the circumferential direction of said rotor, each of said sector partition walls having an axial cross section which gradually becomes thinner towards its mid point in the circumferential direction.

9. A pressure generation mechanism and response member substantially as hereinbefore described with reference to figures 1 and 2, in conjunction with any one of the rotors shown in figures 3 and 4, 5 and 6, 7 and 8, or 9 and 10.

10. A combination of a pressure generation mechanism and a piston member for generating a pressure in response to relative movement between a cylinder housing rotatable about an axis and a rotary shaft received by said cylinder housing for relative rotation about said axis so as to directly move said piston member by the generated

pressure, wherein:

said cylinder has a first end surface transverse to said axis;

said piston member is received, as said response member, in said cylinder housing to be axially movable but non-rotatable relative to said cylinder housing and having a second end surface transverse to said axis, said second end surface facing said first end surface;

a rotor is interposed between said first and second surfaces and is rotated by said rotary shaft, said rotor having at least two blades for defining at least two closed space sections partitioned in a circumferential direction, between said first and second end surfaces; and

a high viscous fluid is filled within said at least two closed space sections for generating a pressure when compulsorily displaced by said at least two blades against its viscosity, said pressure serving to axially move said piston member.

11. A pressure generation mechanism and a piston member substantially as hereinbefore described with reference to figures 11 and 12 in conjunction with any one of the rotors shown in figures 3 and 4, 5 and 6, 7 and 8, or 9 and 10.

Dated this 18th day of September 1991

TOYODA KOKI KABUSHIKI KAISHA

By their Patent Attorneys

GRIFFITH HACK & CO

MVS

402/12633-Q

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FIG. 1

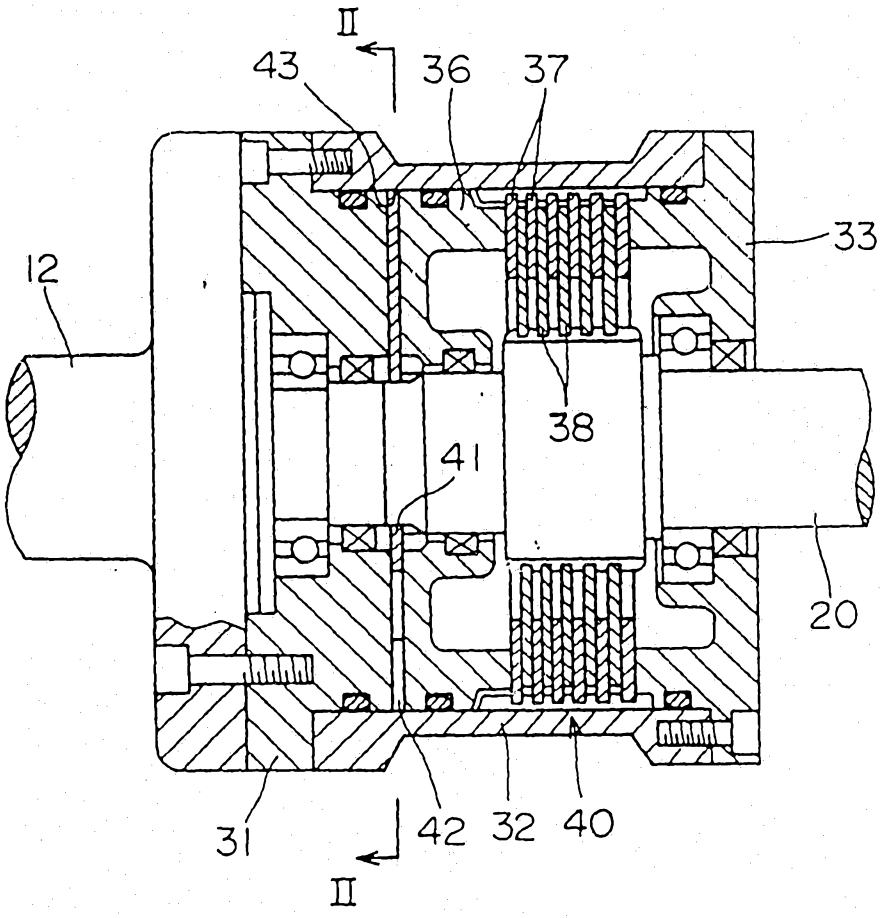

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FIG. 2

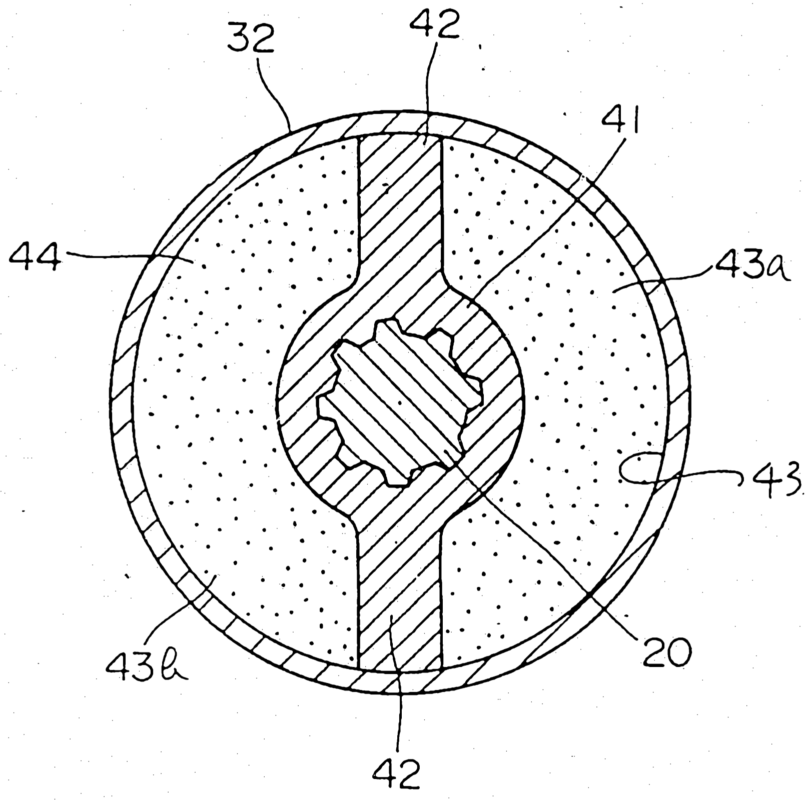

FIG. 3

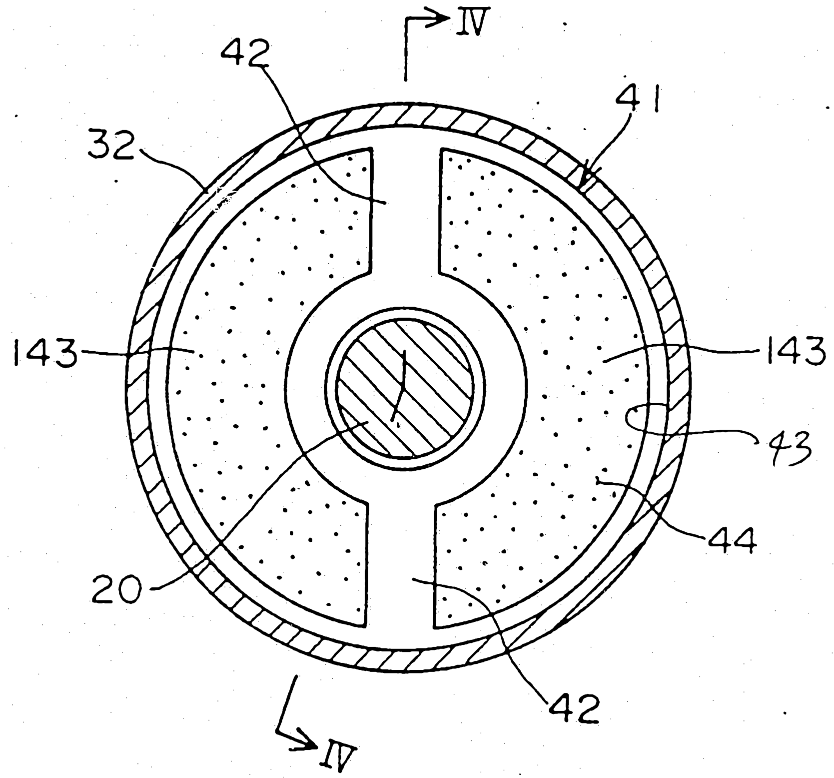

FIG. 4

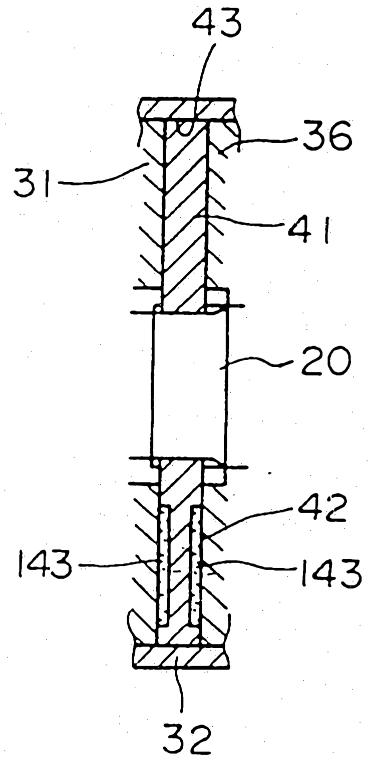

FIG. 5

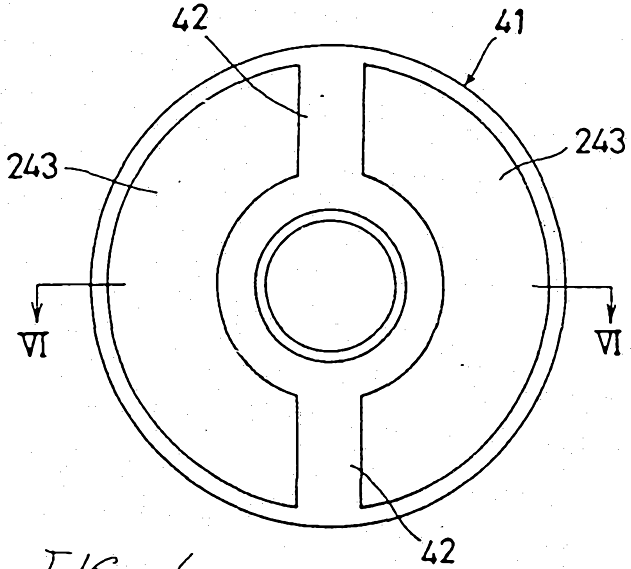

FIG. 7

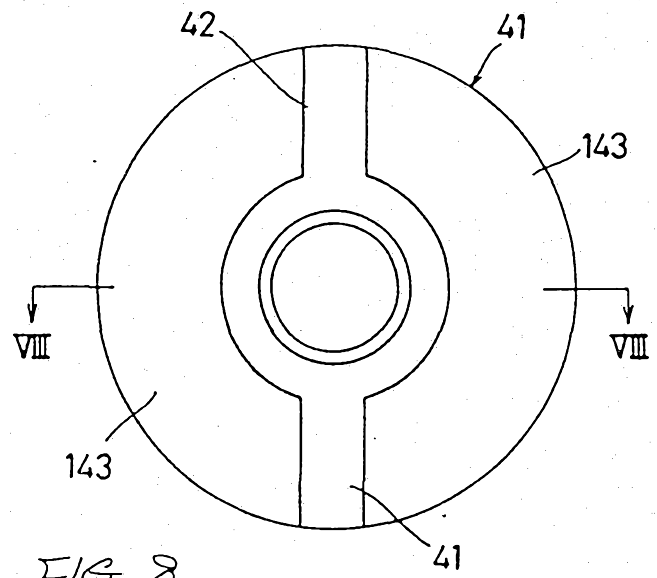

FIG. 6

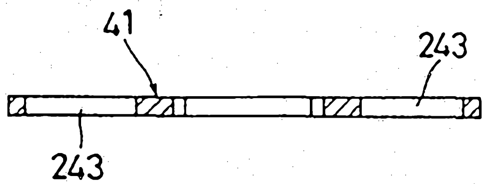

FIG. 8

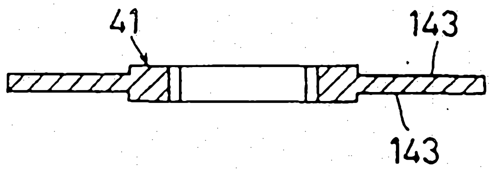

FIG. 9

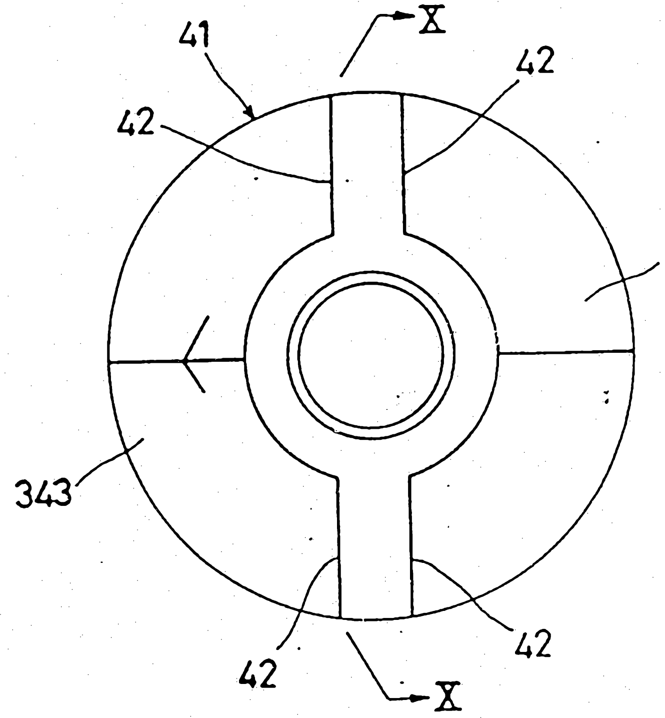

FIG. 10

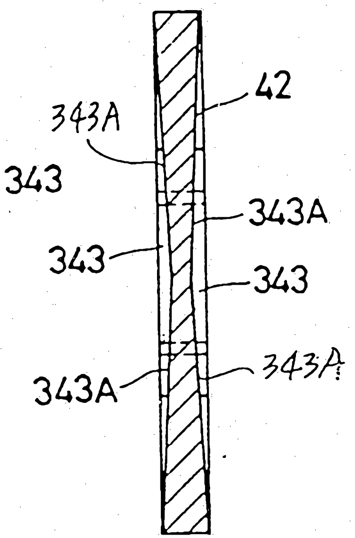

FIG. 13

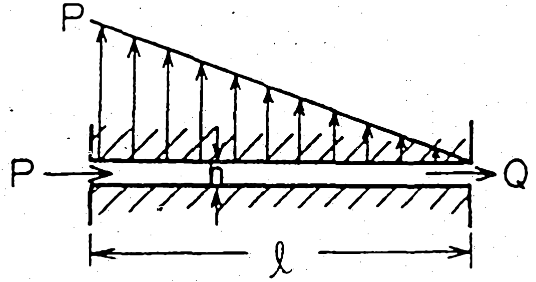

FIG. 11

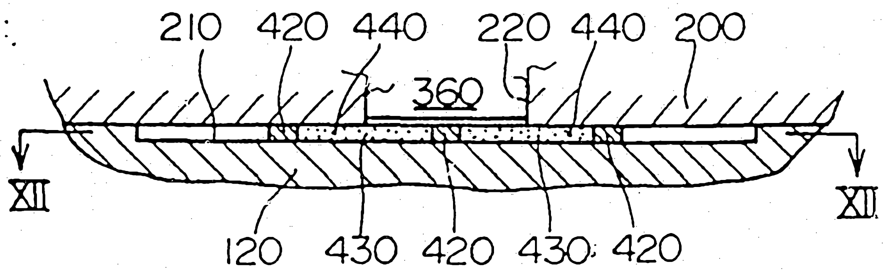

FIG. 12

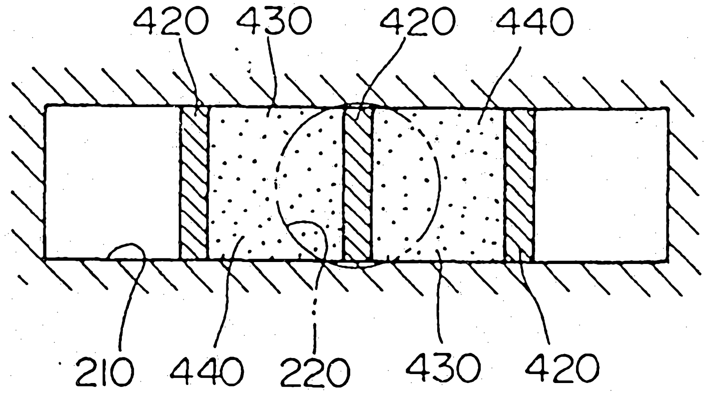

FIG. 14

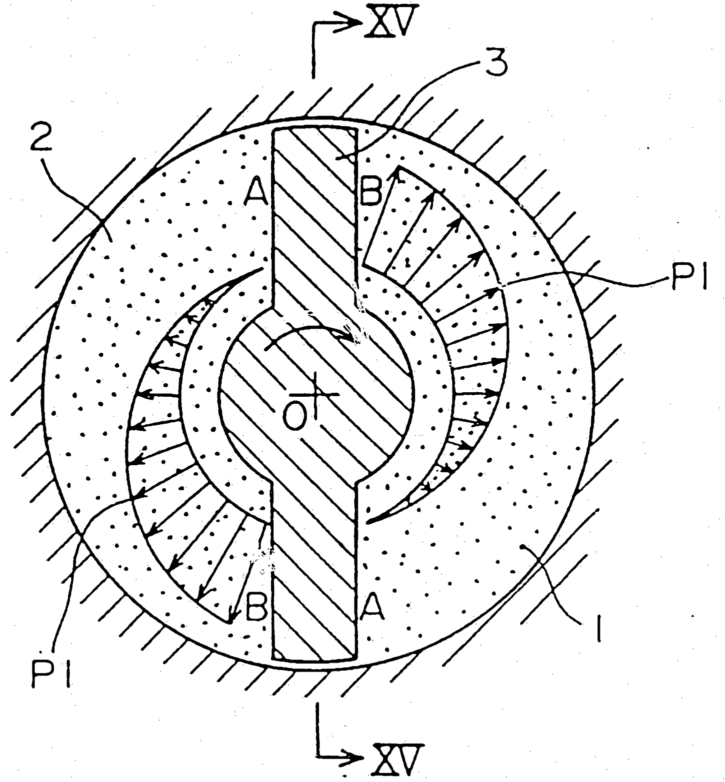

FIG. 15