

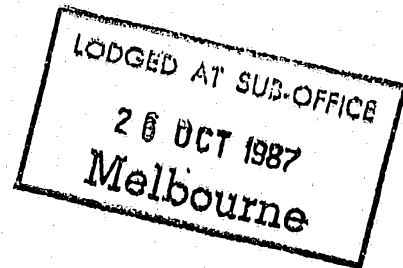
594825 ^{80124/87}

COMMONWEALTH of AUSTRALIA

PATENTS ACT 1952

APPLICATION FOR A STANDARD PATENT

X
We DIESEL KIKI CO., LTD.
Of 6-7, Shibuya 3-Chome,
Shibuya-ku, Tokyo,
Japan.



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

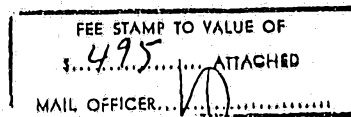
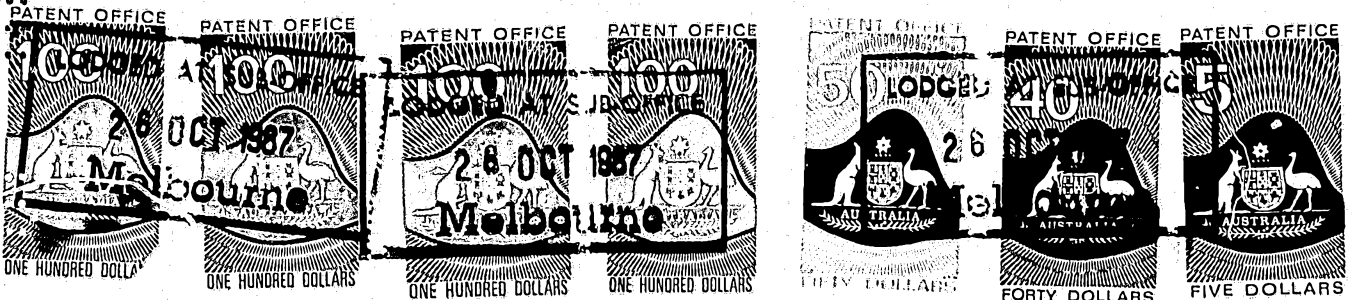
"SLIDING-VANE ROTARY COMPRESSOR" APPLICATION ACCEPTED AND AMENDMENTS

ALLOWED 28-9-89

which is described in the accompanying ~~provisional~~ complete specification.

Details of basic application(s):—

Number	Convention Country	Date
61-255234	JAPAN	27th October 1986



The address for service is care of DAVIES & COLLISON, Patent Attorneys, of 1 Little Collins Street, Melbourne, in the State of Victoria, Commonwealth of Australia.

Dated this 26th day of October 19 87

To: THE COMMISSIONER OF PATENTS

H. A. Rivington
(a member of the firm of DAVIES & COLLISON for and on behalf of the Applicant).

Davies & Collison, Melbourne and Canberra.

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

DECLARATION IN SUPPORT OF CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT

Insert title of invention.

In support of the Application made for a patent for an invention
entitled: "SLIDING-VANE ROTARY COMPRESSOR"

Insert full name(s) and address(es)
of Declarant(s) being the appli-
cant(s) or person(s) authorized to
sign on behalf of an applicant
company.

I, Yukio Itagaki
~~We~~ of Diesel Kiki Co., Ltd.
of 6-7, Shibuya 3-chome, Shibuya-ku,
Tokyo, Japan

Cross out whichever of paragraphs
1(a) or 1(b) does not apply.

1(a) relates to application made
by individual(s).

1(b) relates to application made
by company; insert name of
applicant company.

do solemnly and sincerely declare as follows :-

1. (a) ~~I am~~ ~~the applicant~~ ~~for the patent~~
~~We are~~

or (b) I am authorized by Diesel Kiki Co., Ltd.

Cross out whichever of paragraphs
2(a) or 2(b) does not apply.

2(a) relates to application made
by inventor(s)

2(b) relates to application made
by company(s) or person(s) who
are not inventor(s); insert full
name(s) and address(es) of inven-
tors.

the applicant..... for the patent to make this declaration on ~~its~~ ^{their} behalf.

2. (a) ~~I am~~ ~~the actual inventor~~ ~~of the invention~~
~~We are~~

or (b) Nobuyuki Nakajima of c/o Diesel Kiki Co., Ltd. Konan Factory
39, Oaza-Sendai, Aza-Higashihara,
Konan-machi, Saitama, Japan

Kenichi Inomata of c/o Diesel Kiki Co., Ltd. Konan Factory
39, Oaza-Sendai, Aza-Higashihara,
Konan-machi, Saitama, Japan

and Shigeru Okada of c/o Diesel Kiki Co., Ltd. Konan Factory
39, Oaza-Sendai, Aza-Higashihara,
Konan-machi, Saitama, Japan

~~is~~ ~~are~~ the actual inventor(s)..... of the invention and the facts upon which the applicant.....
~~is~~ ~~are~~ entitled to make the application are as follows :-

the applicant is assignee of the said
actual inventors in respect of the invention.

State manner in which appli-
cant(s) derive title from inven-
tor(s).

Cross out paragraphs 3 and 4
for non-convention applications.
For convention applications
insert basic country(s) followed
by date(s) and basic applicant(s).

3. The basic application..... as defined by Section 141 of the Act ^{was} ~~were~~ made
in Japan on the 27th day of October 1986
by Diesel Kiki Co., Ltd.
in on the
by
in on the
by

4. The basic application..... referred to in paragraph 3 of this Declaration ^{was} ~~were~~
the first application..... made in a Convention country in respect of the invention the subject
of the application.

Insert place and date of signature.

Declared at Tokyo this 6th day of October, 1987

Signature of Declarant(s) (no
attestation required).

Note: Initial all alterations.

DAVIES & COLLISON, MELBOURNE and CANBERRA.

Yukio Itagaki

(12) PATENT ABRIDGMENT (11) Document No. AU-B-80124/87
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 594825

(54) Title
SLIDING-VANE ROTARY COMPRESSOR

International Patent Classification(s)
(51)⁴ F04C 018/344 F04C 029/08 F04C 029/10

(21) Application No. : 80124/87 (22) Application Date : 26.10.87

(30) Priority Data

(31) Number (32) Date (33) Country
61-255234 27.10.86 JP JAPAN

(43) Publication Date : 28.04.88

(44) Publication Date of Accepted Application : 15.03.90

(71) Applicant(s)
DIESEL KIKI CO. LTD.

(72) Inventor(s)
NOBUYUKI NAKAJIMA; KENICHI INOMATA; SHIGERU OKADA

(74) Attorney or Agent
DAVIES & COLLISON, MELBOURNE

(56) Prior Art Documents
AU 408369 59615/65 67.7;29.4
AU 408304 59715/65 67.7;29.4;69.4
AU 224744 35866/58 67.7

(57) Claim

1. A sliding-vane rotary compressor comprising:

(a) a cylinder having an intake hole and a discharge hole, and a rotor rotatably disposed in said cylinder so as to define therebetween an operating compartment, said rotor carrying thereon a plurality of approximately radially movable sliding vanes, there being defined between said cylinder, said rotor and said vanes a plurality of compression chambers which vary in volume with each revolution of said rotor so as to compress a gas sucked therein through said intake hole and thereafter discharge the compressed gas therefrom through said discharged hole;

(b) a first head closing one of opposite open ends of said cylinder;

(c) a side block closing the other open end of said cylinder;

(d) a second head secured to said side block;

(e) said side block and said second head defining therebetween a low pressure chamber communicating with said intake hole and a high pressure chamber communicating with said discharge hole; and

(f) a displacement-adjustment mechanism incorporated in said side block and said second head for adjusting displacement of the compressor, wherein

said displacement-adjustment mechanism includes:

an adjustment member rotatably disposed in said side block for adjusting a compression starting position;

resilient means for urging said adjustment member to turn in one direction;

means defining a pressure chamber for producing a pressure acting on said adjustment member to urge the latter to turn in the opposite direction against the force of said resilient means, said pressure chamber being connected with said high pressure chamber via an orifice; and

a control valve for adjusting the rate of communication between said pressure chamber and said low pressure chamber according to the pressure in said low pressure chamber.

594825

COMMONWEALTH OF AUSTRALIA

PATENT ACT 1952

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE

CLASS

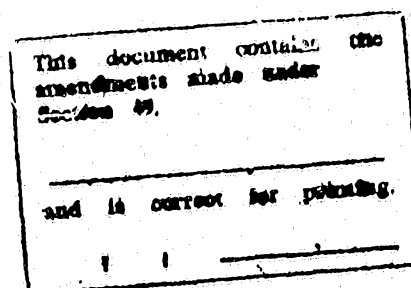
INT. CLASS

Application Number:
Lodged:

Complete Specification Lodged:
Accepted:
Published:

Priority:

Related Art:



NAME OF APPLICANT: DIESEL KIKI CO., LTD.

ADDRESS OF APPLICANT: 6-7, Shibuya 3-chome, Shibuya-ku,
Tokyo, Japan.

NAME(S) OF INVENTOR(S) Nobuyuki NAKAJIMA
Kenichi INOMATA
Shigeru OKADA

ADDRESS FOR SERVICE: DAVIES & COLLISON, Patent Attorneys
1 Little Collins Street, Melbourne, 3000.

COMPLETE SPECIFICATION FOR THE INVENTION ENTITLED:

"SLIDING-VANE ROTARY COMPRESSOR"

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

TITLE OF THE INVENTION
SLIDING-VANE ROTARY COMPRESSOR

BACKGROUND OF THE INVENTION

1. Field of the Invention:

The present invention relates to a sliding-vane rotary compressor suitable for use in an automotive air conditioning system.

2. Prior Art:

A known sliding-vane rotary compressor disclosed in Japanese Patent Laid-open Publication No. 60-204992, for example, includes a circular rotor rotatably disposed in a substantially elliptical bore in a cylinder for sliding contact with the inner wall of the cylinder along a minor axis of the elliptical bore so as to define therebetween two operating compartments disposed in symmetric relation to one another. The rotor carries thereon a plurality of radially movable vanes slidably engageable with the inner wall of the cylinder. The cylinder, the rotor and the vanes define therebetween compression chambers which vary in volume with each revolution of the rotor. Opposite open ends of the cylinder are closed by two side blocks to which are connected heads to define between the corresponding side blocks a high pressure chamber and a low pressure chamber, respectively. A gas sucked from the low pressure chamber through intake holes into the compression chambers is compressed in the compression chambers and then discharged therefrom through discharge holes into the high pressure chamber.

With this construction, the side block and the head disposed on each side of the cylinder are necessary for the formation of the high and low pressure chambers with the result that the known compressor requires an increased number of structural components and hence is costly to manufacture.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a sliding-vane rotary compressor incorporating structural features which enable omission of one side block or head to reduce the number of structural components and lower the manufacturing cost.

Another object of the present invention is to provide a sliding-vane rotary compressor having a rigid integral head which corresponds to a conventional combination of the side block and the head.

A further object of the present invention is to provide a sliding-vane rotary compressor with one side block or head omitted, which has structural features for enabling an adjustable control of the displacement of the compressor according to operating conditions.

According to the present invention, there is provided a sliding-vane rotary compressor comprising:

a cylinder having an intake and a discharge hole, and a rotor rotatably disposed in the cylinder so as to define therebetween an operating compartment, the rotor



carrying thereon a plurality of approximately radially movable sliding vanes, there being defined between the cylinder, the rotor and the vanes a plurality of compression chambers which vary in volume with each revolution of the rotor so as to compress a gas sucked therein through the intake hole and thereafter discharge the compressed gas therefrom through the discharged hole;

a first head closing one of opposite open ends of the cylinder;

a side block closing the other open end of the cylinder;

a second head secured to the side block;

the side block and the second head defining therebetween a low pressure chamber communicating with the intake hole and a high pressure chamber communicating with the discharge hole; and

a displacement-adjustment mechanism

incorporated in the side block and the second head for adjusting displacement of the compressor, wherein said displacement-adjustment mechanism includes:

an adjustment member rotatably disposed in said side block for adjusting a compression starting position;

resilient means for urging said adjustment member to turn in one direction;

means defining a pressure chamber for producing a pressure acting on said adjustment member to urge the latter to turn in the opposite direction against the force of said resilient means, said



pressure chamber being connected with said high pressure chamber via an orifice; and

a control valve for adjusting the rate of communication between said pressure chamber and said low pressure chamber according to the pressure in said low pressure chamber.

With this construction, the compressor is capable of adjusting the displacement thereof.

Many other advantages and features of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying sheets of drawings in which preferred structural embodiments incorporating the principles of the present invention are shown by way of illustrative example.



BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal cross-sectional view taken along line I - I of FIG. 3, showing a first embodiment of sliding-vane rotary compressor according to the present invention;

FIG. 2 is a cross-sectional view taken along line II - II of FIG. 1;

FIG. 3 is a side view of a rear end of the compressor;

FIG. 4 is a cross-sectional view taken along line O - IV of FIG. 3;

FIG. 5 is a cross-sectional view taken along line O - V of FIG. 3;

FIG. 6 is an exploded perspective view showing essential structural components of the compressor;

FIG. 7 is a rear view of a cover of the compressor;

FIG. 8 is a cross-sectional view taken along line VIII - VIII of FIG. 7;

FIG. 9 is a longitudinal cross-sectional view taken along line IX - IX of FIG. 10, showing a second embodiment of sliding-vane rotary compressor according to the present invention;

FIG. 10 is a side view of a rear end of the compressor shown in FIG. 9;

FIG. 11 is a cross-sectional view taken along line XI - XI of FIG. 9;

FIG. 12 is a longitudinal cross-sectional view taken



along line XII - XII of FIG. 14, showing a third embodiment of sliding-vane rotary compressor according to the present invention;

FIG. 13 is a cross-sectional view taken along line XIII - XIII of FIG. 12;

FIG. 14 is a side view of a rear end of the compressor shown in FIG. 12;

FIG. 15 is a cross-sectional view taken along line O - XV of FIG. 14;

FIG. 16 is a cross-sectional view taken along line O - XVI of FIG. 14;

FIG. 17 is an exploded perspective view showing essential structural components of the compressor shown in FIG. 12; and

FIG. 18 is a transverse cross-sectional view showing a fourth embodiment of sliding-vane rotary compressor according to the present invention.

DETAILED DESCRIPTION

FIGS. 1 through 6 show a first embodiment of sliding-vane rotary compressor of the present invention used for compressing a refrigerant, for example. The compressor includes a cylinder 1 and a rotor 2 rotatably disposed in a substantially elliptical bore in the cylinder 1. The rotor 2 is sealingly engageable with the inner wall of the cylinder 1 along a minor axis of the elliptical bore so that there are defined between the rotor 2 and the cylinder 1 two operating compartments 3a, 3b disposed in



diametrically opposite, symmetric relation to one another. The rotor 2 is fixedly mounted on a drive shaft 4 in concentric relation thereto and includes a plurality (five in the illustrated embodiment) of approximately radial slots 5a - 5e in which vanes 6a - 6e are slidably inserted, respectively.

A side block 7 is secured to a rear end face of the cylinder 1 to close a rear open end of the latter and has an outer peripheral wall extending flush with the outer peripheral wall of the cylinder 1. Likewise, a first head 8a is secured to a front end face of the cylinder 1 to close a front open end of the latter and has an outer peripheral wall extending flush with that of the cylinder 1. That is, the opposite open ends of the cylinder 1 are closed by the side block 7 and the first head 8a with the rotor 2 and the vanes 6a - 6e held in sliding contact with inner walls of the side block 7 and the first head 8a. Thus, there are five compression chambers 9a - 9e defined between the cylinder 1, the rotor 2, the vanes 6a - 6e, the side block 7 and the first head 8a.

A second head 8b is disposed outside the side block 7. The cylinder 1, the side block 7 and the second head 8b are fastened together by two screw fasteners 10a, 10b. On the other hand, the cylinder 1, the side block 7 and the first and second heads 8a, 8b are fastened together by four screw fasteners 11a - 11d.

The drive shaft 4 is rotatably supported by the side



block 7 and the first head 8a via a pair of radial bearings 12a, 12b. The first head 8a includes a central hollow cylindrical hub 60 projecting toward the front side for receiving therein an electromagnetic clutch (not shown). The drive shaft 4 has an end portion extending longitudinally in the hub 60 for being releasably coupled with an engine crankshaft (not shown) via the clutch to receive the engine torque. A mechanical seal 13 is disposed between the end portion of the drive shaft 4 and the first head 8a. The mechanical seal 13 and one of the radial bearings 12a define therebetween a low pressure guide chamber 14 communicating through a pair of low pressure guide grooves 15a, 15b with the compression chambers 9a - 9e while the latter are in the suction stroke so that a refrigerant gas entraining a lubricating oil is introduced in the low pressure guide chamber 14, supplying the lubricating oil to the mechanical seal 13 and the radial bearing 12a. Since the mechanical seal 13 and the surrounding areas are kept under low pressure, the load on the mechanical seal 13 is reduced. This ensures that the mechanical seal 13 is able to operate reliably over a prolonged period of time. In the illustrated embodiment, the five vanes 6a - 6e define therebetween the five compression chambers 9a - 9b two of which are adapted to be connected in different phases with the low pressure guide chamber 14 during the suction stroke. Due to this phase difference, the lubricating oil flows back-and-forth



through the low pressure guide grooves 15a, 15b to continuously fill the low pressure guide chamber 14.

The cylinder 1, the side block 7 and the heads 8a, 8b have respective flat confronting end surfaces engageable flatwise with each other to provide a hermetic seal with or without a separate sealing means disposed therebetween. In the illustrated embodiment, a pair of first and second O-rings 16a, 16b is interposed respectively between the side block 7 and the cylinder 1 and between the cylinder 1 and the first head 8a.

The second head 8b has an integral partition wall 17 held in contact with the side block 7 with a gasket (not shown) interposed therebetween. With the partition wall 17 thus provided, there are defined between the side block 7 and the second head 8b a low pressure chamber 18 and a high pressure chamber 19 separated by the partition wall 17. The low and high pressure chambers 18, 19 are connected respectively with an intake port 20 and a discharge port 21 which are defined in an upper portion of the second head 8b. The low pressure chamber 18 is connected to the operating compartments 3a, 3b via a pair of intake holes 22a, 22b defined in the side block 7 in diametrically opposite relation to one another. The intake holes 22a, 22b communicate with the compression chambers 9a - 9e as the latter increase in volume during the suction stroke whereupon the refrigerant gas is sucked from the low pressure chamber 18 through the intake holes 22a, 22b into



the compression chambers 9a - 9e.

The cylinder 1 has two sets of discharge holes 23a - 23d extending radially across the peripheral wall of the cylinder 1. The discharge holes 23a - 22d have their one ends opening to the operating compartments 3a, 3b at diametrically opposite portions of the inner wall of the cylinder 1 which extend along the minor axis of the elliptical bore. The outer peripheral surface of the cylinder 1 is flattened at two diametrically opposite portions thereof to form a pair of flat cover attachment portions 24a (only one shown). Each of the cover attachment portions 24a includes a recess 25a having two laterally spaced arcuate grooves to which the other ends of each respective set of the discharge holes 23a - 22d are open.

A pair of covers 26a, 26b is secured to the cover attachment portions 24a, respectively, by means of four screw fasteners 27 threading through the covers 26a, 26b into the cylinder 1. Disposed respectively between the covers 26a, 26b and the cover attachment portions 24a are a pair of third O-rings 16c, 16d extending around the recess 25a to provide hermetic seals. Each of the covers 26a, 26b has a recessed arcuate inner wall so that there is defined between the cover 26a, 26b and the recess 25a in the cylinder 1 a valve-receiving chamber 28a. The cover 26a, 26b also includes two laterally spaced stopper projections 29a, 29b; 29c, 29d extending toward the



cylinder 1 in alignment with the respective discharge holes 23a, 23b; 23c, 23d. The valve-receiving chambers 28a receive respectively therein a pair of discharge valves 30a, 30b. Each of the discharge valves 30a, 30b is formed from a sheet of resilient material into a split tube having a longitudinal slit. The tubular discharge valve 30a, 30b is spread against its own resiliency when it is retained on the stopper projections 29a - 29e of the cover 26a, 26b. The discharge valve 29a thus attached has outer peripheral portions normally held in contact with the bottom wall of the recess 25a to close the open ends of the respective discharge holes 23a - 23d.

The high pressure chamber 18 and one end of each of the valve-receiving chambers 28a are held in fluid communication with each other by means of a pair of first discharge connecting holes 31a, 31b extending through the cylinder 1 and the side block 7. The other end of each valve receiving chamber 28a is connected with the high pressure chamber 19 via a second discharge connecting hole 32 extending through the cylinder 1, the first head 8a and the side block 7. The second discharge connecting hole 32 is formed in zigzag fashion for separating the lubricating oil entrained in the discharged refrigerant gas to collect the separated lubricating oil into the bottom of the high pressure chamber 19. The first and second discharge holes 31a, 31b, 32 are disposed radially inwardly of the first and second O-rings 16a, 16b so that they are held gas-tight



against leakage.

With this construction, when the drive shaft 4 is driven to rotate the rotor 2 in one direction, the vanes 6a - 6e slide along the inner wall of the cylinder 1 to cause the compression chambers 9a - 9e to successively increase and decrease in size with each revolution of the rotor 2. As the compression chambers 9a - 9e increase in size or volume during the intake or suction stroke, they are brought to fluid communication with the low pressure chamber 18 through the intake holes 22a, 22b, whereupon a refrigerant gas which has been introduced from the intake port 20 into the low pressure chamber 18 is drawn into the compression chambers 9a - 9e through the intake holes 22a, 22b. Then the compression chambers 9a - 9e gradually decrease in size and when succeeding vanes 6a - 6e move past the intake holes 22a, 22b, the gas is trapped in the compression chambers 9a - 9e. Thus, the compression is commenced. A further movement of the rotor 2 causes the preceding vanes 6a - 6e to move past the discharge holes 23a - 23d whereupon the compression chambers 9a - 9e communicate with the discharge holes 23a - 23d and then the discharge valves 30a, 30b are forced by the pressure in the compression chambers 9a - 9e to retract away from the discharge holes 23a - 23d until the valves 30a, 30b engage the stopper projections 29a - 29e of the covers 26a, 26b. Consequently, the gas is discharged from the compression chambers 9a - 9e through the discharge holes 23a - 23d into



the valve-receiving chambers 28a. Then the gas flows through the discharge connecting holes 31a, 31b, 32 into the high pressure chamber 19, and finally is discharged from the discharge port 21 to the outside of the compressor.

A second embodiment shown in FIGS. 9 - 11 differs from the foregoing embodiment in that the compressor has a discharge port 21 formed in a first head 8a and connected in fluid communication with a high pressure chamber 19 defined in a second head 8b via a third discharge connecting hole 33 which extends successively through the first head 8a, the cylinder 1 and the side block 7. The discharge port 21 and an intake port 20 are disposed on the front side and the rear side, respectively, of the compressor. This arrangement will suffice for the requirement on the position of the intake and discharge ports when the compressor is incorporated in a different vehicle or refrigerator.

Other structural details of the compressor are the same as those of the foregoing embodiment and hence will require no further description. For easy reference, like or corresponding parts are indicated by the same reference characters throughout several views.

According to a third embodiment shown in FIGS. 12 through 17, a sliding-vane rotary compressor includes a displacement-adjustment mechanism incorporated in a side block 7 and a second head 8b. The compressor of this



embodiment is the same as the compressor of the first-mentioned embodiment except the shape and internal construction of the side block 7 and the second head 8b.

The displacement-adjustment mechanism is the same in principle as the mechanism as shown in Japanese Utility Model Laid-open Publication No. 55-2000. The mechanism includes a ring-shaped adjustment member 34 for adjusting the compression starting position. The adjustment member 34 is rotatably fitted in an annular groove 35 formed in one surface of the side block 7 facing the cylinder 1. The adjustment member 34 has a pair of diametrically opposite peripheral cut-out recesses 37a, 37b normally held in communication with a pair of intake holes 22a, 22b, respectively, formed in the side block 7. With this arrangement, the circumferential position of the cut-out recesses 37a, 37b varies with angular displacement of the adjustment member 34, thereby enabling adjustment of the compression starting position, i.e. the position in which the vanes 6a - 6e begins to block fluid communication between compression chambers 9a - 9e and the intake holes 23a, 23b.

A torsion coil spring 38 constituting a resilient biasing or urging means is resiliently disposed and acting between the side block 7 and the adjustment member 34 for urging the latter to turn in the clockwise direction in FIG. 13. The adjustment member 34 includes a pair of tongue-like pressure-retaining portions 39a, 39b projecting



perpendicularly from the body of the adjustment member 34. The pressure-retaining portions 39a, 39b are slidably received in a pair of guide grooves 40a, 40b, respectively, formed in the side block 7 and extending continuously from the intake holes 22a, 22b. Thus, there are two pressure chambers 41a, 41b defined between the guide grooves 40a, 40b and the adjustment member 34. The pressure chambers 41a, 41b are sealed from the outside by means of a seal member fitted over the adjustment member 34. The seal member has a specific configuration composed of a plurality of radially spaced inner arcuate seal portions 42 interconnected by a plurality of radially extending outer seal portions 43. The pressure chambers 41a, 41b communicate with each other via a pair of connecting holes 44a, 44b extending through the side block 7 and also via a connecting groove 46 extending in a disk-like seal member 45 disposed between the side block 7 and the second head 8b. One of the pressure chambers 41a is held in fluid communication with a high pressure chamber 19 via an orifice 47 formed in the side block 7 so that a metered flow of high pressure discharge gas is introduced into the pressure chambers 41a, 41b through the orifice 47. The other pressure chamber 41b is connected with a low pressure chamber 18 through a connecting passage 48 formed in the side block 7.

The connecting passage 48 is opened and closed by a control valve 49 disposed in the side block 7 and the



second head 8b. The control valve 49 includes a bellows 50 capable of expanding and contracting in response to the pressure in the low pressure chamber 18, a ball valve element 51 connected to one end of the bellows 50, and a valve seat 52 against which the valve element 51 is seated. The control valve 49 thus constructed operates to vary the open area between the valve element 51 and the valve seat 52, thereby adjusting the rate of communication between the low pressure chamber 18 and the pressure chambers 41a, 41b.

Operation of the displacement-adjustment mechanism is described in detail. When the vehicle is cruising at low speed, the pressure in the low pressure chamber 18 is high. Under such condition, the bellows 50 of the control valve 49 is kept contracted to thereby move the valve element 51 in a direction to reduce the open area between the valve element 51 and the valve seat 52. Consequently, the amount of high pressure gas introduced through the orifice 47 into the pressure chambers 41a, 41b exceeds the amount of gas escaping from the pressure chambers 41a, 41b through the connecting passage 48 into the low pressure chamber 18. Thus the pressure in the pressure chambers 41a, 41b is increased. With this pressure rise, the adjustment member 34 is caused to turn counterclockwise against the bias of the spring 38, thereby displacing the compression starting position in the counterclockwise direction. As a result, the compression starting timing is advanced, thereby increasing the amount of gas to be trapped in the



compression chambers 9a - 9e. The compressor is thus driven at a large displacement.

Conversely, when the vehicle is cruising at high speed, the pressure in the low pressure chamber 18 is low. Consequently, the bellows 50 of the control valve 49 is caused to expand to thereby move the valve element 51 in a direction to increase the open area between the valve element 51 and the valve seat 52. Under such condition, the amount of gas escaping from the pressure chambers 41a, 41b is increased and hence the pressure in the pressure chambers 41a, 41b is reduced. With this pressure drop, the adjustment member 34 is caused to turn clockwise under the force of the spring 38, thereby displacing the compression starting position in the clockwise direction. As a result, the timing when the cut-out recesses 37a, 37b are closed by the succeeding vanes 6a - 6e is retarded. With this delaying, gas in the compression chambers 9a - 9e flows back into the low pressure chamber 18, thereby reducing the amount of gas to be compressed in the compression chambers 9a - 9e. The compressor is thus driven at a reduced displacement.

Other structural details of the compressor are the same as those of the first embodiment and hence will require no further description. For easy reference, like or corresponding parts are indicated by the like or corresponding reference characters throughout several views.



FIG. 8 shows a fourth embodiment of the present invention, wherein each of the left and right halves of a generally U-shaped high pressure chamber 19 is connected with one of a pair of valve receiving chambers (identical with the valve receiving chamber 28a shown in FIG. 2) via a pair of discharge connecting holes 31a, 31b; 31c, 31d, and wherein the left and right halves of the U-shaped high pressure chamber 19 are connected together via a fourth discharge connecting hole 53 defined in the second head 8b and extending between the opposite ends of the U-shaped high pressure chamber 19 behind an intake port 20. With this construction, an improved flow of the compressed refrigerant gas is accomplished.

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



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A sliding-vane rotary compressor comprising:

(a) a cylinder having an intake hole and a discharge hole, and a rotor rotatably disposed in said cylinder so as to define therebetween an operating compartment, said rotor carrying thereon a plurality of approximately radially movable sliding vanes, there being defined between said cylinder, said rotor and said vanes a plurality of compression chambers which vary in volume with each revolution of said rotor so as to compress a gas sucked therein through said intake hole and thereafter discharge the compressed gas therefrom through said discharged hole;

(b) a first head closing one of opposite open ends of said cylinder;

(c) a side block closing the other open end of said cylinder;

(d) a second head secured to said side block;

(e) said side block and said second head defining therebetween a low pressure chamber communicating with said intake hole and a high pressure chamber communicating with said discharge hole; and

(f) a displacement-adjustment mechanism incorporated in said side block and said second head for adjusting displacement of the compressor, wherein

said displacement-adjustment mechanism includes:



an adjustment member rotatably disposed in said side block for adjusting a compression starting position;

resilient means for urging said adjustment member to turn in one direction;

means defining a pressure chamber for producing a pressure acting on said adjustment member to urge the latter to turn in the opposite direction against the force of said resilient means, said pressure chamber being connected with said high pressure chamber via an orifice; and

a control valve for adjusting the rate of communication between said pressure chamber and said low pressure chamber according to the pressure in said low pressure chamber.

2. A sliding-vane rotary compressor substantially hereinbefore described with reference to the drawings.

DATED this 15th day of September, 1989

Diesel Kiki Co. Ltd.

By its Patent Attorneys

DAVIES & COLLISON



FIG. 1

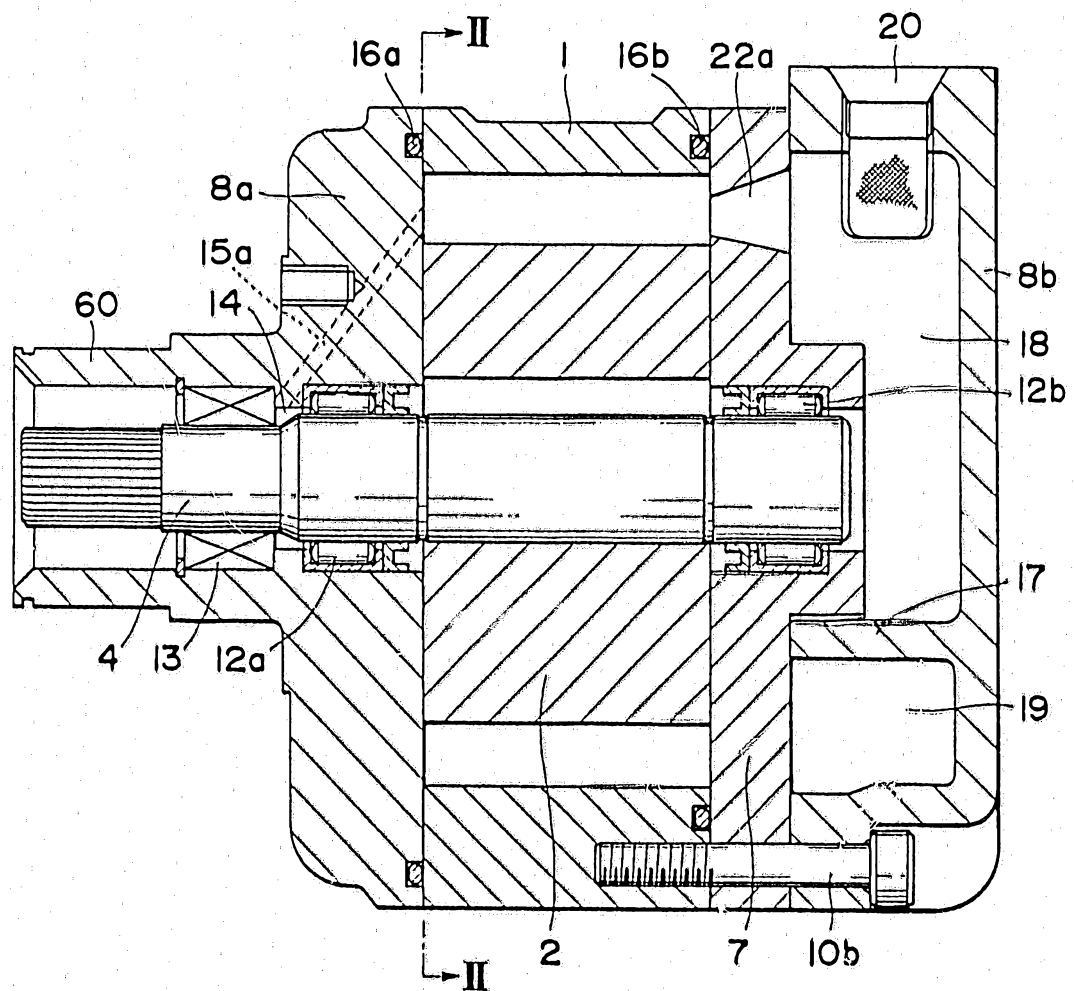


FIG. 2

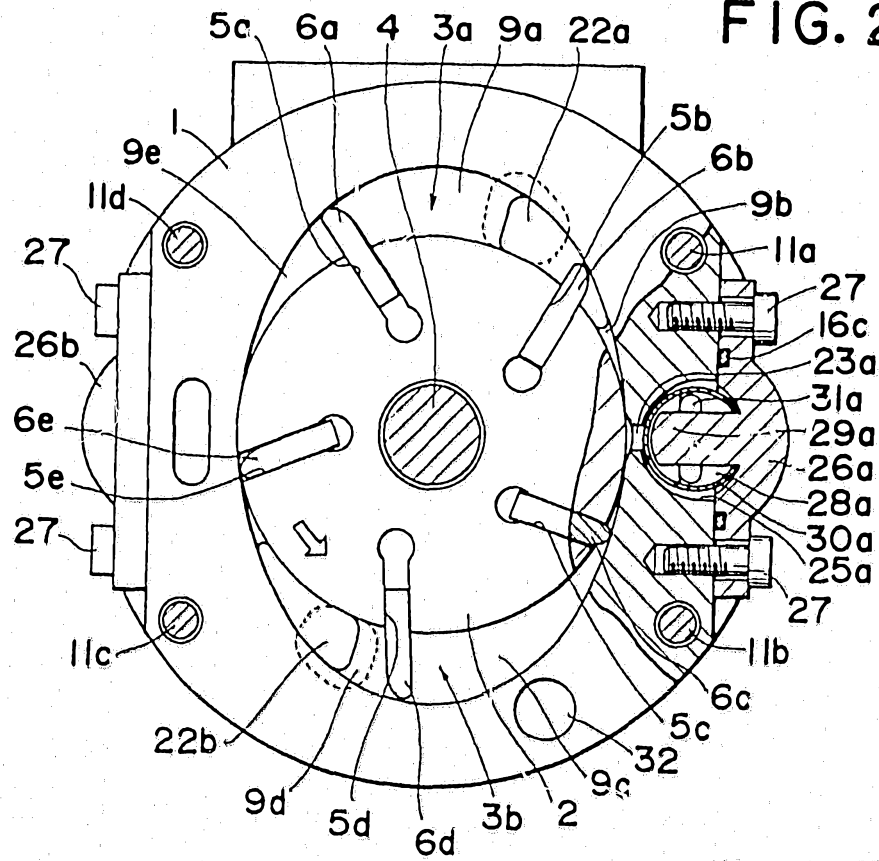


FIG. 3

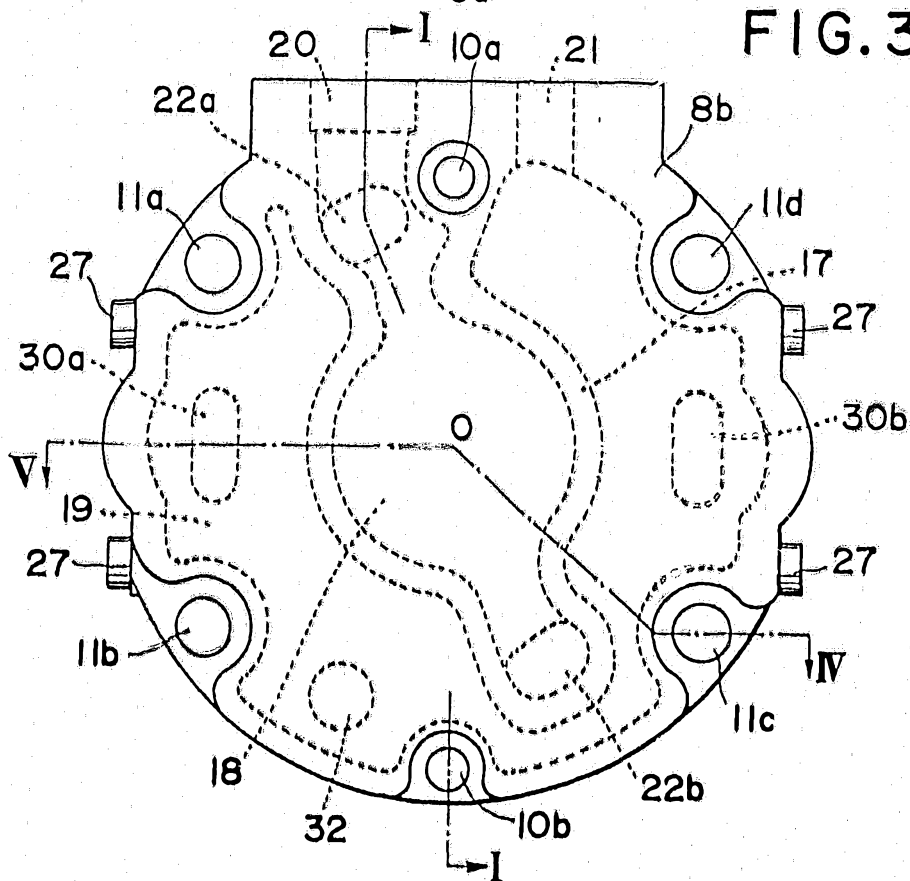


FIG. 4

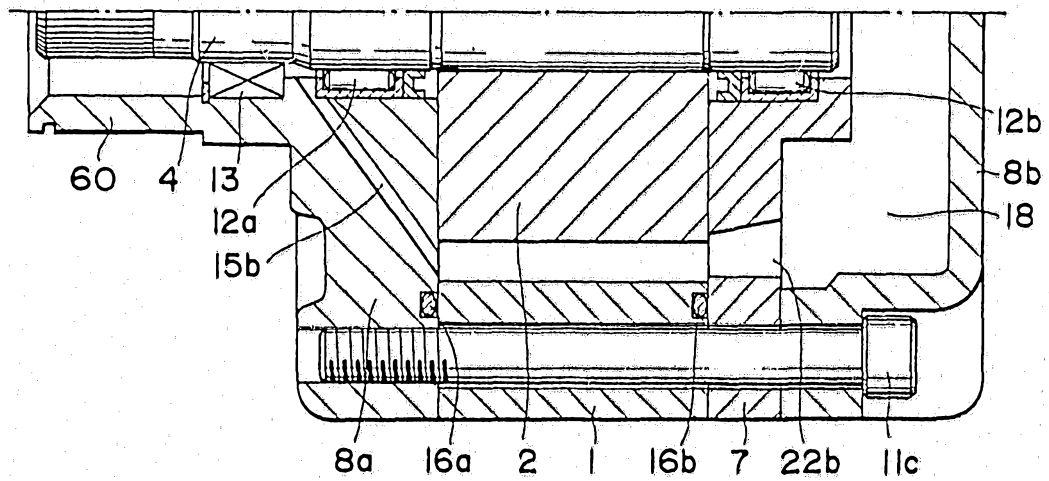
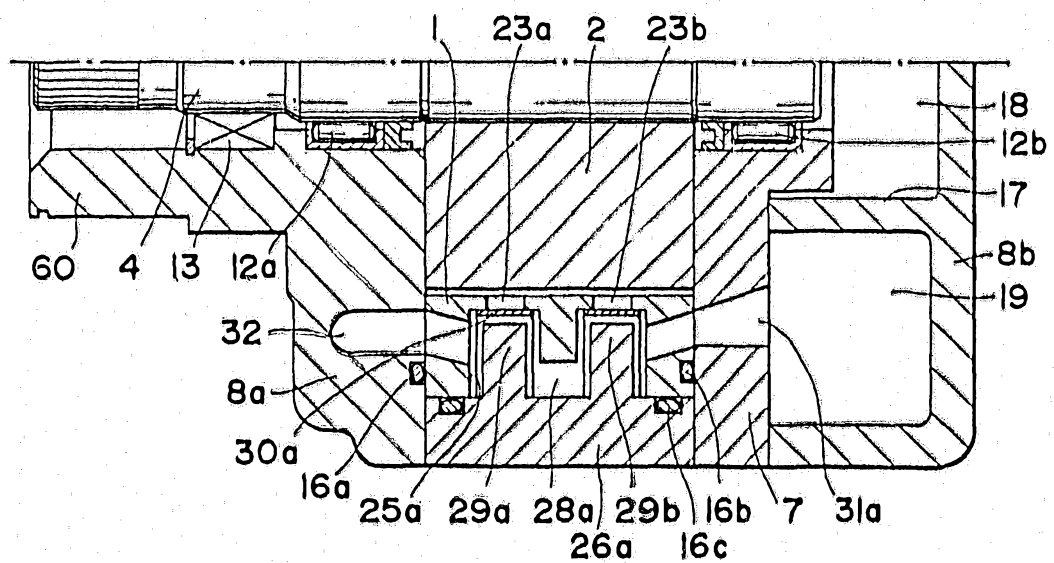


FIG. 5



80124

FIG. 6

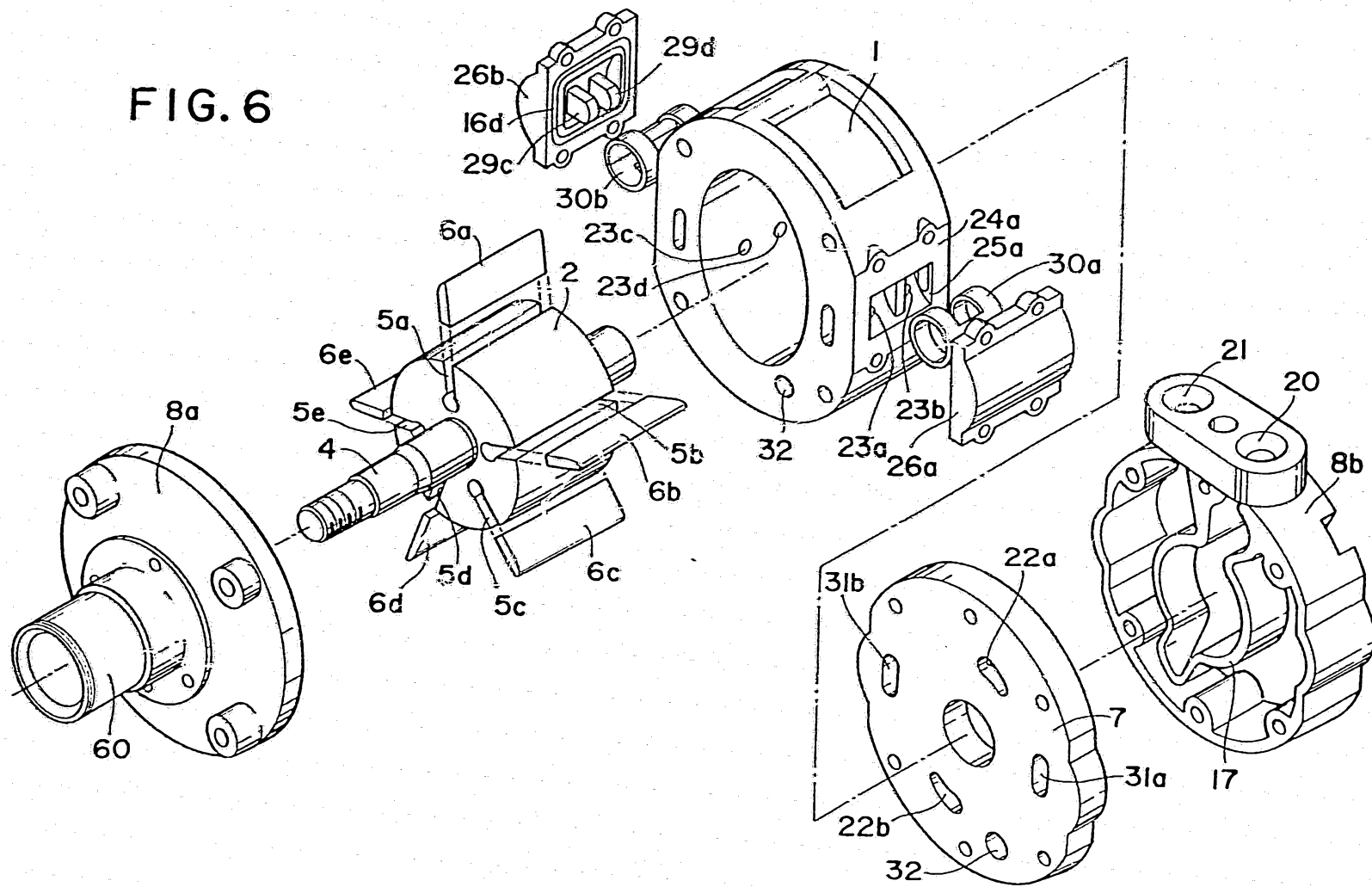


FIG. 7

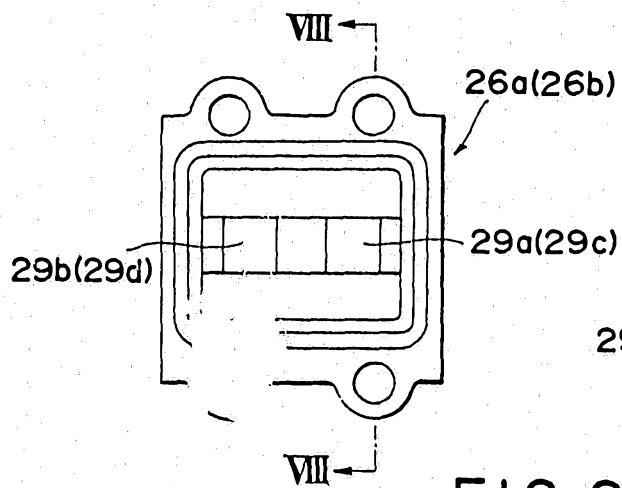


FIG. 8

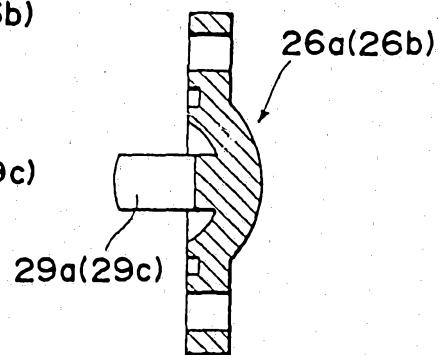


FIG. 9

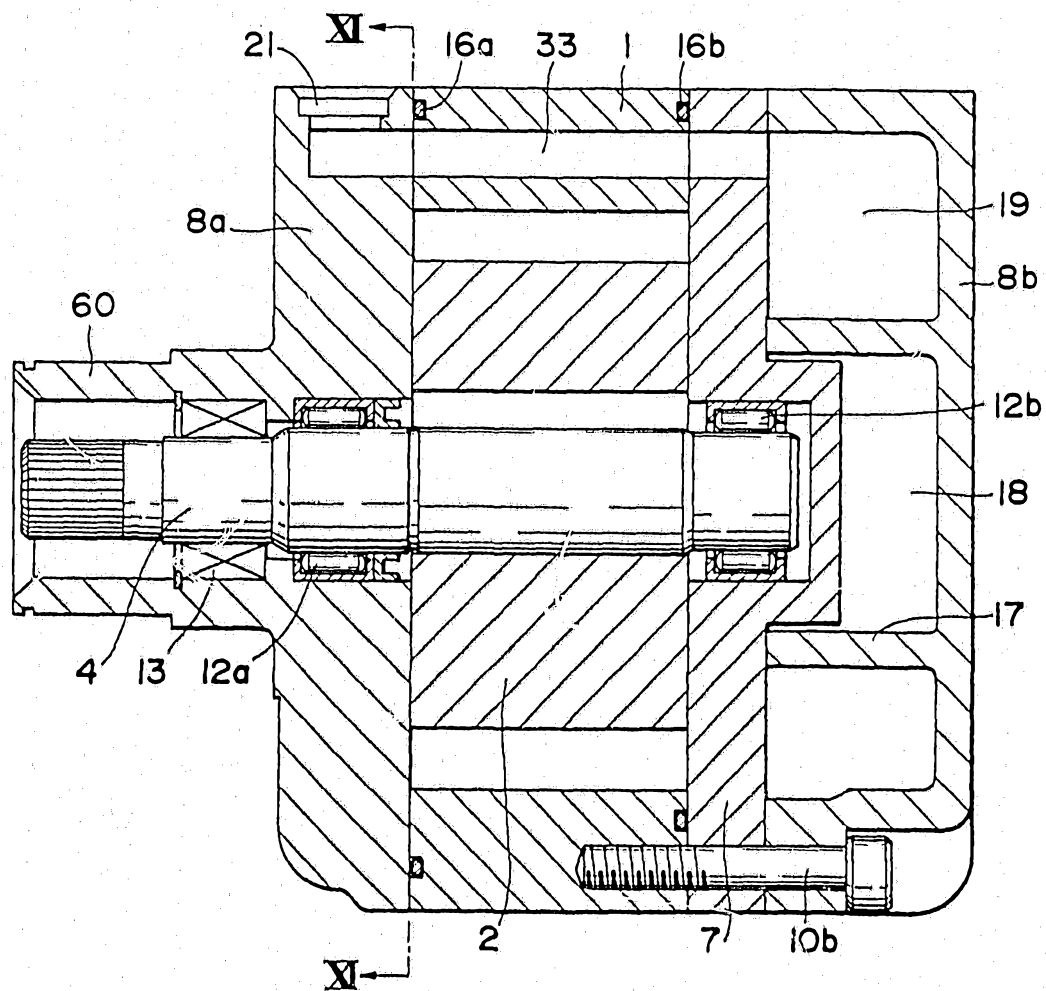


FIG. 10

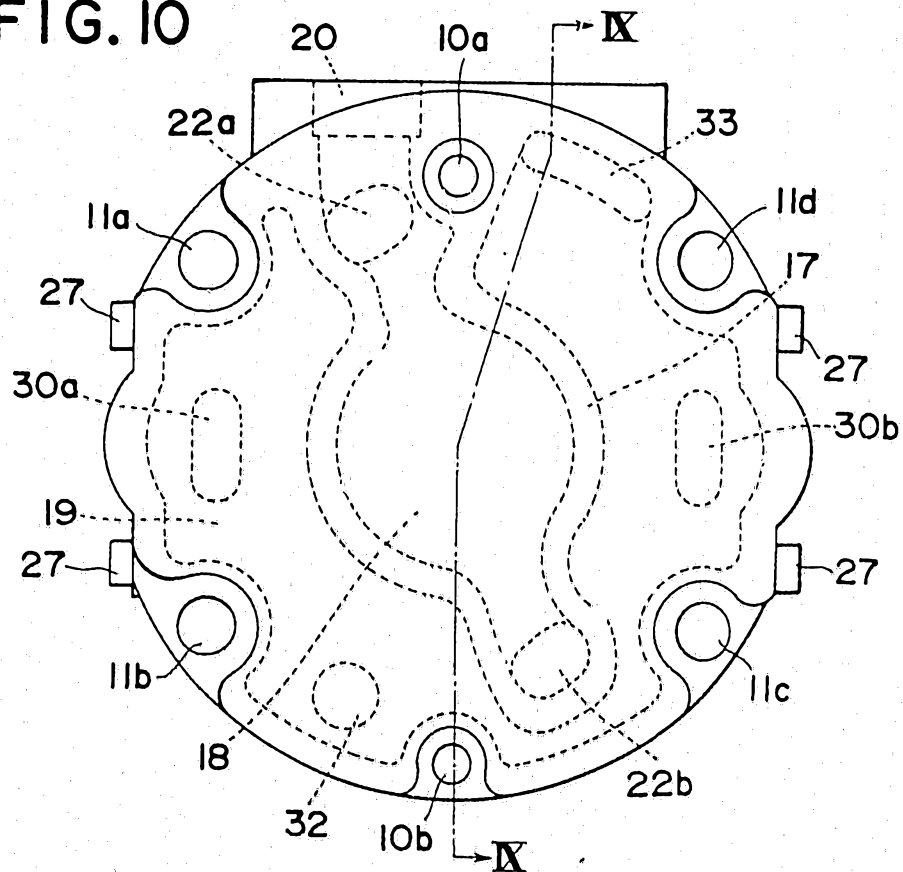


FIG. 11

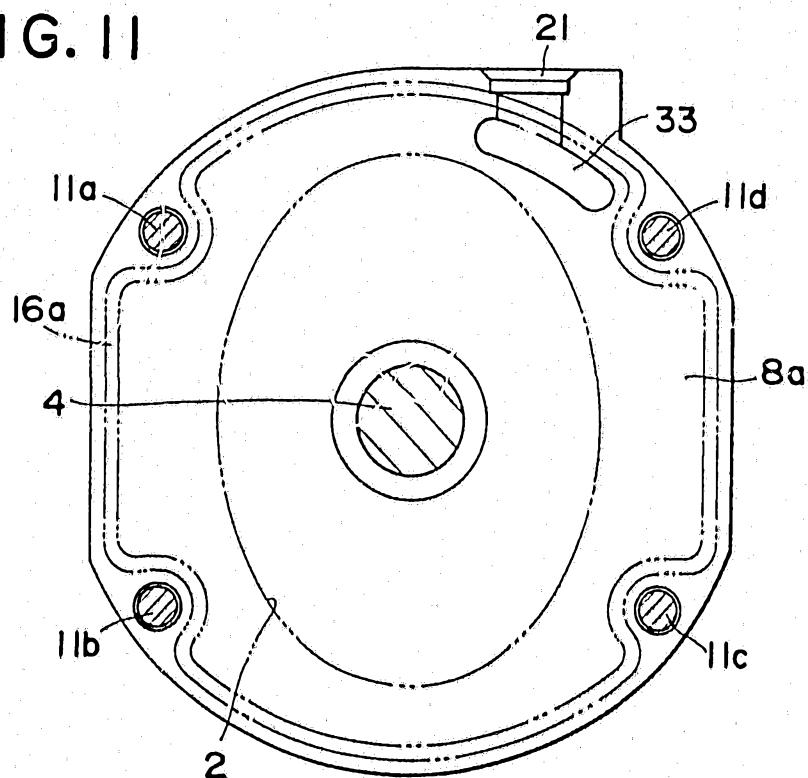
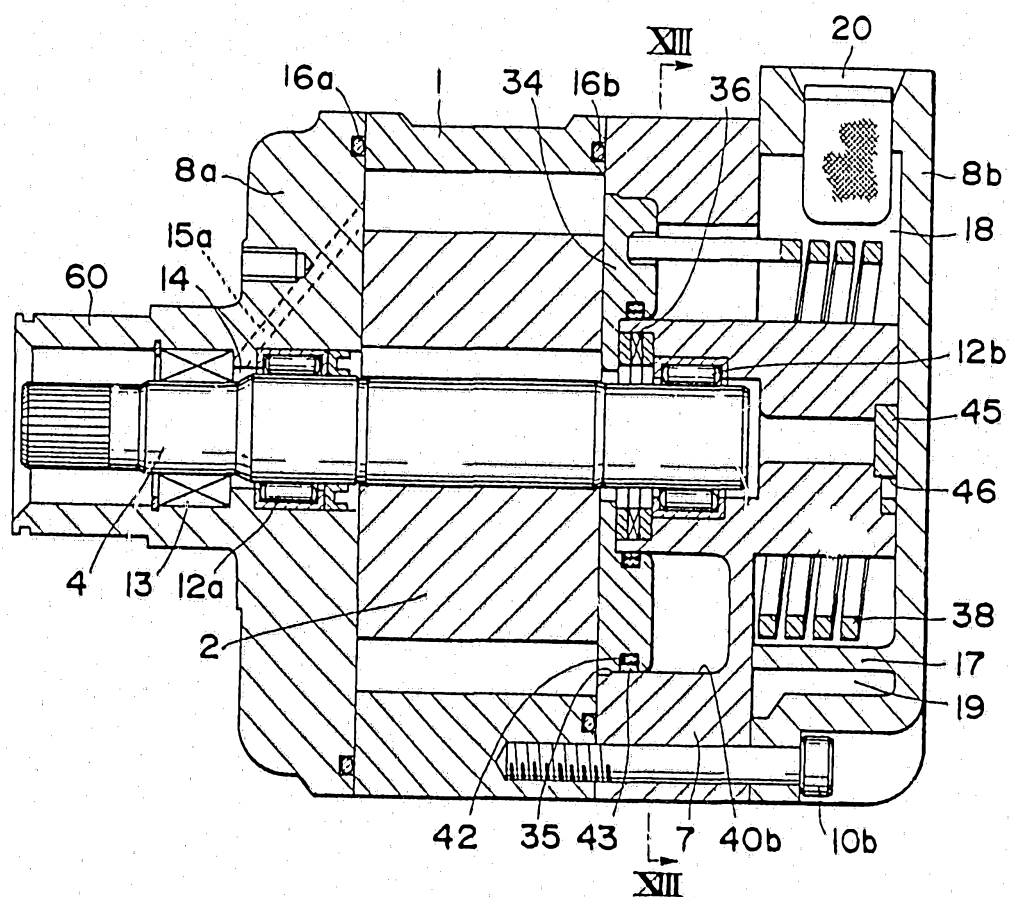


FIG. 12



80124/87

FIG. 13

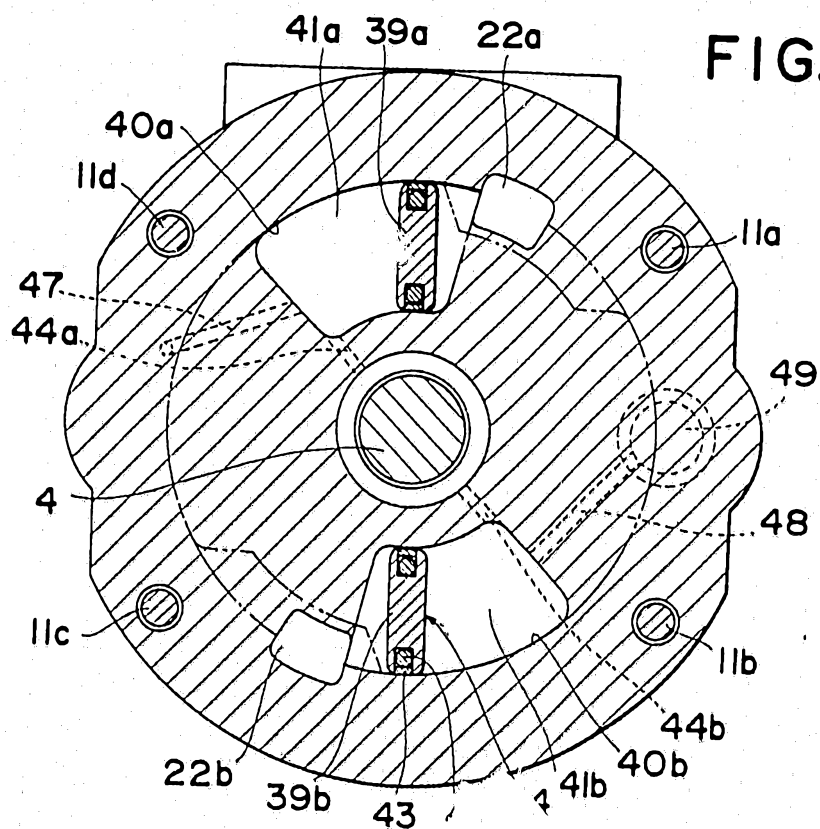
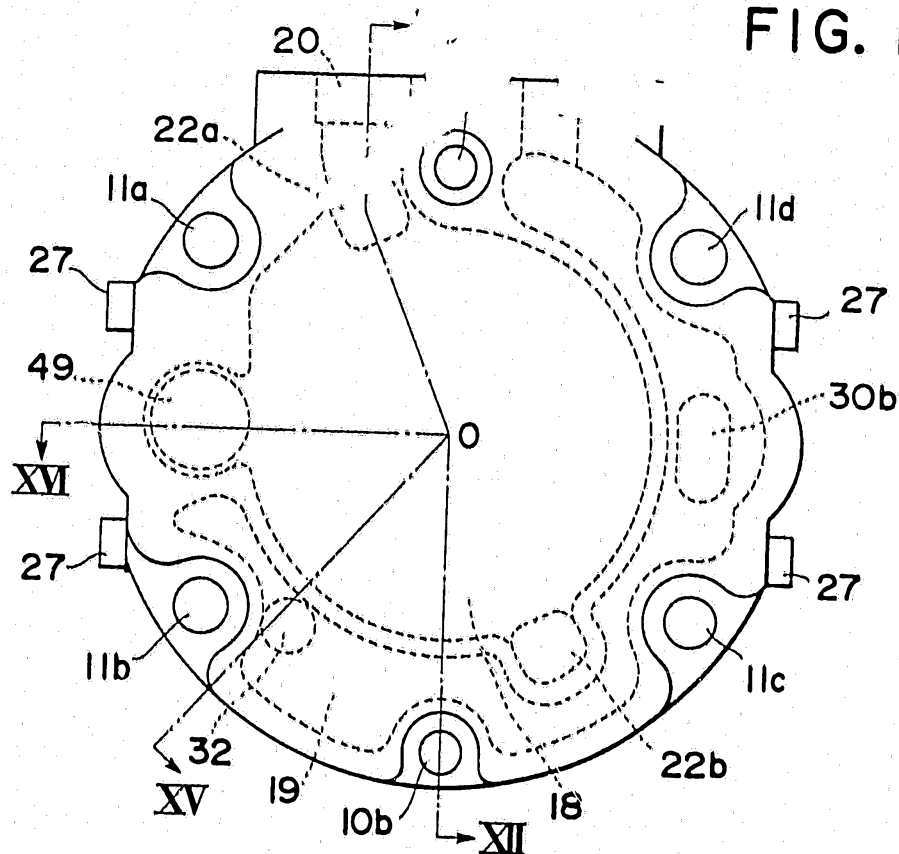


FIG. 14



80124/87

FIG. 15

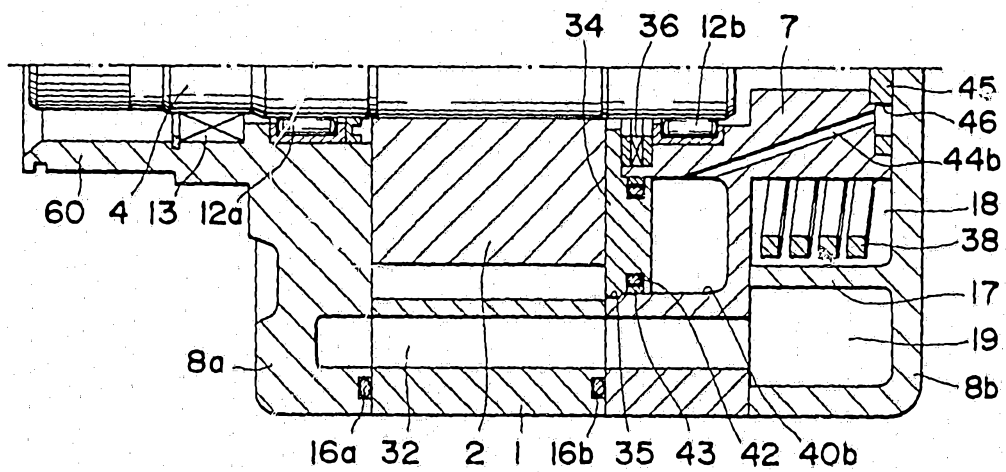


FIG. 16

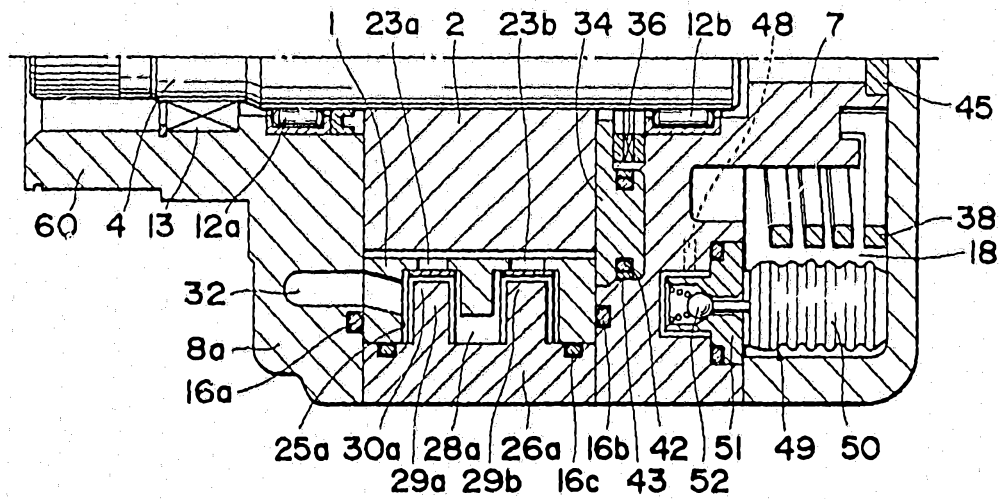


FIG. 17

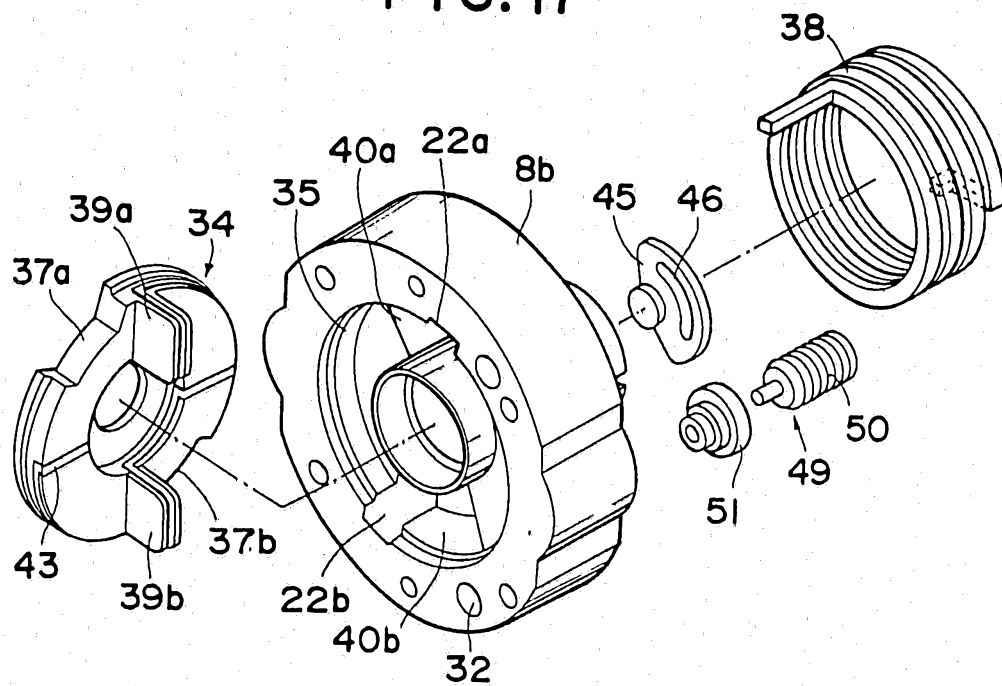


FIG. 18

