FORM 1 SPRUSON & FERGUSON

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

603367

APPLICATION FOR A STANDARD PATENT

Sanden Corporation, of 20 Kotobuki-Cho, Isesaki-Shi, Gunma, 372, JAPAN, hereby apply for the grant of a standard patent for an invention entitled:

Wobble plate type compressor with variable capacity mechanism

which is described in the accompanying complete specification.

Details of basic application(s):-

Basic Applic. No:	Country:	Application Date:
P 169,897/61	JAPAN	21 July 1986

The address for service is:-

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DATED this TWENTIETH day of JULY 1987

Sanden Corporation

By: M.J. Anderson

Registered Patent Attorney

TO: THE COMMISSIONER OF PATENTS
OUR REF: 31030
S&F CODE: 61189

LODGED AT SUB-OFFICE
20 JUL 1987
Sydney

5845/4

APPLICATION ACCEPTED AND AMENDMENTS

ALLOWED 24-8-90

FEE STAMP TO VALUE OF $ 165.00 ATTACHED
MAIL OFFICER

Spruson & Ferguson

AUSTRALIA
CONVENTION
STANDARD
& PETTY PATENT
DECLARATION
SFP4

COMMONWEALTH OF AUSTRALIA

THE PATENTS ACT 1952

DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT

In support of the Convention Application made for a patent for an invention entitled:

Title of Invention: "Wobble Plate Type Compressor With Variable Capacity Mechanism"

I/~~We~~ Tomoaki Ushikubo

Full name(s) and address(es) of Declarant(s)

of 185 Kotobuki-cho, Isesaki-shi, Gunma, 372 Japan

do solemnly and sincerely declare as follows:-

Full name(s) of Applicant(s)

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

(or, in the case of an application by a body corporate)

1. I am/We ~~are~~ authorised by Sanden Corporation

the applicant(~~s~~) for the patent to make this declaration on its/~~their~~ behalf.

2. The basic application(~~s~~) as defined by Section 141 of the Act was/~~were~~ made

Basic Country(ies) in Japan

Priority Date(s) on 21st July, 1986

Basic Applicant(s) by Sanden Corporation

~~3. I am/We are the actual inventor(s) of the invention referred to in the basic application(s)~~

Full name(s) and address(es) of inventor(s)

(or where a person other than the inventor is the applicant)

3. Yukihiko Taguchi

of 4-358-1 Hiyoshi-cho, Maebashi-shi, Gunma, 371 Japan

~~(respectively)~~

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

Set out how Applicant(s) derive title from actual inventor(s) e.g. The Applicant(s) is/are the assignee(s) of the invention from the inventor(s)

The said applicant is the assignee of the actual inventor.

4. The basic application(~~s~~) referred to in paragraph 2 of this Declaration was/~~were~~ the first application(~~s~~) made in a Convention country in respect of the invention(~~s~~) the subject of the application.

Declared at Isesaki this 26th day of June, 1987

T. Ushikubo

Signature of Declarant(s)

SFP4 To: The Commissioner of Patents 11/81

(12) PATENT ABRIDGMENT (11) Document No. AU-B-75913/87
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 603367

(54) Title
VARIABLE DISPLACEMENT WOBBLE PLATE COMPRESSOR

International Patent Classification(s)
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(21) Application No. : 75913/87 (22) Application Date : 20.07.87

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(56) Prior Art Documents
US 4687419
US 4475871

(57) Claim

1. A wobble plate type compressor including a compressor housing having a cylinder block provided with a plurality of cylinders and a crank chamber adjacent said cylinder block, a piston slidably fitted within each of said cylinders and reciprocated by a wobble plate driven by a drive mechanism, (of which a stroke is varied by changes of pressure in said crank chamber,) a front end plate disposed on said compressor housing for rotatably supporting said drive mechanism, a rear end plate disposed on the opposite end of said compressor housing and having a suction chamber and a discharge chamber, a passageway connecting said crank chamber with said suction chamber, and variable capacity control means for controlling the closing and opening of said passageway, wherein said variable capacity control means includes a first valve control means for controlling movement of a valve element to open and close said passageway in response to changes of refrigerant pressure in the compressor, and a second valve control means coupled to said first valve control means for forcibly opening said passageway and operating said compressor at high capacity despite the operation of said first valve control means which would otherwise cause said compressor to operate at a lower capacity.

S & F Ref: 31030

FORM 10

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE:

Class Int Class

Complete Specification Lodged:
Accepted:
Published:

Priority:

Related Art:

Name and Address of Applicant: Sanden Corporation
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JAPAN

Address for Service: Spruson & Ferguson, Patent Attorneys
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Complete Specification for the invention entitled:

Wobble plate type compressor with variable capacity mechanism

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

5845/5

ABSTRACT

This invention is directed to a wobble plate type compressor which is provided with a variable displacement mechanism. The variable displacement mechanism controls the slant angle of the wobble plate due to the change of pressure in the crank chamber, and comprises a passageway communicating the suction chamber and the crank chamber, and a valve mechanism to control the opening and closing of the passageway. The valve mechanism includes a first valve control means for directly controlling the opening and closing of the passageway and a second valve control means which is complied with the first valve means and forcibly opens the passageway while opening itself.

The present invention relates to a wobble plate type compressor for automotive air conditioner, and more particularly, to a wobble plate type compressor with a variable capacity mechanism which has an effective characteristic for cooling down.

One construction of a wobble plate type compressor with a variable capacity mechanism which is suitable use for in automotive air conditioners is disclosed in U.S. Pat. No. 3,861,829. The change of inclined angle of a wobble plate of the above compressor is accomplished by adjusting the pressure in a crank chamber, i.e., adjusting gas pressure added to the rear side of the pistons.

Referring to Fig. 1, the construction of a conventional wobble plate type compressor is shown. The compressor includes a compressor housing 1 having a cylinder block 2 which is provided with a plurality of cylinders 21 and a crank chamber 3, and a cylinder head 4 which is mounted on one end portion of the cylinder block 2 through a valve plate 5. The drive shaft 6 is rotatably supported on a tubular extension 11 which is formed on the other end of the compressor housing 1 through a bearing 7, and, the inner terminal end of the drive shaft 6 is extended within the crank chamber 3 to form the rotatable support on central hole 21 of cylinder block 2 through bearing 8.

A rotor 9 is fixed on the drive shaft 6 and the end of the rotor 9 is connected to an inclined plate 10 through a hinge mechanism 91. Accordingly, the inclined plate 10 is driven together with the rotor 9 and the hinge mechanism 91 while the incline angle of the plate 10 is varied. The slanted surface of the inclined plate 10 is in close proximity to the surface of the wobble plate 12 which is rotatably supported thereon. A thrust bearing 13 is disposed between the slanted surface of inclined plate 10 and wobble plate 12. A guide bar 14 is axially extended within the crank chamber 3 so as to connect one end of the compressor housing 1 with the cylinder block 2. The lower end portion of the wobble plate 12 engages the guide bar 14 to enable the wobble plate 12 to reciprocate along the guide bar 14 whilst preventing any rotational motion.

A plurality of pistons 15 are slidably fitted within a respective cylinder 22, and are connected to the wobble plate 12 through connecting rods 16. The cylinder head 4 is divided into a suction chamber 41 and a discharge chamber 42.

A control valve mechanism 17 is shown in Fig. 2 and is disposed in the suction chamber 41 controlling the opening and closing of a first channel 18 which communicates the crank chamber 3 with the suction chamber

41. The control valve mechanism 17 includes a first casing 171, a second casing 172 which is fixed on one end surface of the first casing 171, and a bellow 173 which is disposed within the interior space of the first casing 171, and held in position by a coil spring 174. The bellows 173 is provided with a valve portion 173a at the outer end surface thereof and a coil spring (not shown) is disposed within the bellows 173, to control the expansion and contraction of the bellows 173. The first casing 171 is provided with an aperture 171a at its outer peripheral portion to communicate the interior of the first casing 171 with the suction chamber 41. The second casing 172 is provided with a second channel 172a communicating with the suction chamber 3 through the first channel 18, and a third channel 172b which communicates the interior of the first casing 171 with the crank chamber 3 through both the first channel 18 and second channel 172a. Thus, the crank chamber 3 and the suction chamber 41 communicate with one another through the control valve mechanism 17.

The operation of the control valve mechanism 17 is such that if pressure in the suction chamber 41 exceed a predetermined valve, the bellows 173 in the first casing 171 shrink, and this moves the valve portion 173a towards the left in the drawing. Accordingly, the opening of the third channel 172b opens the crank chamber 3 to the suction chamber 41 through the first channel 18, the second channel 172a and the third channel 172b. Therefore, the pressure in the crank chamber 3, when the rear pressure on the pistons 15 is decreased, increases the inclined angle of the wobble plate 12. As a result. the stroke volume of the pistons 15 is increased, and the capacity of the compressor is also increased.

Reversely, if the pressure in the suction chamber 41 below the predetermined value, the bellows 173 is the first casing 171 extend, and move the valve portion 173a towards right in the drawing. Accordingly, when the third channel 172b is closed, the communication between the crank chamber 3 and the suction chamber 41 is interrupted. The pressure in the crank chamber 3 is thus gradually increased by gas leakage from cylinders 22. Therefore, the rear pressure to the pistons 15 is increased, and the inclined angle of wobble plate 12 is decreased. As a result, the stroke volume of the pistons 15 is decreased, and the capacity of the compressor is decreased.

In an automotive air conditioning system in which the abovementioned compressor is included, if the compressor is initially started under the condition that the thermal load in a compartment of a car is large and the engine is driven at high revolution, such as during high drive of a car,

the pressure in the suction chamber of the compressor is rapidly decreased until a predetermined value of the control mechanism is reached. Therefore, the capacity control mechanism of the compressor is operated in spite of the insufficient decrease of a temperature in the compartment of the car. Thus, the characteristic of cooling down in the above compressor is not as good as compared with a conventional wobble plate type compressor without a variable capacity mechanism.

Accordingly, it is a primary object of this invention to provide a wobble plate type compressor with a capacity mechanism which can more relevantly control the temperature in a compartment of a car.

A wobble plate type compressor according to this invention includes a compressor housing having a cylinder block provided with a plurality of cylinders and a crank chamber adjacent the cylinder block. A piston is slidably fitted within each of the cylinders and reciprocated by a swash plate driven by a drive mechanism. A stroke of the piston is varied by changes of pressure in the crank chamber. A front end plate is mounted on the compressor housing and rotatably supports the drive mechanism. A rear end plate is mounted on the opposite end of the compressor housing and divides its interior space into a suction chamber and a discharge chamber. A passageway is formed through the housing to connect between the crank chamber and the suction chamber. A variable capacity control means is disposed on the rear end plate for controlling the open and close of the passageway. The variable capacity control means includes a first valve control means for controlling movement of a valve element to open and close the passageway in response to changes of refrigerant pressure in the compressor, and second valve control means coupled to the first valve control means to forcibly open the passageway in spite of the movement of the first valve control means.

Further objects, features and aspects of this invention will be understood from the following detailed description of a preferred embodiments of this invention, while referring to the annexed drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a cross-sectional view of a conventional wobble plate type compressor with a variable capacity mechanism.

Fig. 2 is a cross-sectional view of a variable capacity mechanism shown in Fig. 1.

Fig. 3 is a cross-sectional view of a wobble plate type compressor with a variable capacity mechanism in accordance with one embodiment of this invention.

Fig. 4 is a cross-sectional view of a control valve mechanism shown in Fig. 3.

Fig. 5 is a cross-sectional view of an electromagnetic actuator shown in Fig. 3.

Fig. 6 is a cross-sectional view of a variable capacity mechanism which includes a control valve mechanism and an electromagnetic actuator shown in Fig. 3.

Fig. 7 is a graph which shows the relationship between time and temperature for cooling down in a wobble plate type compressor with a conventional variable capacity mechanism or a present variable capacity mechanism.

Fig. 8 is a cross-sectional view of a wobble plate type compressor which is shown in Fig. 8.

Fig. 9 is a cross-sectional view of a variable capacity mechanism which is modified to that shown in Fig. 6.

Fig. 10 is a part of a cross-sectional view of a wobble plate type compressor in accordance with another embodiment of this invention.

Fig. 11 is a cross-sectional view of a vacuum actuator shown in Fig. 8.

With reference to Fig. 3, the construction of a wobble plate type compressor with a variable capacity mechanism in accordance with one embodiment of this invention is shown. The compressor includes a front end plate 30, a compressor housing 31 which is provided with a crank chamber 32 and a cylinder block 33, and a cylinder head 34 which is attached on one end surface of the cylinder block 33 through a valve plate 35 by securing belts (not shown).

A drive shaft 36 is rotatably supported within the front end plate 30 through a bearing 301 at one end thereof and extends into a central aperture 331 of the cylinder block 33. The other end of the drive shaft 36 is rotatably supported within the cylinder block 33 through a bearing 332 in the central hole 331.

A rotor 37 is fixedly disposed on the outer terminal end of the drive shaft 36 and is connected to an inclined plate 38 through a hinge mechanism 39. The inclined plate 38 is axially and movably disposed on the outer surface of the drive shaft 36 and rotates together with the rotor 37. The hinge mechanism 39 includes a pin 391 which is fixed within a hole 371 of the rotor 37 and a longitudinal hole 381 of the inclined plate 38. The other end of the pin 391 is movably fitted within the longitudinal hole 381 to operate the inclined plate 38 axially.

A wobble plate 40 is placed in close proximity to the surface of the inclined plate 38 and is radially supported on the outer surface of a tubular portion 382 of the inclined plate 38 through a bearing 383. A thrust needle bearing 40 is disposed between the sloping surface on the inclined plate 38 and wobble plate 40. The lower end portion of the wobble plate 40 engages a guide bar 42 to enable the wobble plate 40 to reciprocate along the guide bar 42 while preventing any rotational movement.

A plurality of pistons 43 are reciprocably fitted within respective cylinders 333 and each of the pistons 42 is connected to the other end of the wobble plate 40 through respective connecting rods 44. The cylinder block 34 is divided into a suction chamber 341 and a discharge chamber 342 and each of the chambers 341, 342 is in communication with a refrigerant circuit through an inlet or outlet port (not shown).

A control valve mechanism 45 is disposed in a cavity 334 of the cylinder block 33 and controls the opening and closing of the channel 335, which communicates the crank chamber 32 with the cavity 334. An electromagnetic actuator 46 projects into the suction chamber 341, which is connected to one end of the control valve mechanism 45 through a bracket 47.

Referring to Fig. 4, the construction of the control valve mechanism 45 is shown. The control valve mechanism 45 includes a cup shaped casing 451 which is provided with an aperture 451a at its peripheral portion to connect the interior of the casing 451 with the crank chamber 32 through the channel 335 and aperture 451b, and the bellow 452 which is disposed within the interior of the casing 451. An o-ring 453 is disposed on the outer surface of the casing 451 for sealing the inner surface of the cavity 334 and the outer peripheral surface of the valve mechanism 45.
The bellows 452 is provided with an adjusting screw 452a for adjusting the operating point of the bellows 452, which is attached on the upper end surface thereof, and the valve portion 452b which is fixed on the lower end surface thereof. In the above construction, communication between the crank chamber 32 and the suction chamber 46 is controlled in accordance with the operation of the control valve mechanism 45.

An electromagnetic actuator 46 is shown in Fig. 5. The actuator 46 includes a casing 461 within which an electromagnetic coil 463 is disposed, a frame 462 attached on one end surface of the casing 461 and actuator pin 464 which is axially slidably extended within the central aperture of casing 461 and the frame 462. The frame 462 is provided with a cavity 462a and a screw thread 462b which is formed on the other surface thereof. A pin 464 is provided with a radial flange portion 464a which is disposed

within the cavity 462a of the frame 462 for receiving recoil strength of the coil spring 465, and an armature portion 464b which is attracted to the electromagnetic coil 463 as the electromagnetic coil 463 is supplied with an electric current.

Referring to Fig. 6, the construction of an improved variable capacity mechanism is shown, which includes the control valve mechanism 45 and the electromagnetic actuator 46. The control valve mechanism 45 and the electromagnetic actuator 46 are connected through a bracket 47. The bracket 47 includes a cup-shaped casing 471 which is provided with an aperture 471a for communicating the suction chamber 341 with the interior of the casing 471, and an aperture 471b which is formed so as to receive the screw thread 462b of the frame 462. The opening 472 of the cup-shaped casing 471 is threaded on a thread portion 451c of the casing 451. The control valve mechanism 45 and electromagnetic actuator 46 are connected to each other through the bracket 47 by securing each of the screw threads 451c, 462b.

As to the operation of the control valve mechanism 45 and electro-magnetic actuator 46, the control valve mechanism 45 operates to equalize suction pressure whilst detecting the pressure in the crank chamber 32. That is, if the pressure in the suction chamber 342 exceed a predetermined value, the bellows 452 shrink. The aperture 451b of the casing 451 is thus opened. Accordingly, the suction chamber 341 communicates with the crank chamber 32 through the channel 335 formed within the cylinder block 33. The pressure added to the rear of the piston 43 gradually decreases, and the inclined angle of the wobble plate 40 to the drive shaft 36 is decreased. Therefore, the stroke of the piston 43 in the cylinder 333 increases, and the capacity of the compressor becomes large.

On the other hand, if the pressure in the suction chamber 341 is below the predetermined value, the bellows 452 extend. The aperture 451b of the casing 451 is thus closed. Accordingly, the communication between the suction chamber 341 and the crank chamber 32 is interrupted, and the pressure added to the rear of piston 43 gradually increases. The inclined angle of the wobble plate 40 to the drive shaft 36 is gradually increased in accordance with the increase of the pressure in the crank chamber 32. Therefore, the stroke of the piston 43 also gradually decreases, and the capacity of the compressor becomes small.

As mentioned above, the control valve mechanism 45 is operated in accordance with the pressure in the suction chamber 341 to adjust the

inclined angle of the wobble plate 40. That is, the stroke of the piston 43 is controlled so as to make the pressure in the suction chamber 341 a predetermined value.

Furthermore, when the electromagnetic coil 463 is energized, the electromagnetic coil 463 generates electromagnetic force around itself, and attracts the armature portion 464b of the pin 464 toward the casing 461. Accordingly, the pin 464 moves upwardly against the recoil strength of the coil spring 465. Therefore, when the pressure in the suction chamber 341 becomes less than a predetermined value, the bellows 452 extend downwardly, as a resulting pin 464 pushes the valve portion 452b of the bellows 452 upwardly to open the aperture 451b. Thus, the aperture 451b is forcibly opened in spite of the operation of the control valve mechanism 45 while the electromagnetic coil 463 is energized. On the other hand, when the electromagnetic coil 48 is not energized, the operating pin 464 moves downwardly. Therefore, the bellows 452 recover in general operation.

Referring to Fig. 7, the relationship between the characteristic for cooling down in a wobble plate type compressor with a conventional variable capacity mechanism or a variable capacity mechanism in accordance with one embodiment of this invention is shown. Comparison with the above mechanism refers to the temperature in the compartment of a car and of the air blown from a louver. Dotted lines show the temperature in relation to a conventional variable capacity mechanism and solid lines show the temperature. In relation to a variable capacity mechanism in accordance with one embodiment of this invention. This graph indicates that the mechanism in accordance with this invention has better characteristics for cooling down in each of conditions than the conventional mechanism.

As explained with reference to Figures 3 to 6, operation of the bellow 452 is disposed on the space in which the pressure of the crank chamber 32 is introduced, and the pressure of the suction chamber is applied to one end portion of the bellow 452. Alternatively, the bellow may be disposed on the space in which the pressure of the suction chamber 341 is introduced, and the pressure in the crank chamber 32 is applied to one end portion of the bellow 452, as shown in Figure 8. The construction of the control mechanism utilized in this embodiment is the same as the control mechanism 17 which is explained with reference to Figure 2. In this embodiment, as shown in Figure 9, the control mechanism 17 is provided with the electromagnetic actuator 46 of which construction is clearly explained with reference to Figure 5. Therefore, the incline angle of the wobble plate 40 is varied in accordance with the operation of the control

mechanism 17, as previously explained. Furthermore, under the energization of the electromagnetic actuator 46, the compressor is operated at a high capacity.

As shown in the embodiment of Figure 10, a vacuum actuator 50 replaces the electromagnetic actuator 46 of first embodiment. The vacuum actuator 50 includes a casing 502 which is divided into an air chamber 502a and a negative pressure chamber 502b with a diaphram 501, and a tubular extension 503 which is connected with the casing 502. An operating pin 504 is reciprocably disposed within the tubular extension 503 and fixed on the diaphram 501. The tubular extension 503 is provided with a stopper portion 505 for limiting the axial moving range of the operating pin 504 at the inner end portion thereof. A coil spring 506 is disposed between the stopper portion 505 and the diaphram 501 for supporting the diaphram 501 in the stationary position. O-rings 507 and packing 508 are disposed on the outer surface of the operating pin 504 for sealing the pin 504 and tubular extension 503. A screw thread 503a is formed on the outer surface of the tubular extension 503 in order to fix the vacuum actuator 50 within the cylinder head 34, with a nut 51.

When the vacuum actuator 50 is placed on a predetermined position, the outer terminal end of the operating pin 504 is opposed to the valve portion 452b of the bellows 452. When in operation, if a negative pressure is introduced into the interior of the negative pressure chamber 502b through an introduction tube 509, the diaphram 501 is moved towards the negative pressure chamber 502b and moves until one end surface of the diaphram 501 is in contact with the stopper portion 505. Accordingly, the operating pin 504 moves upwardly together with the diaphram 501 and, an upper end of the operating pin 504 pushes the valve portion 452b of the bellows 452 upwardly. Thus, the aperture 451b is forced to open without regard for operation of the control valve mechanism 45. Therefore, the crank chamber 32 communicates with the suction chamber 341, and the stroke of the piston 43 can be maintained at high.

On the other hand, when air is introduced into the interior of negative pressure chamber 502b through the introduction tube 509, the diaphram 501 is forced to return with by the recoil strength of the coil spring 506. Accordingly, the operating pin 504 moves downwardly together with the diaphram 501. Therefore, the control valve mechanism 45 can control the opening and closing of the aperture 451b.

This invention has been described in detail in connection with some preferred embodiments, but these are examples only and this invention is

not restricted thereto. It will be easily understood by those skilled in the art that other variations and modifications can be easily made within the scope of this invention.

The claims defining the invention are as follows:

1. A wobble plate type compressor including a compressor housing having a cylinder block provided with a plurality of cylinders and a crank chamber adjacent said cylinder block, a piston slidably fitted within each of said cylinders and reciprocated by a wobble plate driven by a drive mechanism, (of which a stroke is varied by changes of pressure in said crank chamber,) a front end plate disposed on said compressor housing for rotatably supporting said drive mechanism, a rear end plate disposed on the opposite end of said compressor housing and having a suction chamber and a discharge chamber, a passageway connecting said crank chamber with said suction chamber, and variable capacity control means for controlling the closing and opening of said passageway, wherein said variable capacity control means includes a first valve control means for controlling movement of a valve element to open and close said passageway in response to changes of refrigerant pressure in the compressor, and a second valve control means coupled to said first valve control means for forcibly opening said passageway and operating said compressor at high capacity despite the operation of said first valve control means which would otherwise cause said compressor to operate at a lower capacity.

2. The wobble plate type compressor of claim 1 werein said first valve control means is a bellows.

3. The wobble plate type compressor of claims 1,2 wherein said second valve control means is an electromagnetic actuator.

4. The wobble plate type compressor of claims 1,2 wherein said second valve control means is a vacuum actuator.

5. A wobble plate type compressor substantially as hereinbefore described with reference to Figs. 3 to 8.

DATED this FOURTEENTH day of AUGUST 1990
Sanden Corporation

Patent Attorneys for the Applicant
SPRUSON & FERGUSON

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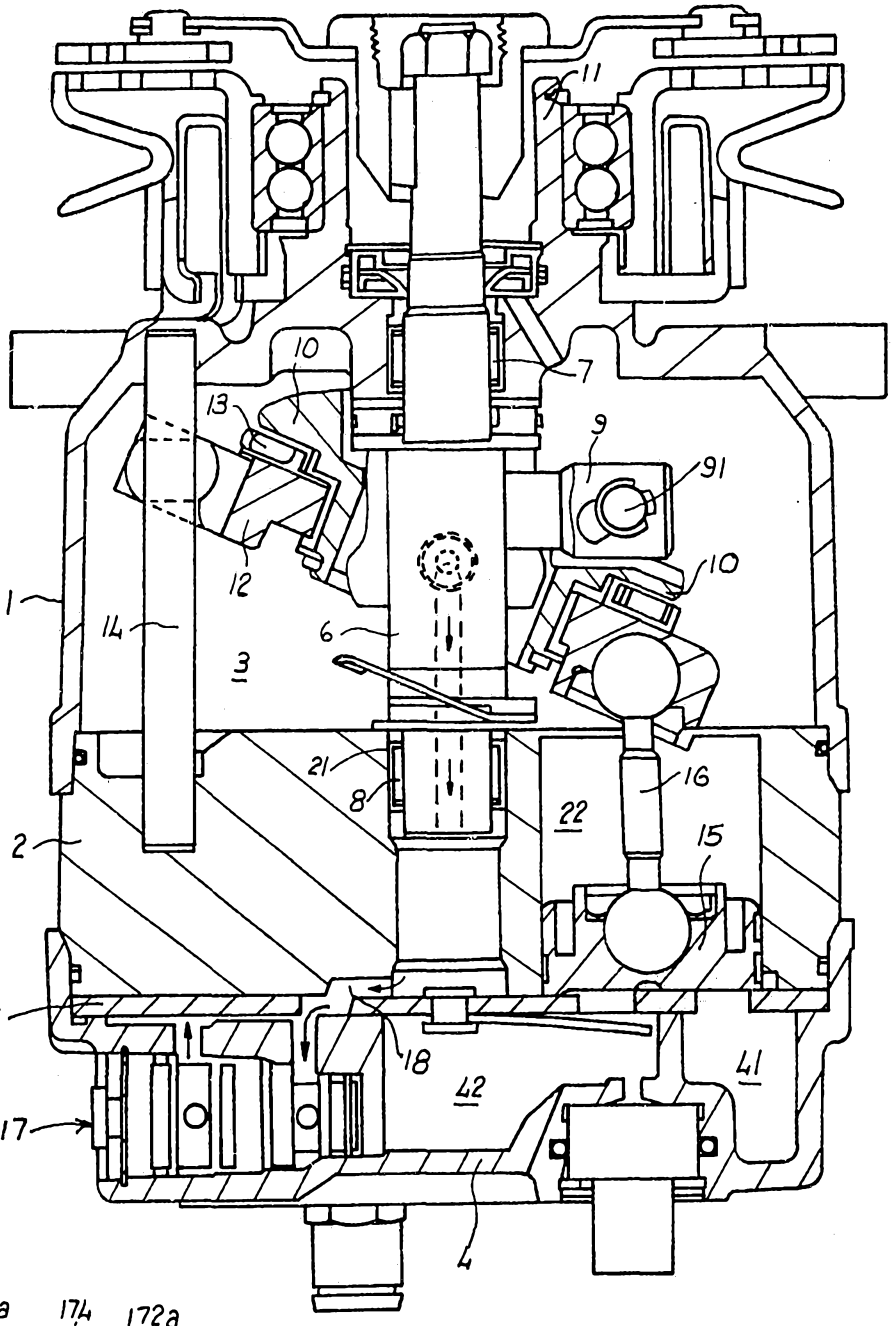
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FIG. 1.

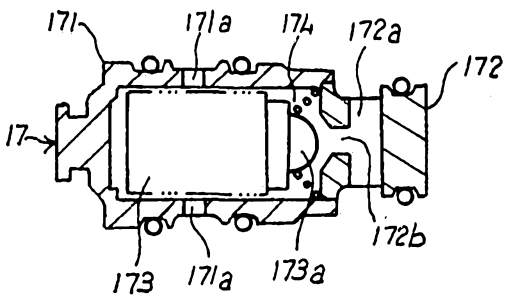
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FIG. 2.

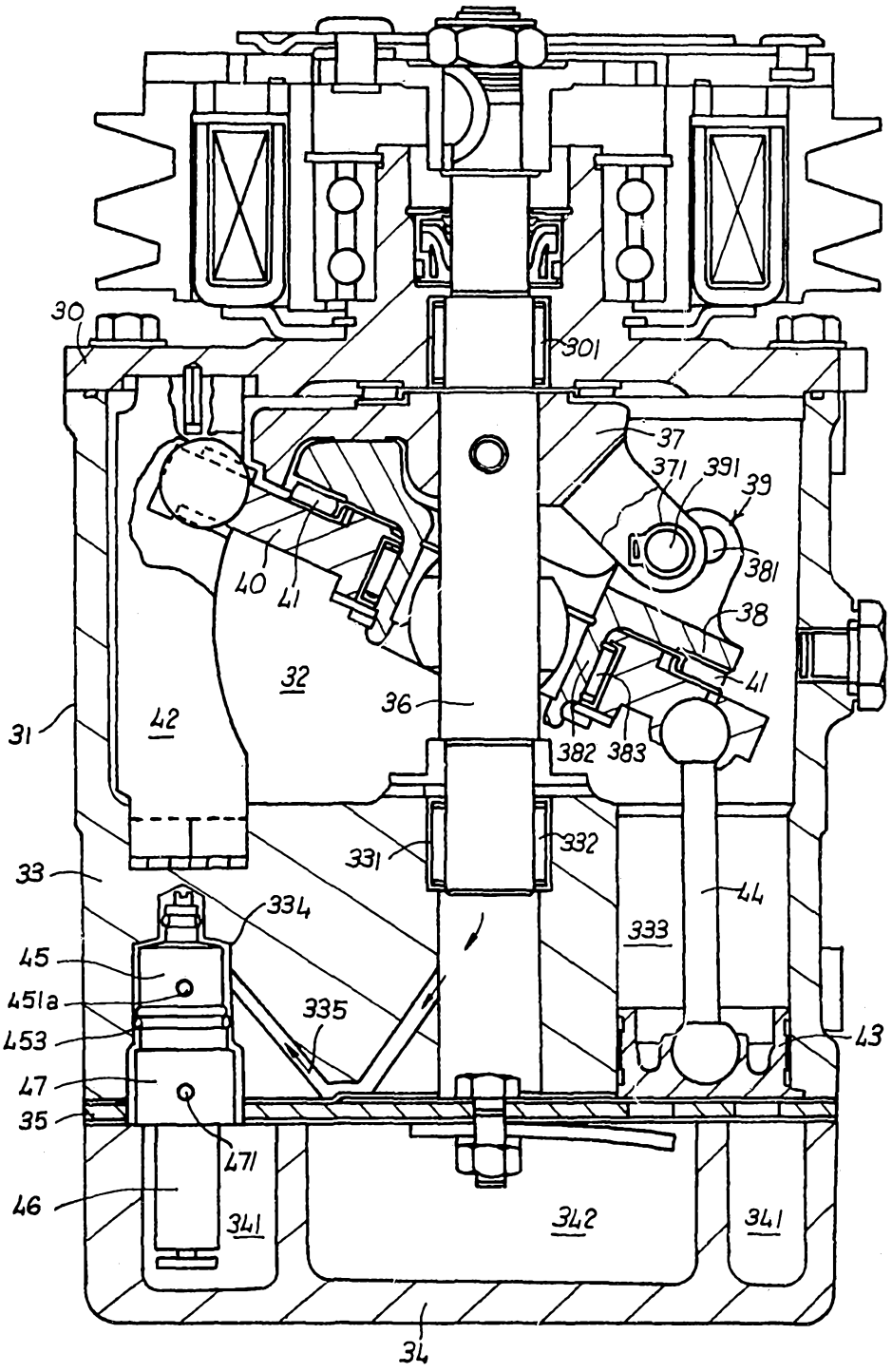
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FIG. 3.

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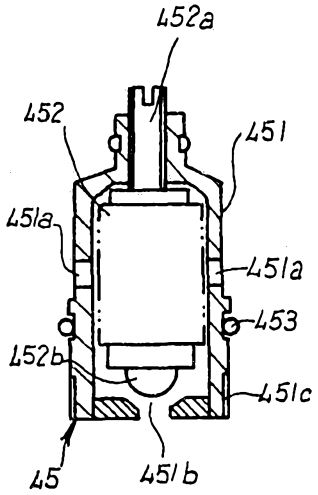

FIG. 4.

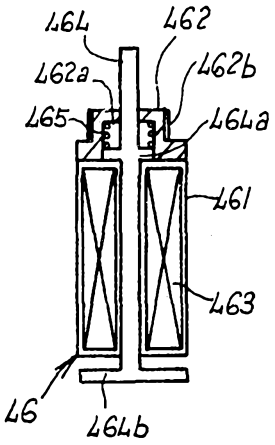

FIG. 5.

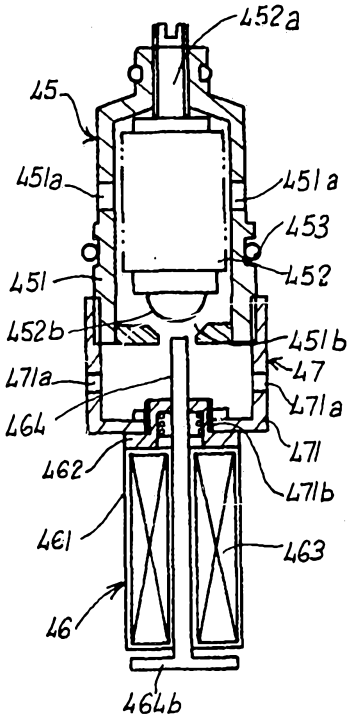

FIG. 6.

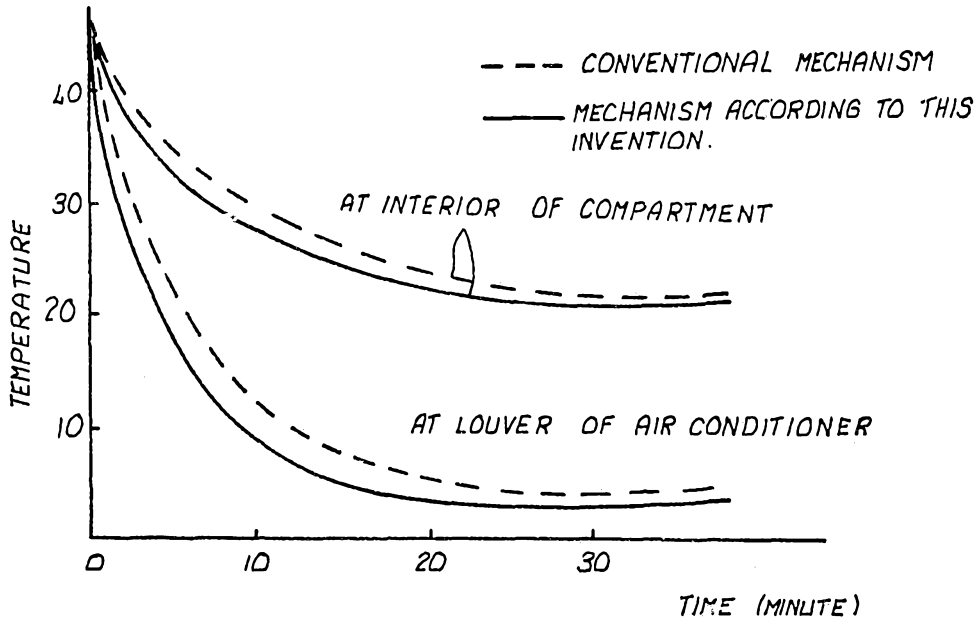

FIG. 7.

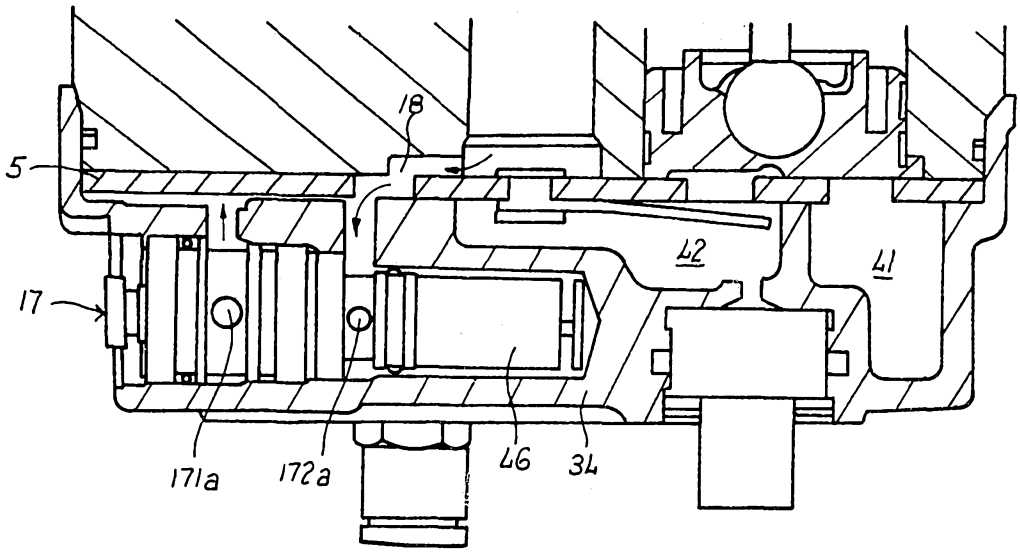
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FIG. 8.

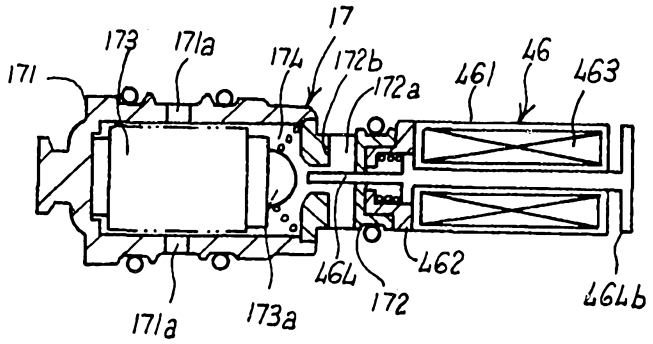
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FIG. 9.

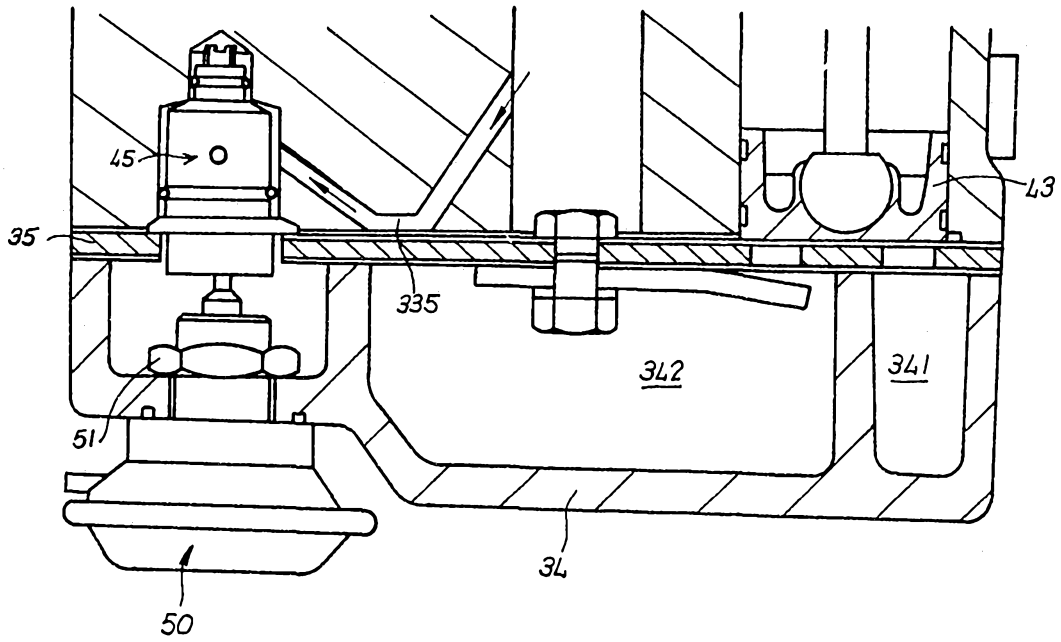
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FIG. 10

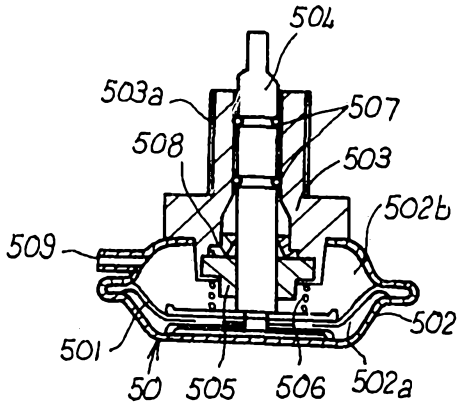
504
503a
507
508
503
502b
509
502
501
50
505
506
502a

FIG. 11.