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(71) Applicant:
MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
Kadoma-shi, Osaka 571-8501 (JP)

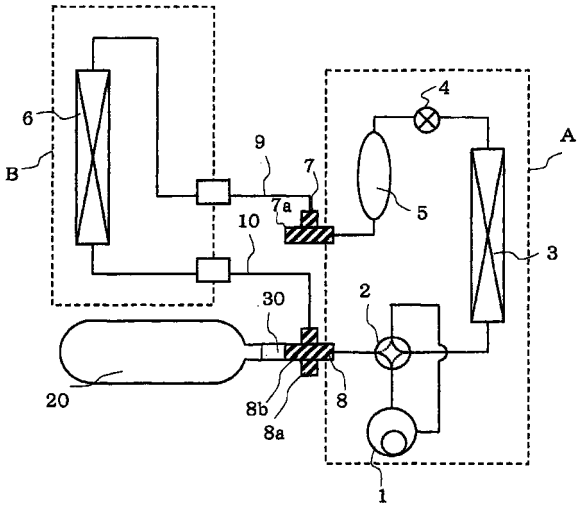
(72) Inventors:
- **Sato, Shigehiro**
  Kusatsu-shi, Shiga 525-0045 (JP)
- **Motegi, Hitoshi**
  Kusatsu-shi, Shiga 525-0057 (JP)
- **Watanabe, Yukio,**
  Rm 1108,Co-op Nomura Kyoto Minami kyoto-shi, Kyoto 601-8037 (JP)
- **Numoto,Hironao**
  Otsu-shi, Shiga 520-2101 (JP)
- **Takeuchi, Hiroyuki**
  Otsu-shi, Shiga 520-2264 (JP)
- **Nakatsuno, Eiji**
  Otsu-shi, Shiga 520-2276 (JP)

(74) Representative:
Körfer, Thomas, Dipl.-Phys. et al
Mitscherlich & Partner,
Patent- und Rechtsanwälte,
Sonnenstrasse 33
80331 München (DE)

(54) Connecting apparatus for installing air conditioner

(57) A connecting apparatus for installing an air conditioner comprises a first connecting port connected to a refrigerant charge port of a pipe connecting valve body provided in an outdoor unit of the air conditioner, and a second connecting port connected to a replacing gas charging container for installing the air conditioner, replacing gas in the replacing gas charging container being allowed to flow from the refrigerant charge port, wherein the first connecting port includes a first connecting portion capable of being connected to the refrigerant charge port, the second connecting port includes a second connecting portion capable of being connected to the replacing gas charging container, the refrigerant charge port is opened by connecting the first connecting port and the refrigerant charge port to each other by the first connecting portion, and the refrigerant charge port is opened by connecting the second connecting portion and the replacing gas charging container to each other by the second connecting portion. With this structure, after air in the indoor unit heat exchanger or the connecting pipe is once replaced by the replacing gas, the replacing gas can easily be collected.

FIG.1



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Description

Background of the Invention

(1) Field of the Invention

[0001] The present invention relates to a connecting apparatus for installing an air conditioner used for connecting an indoor unit and an outdoor unit using connecting pipes.

(2) Description of the Prior Art

[0002] A refrigeration cycle used for an air conditioner comprises a mechanical portion in which a compressor, a heat exchanger and a refrigerant flow rate controller having an expanding mechanism such as a capillary tube or an expanding valve, are connected by pipes such as copper pipes, and fluid charged in the refrigeration cycle such as refrigerant and lubricant oil composition.

[0003] A separate-type air conditioner comprises an outdoor unit having a compressor and a heat exchanger, and an indoor unit having another heat exchanger installed at a place where refrigeration air conditioning is performed. The outdoor unit and the indoor unit are connected through connection pipes such as copper pipes. In this type of refrigeration cycle, it is common to establish a the refrigeration cycle in the following way: first, a part or all of the refrigerant and lubricant oil composition is previously charged into the outdoor unit and the valves of the outdoor unit are closed; and then the outdoor unit is connected to the indoor unit by the connection pipes at the time of installing.

[0004] However, if the pipes are merely connected in this way, air remains in the indoor unit and the connection pipes. In order to remove the air, a conventional method employs a vacuum pump connected to a refrigerant charge port provided at the valve of the outdoor unit. And, after the air is removed by the vacuum pump, the valve is opened to connect the indoor unit and the outdoor unit, thereby forming the refrigeration cycle.

[0005] There is another simple installing method in which a valve of the outdoor unit is opened at the time of the installing so that the refrigerant in the outdoor unit is allowed to flow into the one of connection pipes, the indoor unit and then the other connection pipe and is released together with the air remained in the system from a gap created by moderating the connection of a connection port or a refrigerant charge port provided at the other valve of the outdoor unit; thereby replacing the gas in the indoor unit and the connection pipes.

[0006] In view of these conventional methods, Japanese Patent Application Laid-open No.H3-70953 discloses a method to establish a refrigeration cycle without using a vacuum pump in which, after replacing the gas in the refrigeration cycle by oxygen, the refrigerant is charged and the oxygen is solidified by oxygen fixing agent disposed in the refrigeration cycle.

[0007] Further, Japanese Patent Application Laid-open No.H7-159004 discloses a method for charging, into a portion of a refrigeration cycle, material capable of absorbing two or more of water, oxygen, nitrogen, carbon dioxide and the like in the air in such a separate type air conditioner in which among a freezing compressor, a condenser, an expanding mechanism such as a capillary tube and an expanding valve, and an evaporator, one of the condenser and the evaporator, or one of the condenser and the evaporator is separated from the expanding mechanism and connected by the pipes.

[0008] Further, Japanese Patent Application Laid-open No.H7-269994 discloses a refrigeration cycle in which oxygen absorbing agent is disposed in a refrigerant circulating system.

[0009] Further, Japanese Patent Application Laid-open No.H9-292168 discloses a method in which air absorbing agent is disposed for removing air in a pipe and an indoor unit, and a method in which after carbon dioxide is charged in the pipe and the indoor unit, the carbon dioxide in the pipe and the indoor unit is absorbed by carbon dioxide absorbing agent to establish vacuum.

[0010] Since air remaining in the refrigeration cycle deteriorates freezing ability as non-condensation gas, and oxygen and water facilitate degradation of freezer oil, iron and the like in the refrigeration cycle, it is inevitably necessary to remove the air.

[0011] Among the above-described conventional techniques, the method for removing the air using the vacuum pump is common. However, in order to operate the vacuum pump in the installing site, it is necessary that an electric power supply is available; further, it is difficult to use the pump on a roof and the like, and therefore, this method cannot be called a simple method.

[0012] Further, in the case of the replacing method of air using refrigerant, it is not possible to avoid emissions of chlorofluorocarbon, which is the refrigerant, into the atmosphere, and this is not preferable because of global-warming problem in view of global environment concerns.

[0013] Further, concerning a method for collecting a replacing gas after the air in the indoor heat exchanger and the connection pipes is once replaced by the replacing gas, no simple apparatus for collecting the replacing gas has not been proposed.

[0014] Thereupon, it is an object of the present invention to provide a connecting apparatus for installing an air conditioner capable of easily collecting a replacing gas after the air in an indoor heat exchanger and connection pipes is once replaced by the replacing gas.

Disclosure of the Invention

[0015] To achieve the above object and other objects, according to the first aspect of present invention, there is provided a connecting apparatus for installing an air conditioner comprising a first connecting port connected to a refrigerant charge port of a pipe connecting valve body provided in an outdoor unit of the air conditioner, and a second connecting port connected to a replacing gas charging container for installing the air conditioner, replacing gas in the replacing gas charging container being allowed to flow from the refrigerant charge port, wherein the first connecting port includes a first connecting portion capable of being connected to the refrigerant charge port, the second connecting port includes a second connecting portion capable of being connected to the replacing gas charging container, the refrigerant charge port is opened by connecting the first connecting port and the refrigerant charge port to each other by the first connecting portion, and the refrigerant charge port is opened by connecting the second connecting portion and the replacing gas charging container to each other by the second connecting portion.

[0016] In the connecting apparatus for installing an air conditioner according to the first aspect of present invention, the first connecting port includes the first connecting portion capable of being connected to the refrigerant charge port, the second connecting port includes the second connecting portion capable of being connected to the replacing gas charging container. By connecting the first connecting port and the refrigerant charge port to each other by the first connecting portion, the refrigerant charge port is opened. By connecting the second connecting portion and the replacing gas charging container to each other by the second connecting portion, the replacing gas charging container is opened. According to the invention, the refrigerant charge port can be opened simply by connecting the connecting apparatus to the refrigerant charge port, and the replacing gas charging container can be opened simply by connecting the replacing gas charging container to this connecting apparatus. Therefore, a replacing gas in the replacing gas charging container can be allowed to flow in from the refrigerant charge port simply by connecting the connecting apparatus to the refrigerant charge port and by connecting the replacing gas charging container to this connecting apparatus. Therefore, according to the first aspect of this invention, the operation for flowing the replacing gas in the replacing gas charging container into the air conditioner simply by connecting this connecting apparatus. In this manner, according to the present aspect of invention, it is unnecessary to operate the vacuum pump unlike the prior art, and even when the replacing gas is utilized, it is unnecessary to use a large-scale cylinder having a valve, it is possible to use a throwaway type replacing gas charging container having no valve and thus, an installing operation of the air conditioner can be facilitated.

[0017] According to a second aspect of the present invention, there is provided a connecting apparatus for installing an air conditioner comprising a first connecting port connected to a refrigerant charge port of a pipe connecting valve body provided in an outdoor unit of the air conditioner, and a second connecting port connected to a replacing gas collecting container for installing the air conditioner, replacing gas being absorbed into the replacing gas collecting container through the refrigerant charge port, wherein the first connecting port includes a first connecting portion capable of being connected to the refrigerant charge port, the second connecting port includes a second connecting portion capable of being connected to the replacing gas collecting container, the refrigerant charge port is opened by connecting the first connecting port and the refrigerant charge port to each other by the first connecting portion, and the refrigerant charge port is opened by connecting the second connecting portion and the replacing gas collecting container to each other by the second connecting portion.

[0018] In the connecting apparatus for installing an air conditioner according to the second aspect of the present invention, the first connecting port includes the first connecting portion capable of being connected to the refrigerant charge port, the second connecting port includes the second connecting portion capable of being connected to the replacing gas collecting container. By connecting the first connecting port and the refrigerant charge port to each other by the first connecting portion, the refrigerant charge port is opened. By connecting the second connecting portion and the replacing gas collecting container to each other by the second connecting portion, the replacing gas collecting container is opened. According to the present embodiment, the refrigerant charge port can be opened simply by connecting the connecting apparatus to the refrigerant charge port, and the replacing gas collecting container can be opened simply by connecting the replacing gas collecting container to this connecting apparatus. Therefore, a replacing gas in the replacing gas collecting container can be collected from the refrigerant charge port into the replacing gas collecting container simply by connecting the replacing gas collecting container to the connecting apparatus and by connecting the connecting apparatus to the refrigerant charge port. Therefore, according to the present embodiment, the operation for collecting the replacing gas from the air conditioner to the replacing gas collecting container simply by connecting this connecting apparatus. In this manner, according to the present invention, it is unnecessary to operate the vacuum pump unlike the prior art, and even when the replacing gas is utilized, it is unnecessary to use a large-scale cylinder having a valve, it is possible to use a throwaway type replacing gas collecting container having no valve and thus, an installing operation of the air conditioner can be facilitated.

[0019] According to a third aspect of the invention,

there is provided a connecting apparatus for installing an air conditioner comprising a first connecting port connected to a refrigerant charge port of a pipe connecting valve body provided in an outdoor unit of the air conditioner, and a second connecting port connectable to a replacing gas charging container and a replacing gas collecting container for installing the air conditioner, replacing gas in the replacing gas charging container being allowed to flow through the refrigerant charge port or the replacing gas being absorbed into the replacing gas collecting container through the refrigerant charge port, wherein the first connecting port includes a first connecting portion capable of being connected to the refrigerant charge port, the second connecting port includes a second connecting portion capable of being connected to the replacing gas charging container and the replacing gas collecting container, the refrigerant charge port is opened by connecting the first connecting port and the refrigerant charge port to each other by the first connecting portion, and the refrigerant charge port is opened by connecting the second connecting portion and the replacing gas charging container or the replacing gas collecting container to each other by the second connecting portion.

[0020] In the connecting apparatus for installing an air conditioner according to the third aspect of the present invention, the first connecting port includes the first connecting portion capable of being connected to the refrigerant charge port, the second connecting port includes the second connecting portion capable of being connected to the replacing gas charging container and the replacing gas collecting container. By connecting the first connecting port and the refrigerant charge port to each other by the first connecting portion, the refrigerant charge port is opened. By connecting the second connecting portion to the replacing gas charging container or the replacing gas collecting container by the second connecting portion, the replacing gas charging container or the replacing gas collecting container is opened. According to the present invention, the refrigerant charge port can be opened simply by connecting the connecting apparatus to the refrigerant charge port, and the replacing gas charging container or the replacing gas collecting container can be opened simply by connecting the replacing gas charging container or the replacing gas collecting container to this connecting apparatus. Therefore, since both the replacing gas charging container and the replacing gas collecting container can be used with the single connection apparatus, the operation for once replacing the air in the air conditioner by the replacing gas and then collecting the replacing gas can be carried out only by using this connecting apparatus. In this manner, according to the present invention, it is unnecessary to operate the vacuum pump unlike the prior art, and even when the replacing gas is utilized, it is unnecessary to use a large-scale cylinder having a valve, it is possible to use a throwaway type replacing gas charging container or the replacing gas collecting container having no valve and thus, an installing operation of the air conditioner can be facilitated.

[0021] According to a fourth aspect of the present invention, in the connecting apparatus for the air conditioner of any of the first to third aspects of the invention, the first connection portion includes a seal member and a valve rod, and when the first connecting port and the refrigerant charge port are connected to each other by the first connection portion, after the first connecting portion and the refrigerant charge port are hermetically closed by the seal member, the valve rod pushes and opens a valve core in the refrigerant charge port. According to the present embodiment, the first connecting port and the refrigerant charge port can be connected to each without immixing air in the atmosphere.

[0022] According to this aspect of the present invention, in the connecting apparatus for the air conditioner of any of the first to third aspects of the invention, a screw is formed on an inner peripheral surface of the connecting portion, and the connecting portion is rotatably provided around an outer periphery of the connecting port. According to the present invention, since it is possible to screw without rotating the connecting apparatus itself, the operability at the time of installation is excellent.

[0023] According to a sixth aspect of the present invention, in the connecting apparatus for the air conditioner of the fifth aspect of the invention, the connecting portion includes a seal member which is located deeper than the screw. After an end of the refrigerant charge port abuts against the seal member, a valve core in the refrigerant charge port is pushed and opened. According to the present invention, the connection operation can be carried out without immixing air in the atmosphere.

[0024] A charging container according to a seventh aspect of the present invention is connected to the connecting apparatus for installing the air conditioner of the first or third aspects of the invention for charging the replacing gas or the refrigerant. According to the seventh aspect of the invention, it is possible to use a throwaway type charging apparatus having no on-off valve, and to shrink the size of the charging container.

[0025] A collecting container according to an eighth aspect of the present invention is connected to the connecting apparatus for installing the air conditioner of the second or third aspects of the present invention for collecting the replacing gas or the refrigerant. According to this aspect of the invention, it is possible to use a throwaway type collecting apparatus having no on-off valve, and to shrink the size of the collecting container.

[0026] An installation method of an air conditioner according to a ninth aspect is for charging or collecting the replacing gas or the refrigerant using the connecting apparatus for installing the air conditioner of any of the first to third aspects of the invention. According to the present aspect of the invention, it is unnecessary to

operate the vacuum pump unlike the prior art, and even when the replacing gas is utilized, it is unnecessary to use a large-scale container having a valve, it is possible to use a throwaway type container and thus, an installing operation of the air conditioner can be facilitated.

[0027] According to a tenth aspect, there is provided a replacing gas charging container for installing an air conditioner wherein, one or more kinds of replacing gas which is gas state at room temperature and atmospheric pressure and which is inert with respect to refrigerant used in a refrigeration cycle of the air conditioner is charged in the replacing gas charging container, a connecting port is connected to a refrigerant charge port of a pipe connecting valve body provided in an outdoor unit of the air conditioner, and the replacing gas is allowed to flow through the refrigerant charge port, wherein the connecting port includes a connecting portion capable of being connected to the refrigerant charge port, and by connecting the connecting port and the refrigerant charge port by the connecting portion, the connecting port is opened and the refrigerant charge port is opened.

[0028] In the replacing gas charging container for installing an air conditioner according to the tenth aspect of the present invention, a connecting port includes a connecting portion capable of being connected to a refrigerant charge port, and by connecting the connecting port and the refrigerant charge port by the connecting portion, the connecting port is opened and the refrigerant charge port is also opened. According to the present aspect of the invention, the represents charge port and the replacing gas charging container can be opened simply by connecting the replacing gas charging container to the refrigerant charge port. Therefore, it is possible to introduce the replacing gas in the replacing gas charging container through the refrigerant charge port simply by connecting the replacing gas charging container to the refrigerant charge port. In this manner, according to this aspect of the invention, it is unnecessary to operate the vacuum pump unlike the prior art, and even when the replacing gas is utilized, it is unnecessary to use a large-scale cylinder having a valve, it is possible to use a throwaway type replacing gas charging container having no valve and thus, an installing operation of the air conditioner can be facilitated.

[0029] According to an eleventh aspect of the invention, there is provided a replacing gas collecting container for installing an air conditioner, wherein, a material which absorbs one or more kinds of replacing gas which is gas state at room temperature and atmospheric pressure and which is inert with respect to refrigerant used in a refrigeration cycle of the air conditioner is contained in the replacing gas collecting container, a connecting port is connected to a refrigerant charge port of a pipe connecting valve body provided in an outdoor unit of the air conditioner, and the replacing gas charged in the connecting of the air conditioner is absorbed through the refrigerant charge port, wherein the connecting port includes a connecting portion capable of being connected to the refrigerant charge port, and by connecting the connecting port and the refrigerant charge port by the connecting portion, the connecting port is opened and the refrigerant charge port is opened.

[0030] In the replacing gas collecting container for installing an air conditioner according to the eleventh aspect of the present invention, the connecting port includes the connecting portion capable of being connected to the refrigerant charge port, and by connecting the connecting port and the refrigerant charge port by the connecting portion, the connecting port is opened and the refrigerant charge port is also opened. According to the present aspect of the invention, the refrigerant charge port and the replacing gas collecting container can be opened simply by connecting the replacing gas collecting container to the refrigerant charge port. Therefore, it is possible to recover the replacing gas from the refrigerant charge port into the replacing gas collecting container simply by connecting the replacing gas collecting container to the refrigerant charge port. In this manner, according to the present aspect of the invention, it is unnecessary to operate the vacuum pump unlike the prior art, and even when the replacing gas is utilized, it is unnecessary to use a large-scale cylinder having a valve, it is possible to use a throwaway type replacing gas collecting container having no valve and thus, an installing operation of the air conditioner can be facilitated.

[0031] According to a twelfth aspect of the present invention, a replacing gas having global warming coefficient smaller than that of a refrigerant used in a refrigeration cycle of an air conditioner is used in the replacing gas charging container of the tenth aspect of invention. The present aspect of the invention is advantageous to global environment as compared with a case in which a refrigerant which has been charged is purged and the refrigerant is discharged out into the atmosphere.

[0032] According to a method for installing an air conditioner of a thirteenth aspect of this invention, the air conditioner is installed using the replacing gas charging container of the tenth aspect of the invention. According to the present aspect, it is unnecessary to operate the vacuum pump unlike the prior art, and even when the replacing gas is utilized, it is unnecessary to use a large-scale container having a valve, it is possible to use a throwaway type container and thus, an installing operation of the air conditioner can be facilitated.

[0033] According to a method for installing an air conditioner of a fourteenth aspect, the air conditioner is installed using the replacing gas collecting container of the tenth aspect. According to the present aspect of invention, it is unnecessary to operate the vacuum pump unlike the prior art, and even when the replacing gas is utilized, it is unnecessary to use a large-scale container having a valve, it is possible to use a throwa-

way type container and thus, an installing operation of the air conditioner can be facilitated.

[0034] According to a replacing gas collecting container for installing an air conditioner of a fifteenth aspect of the present invention, a replacing gas charging container or the replacing gas collecting container includes a connection port provided with a connecting portion capable of being connected to a refrigerant charge port of a pipe connection valve body disposed in an outdoor unit, and by connecting the connecting port and the refrigerant charge port by the connecting portion, the connecting port is opened and the refrigerant charge port is opened. According to the present aspect of the invention, it is possible to open the refrigerant charge port and the replacing gas charging container or the replacing gas collecting container simply by connecting the replacing gas charging container or the replacing gas collecting container to the refrigerant charge port. Therefore, it is possible to flow and recover the replacing gas through the refrigerant charge port. In this manner, according to the present aspect of invention, it is unnecessary to operate the vacuum pump unlike the prior art, and even when the replacing gas is utilized, it is unnecessary to use a large-scale cylinder having a valve, it is possible to use a throwaway type replacing gas container having no valve and thus, an installing operation of the air conditioner can be facilitated.

[0035] According to a method for installing an air conditioner of a sixteenth aspect of the present invention, the air conditioner is installed using the installation apparatus for an air conditioner of the fifteenth aspect of the invention. According to this aspect of invention, it is unnecessary to operate the vacuum pump unlike the prior art, and even when the replacing gas is utilized, it is unnecessary to use a large-scale cylinder having a valve, it is possible to use a throwaway type replacing gas container having no valve and thus, an installing operation of the air conditioner can be facilitated.

Brief Description of the Drawings

[0036]

Fig.1 is a block diagram of a refrigeration cycle for an air conditioner used for an embodiment of the present invention to which a replacing gas charging container is connected;

Fig.2 is a block diagram of a refrigeration cycle for an air conditioner used for an embodiment of the invention to which a replacing gas collecting container is connected;

Fig.3 is a schematic view of a connecting apparatus of the replacing gas charging container according to the embodiment of the invention;

Fig.4 is a schematic view of a connecting apparatus of the replacing gas collecting container according to the embodiment of the invention; and

Fig.5 is a schematic view of a replacing gas charging container and a gas-side three-way valve according to another embodiment of the invention.

Description of the Preferred Embodiments

[0037] Embodiments of the present invention will be explained with reference to the drawings below.

[0038] Figs.1 and 2 are block diagrams of refrigeration cycles used in the embodiment. Fig.1 shows the refrigeration cycle to which a replacing gas charging container is connected; and Fig.2 shows the refrigeration cycle to which a replacing gas collecting container is connected.

[0039] First, the entire structure of the refrigeration cycle constituting the air conditioner will be explained using Figs.1 and 2.

[0040] The refrigeration cycle comprises a compressor 1, a four-way valve 2, an outdoor unit heat exchanger 3, an expansion device 4, a dryer 5 and an indoor unit heat exchanger 6. The compressor 1, the four-way valve 2, the outdoor unit heat exchanger 3, the expansion device 4 and the dryer 5 are disposed in an outdoor unit A, and the indoor unit heat exchanger 6 is disposed in an indoor unit B.

[0041] The outdoor unit A is provided with a liquid-side two-way valve 7 and a gas-side three-way valve 8. The outdoor unit A and the indoor unit B are connected to each other through connection pipes 9 and 10 using the liquid-side two-way valve 7 and the gas-side three-way valve 8. The liquid-side two-way valve 7 is provided with a screw portion 7a, and a pipe on the side of the outdoor unit A and a connecting pipe 9 are brought into communication with each other by opening the screw portion 7a. The gas-side three-way valve 8 is provided with a screw portion 8a and a refrigerant charge port 8b, and a pipe on the side of the outdoor unit A and a connecting pipe 10 are brought into communication with each other by opening this screw portion 8a.

[0042] As shown in Fig.1, a replacing gas charging container 20 can be connected to the refrigerant charge port 8b using a connecting apparatus 30, and as shown in Fig.2, a replacing gas collecting container 40 can be connected to the refrigerant charge port 8b using a connecting apparatus 50.

[0043] These replacing gas charging container 20 or the replacing gas collecting container 40 can be brought into communication with the connecting pipe 10 by connecting the container to the connecting apparatus 30 or 50, respectively.

[0044] A replacing gas comprising one kind or a plurality of kinds of gas mixture which is inert toward the refrigerant in the refrigeration cycle and which is gas state at room temperature and atmospheric pressure is charged into the replacing gas charge container 20. More specifically, it is preferable that the replacing gas has a global warming coefficient smaller than that of a refrigerant. For example, when R410A is used as the

refrigerant, the global warming coefficient (GWP) is 1730, it is preferable that the replacing gas has a global warming coefficient smaller than this value and the replacing gas is inert toward the refrigeration cycle. Examples of the replacing gas are carbon dioxide (GWP=1), propane (GWP<3), butane (GWP<3) and the like.

[0045] On the other hand, a material which absorbs the replacing gas is charged in the replacing gas collecting container 40. More specifically, when carbon dioxide is charged as the replacing gas, zeolite, epoxy compound, calcium hydroxide and the like can be used as the material which absorbs the replacing gas. Among them, zeolite is preferable because the absorbing speed is high. Zeolite having hole diameter of 1.0 nm is most suitable because the absorbing speed of the carbon dioxide is high. Although any shape of zeolite can be used , but spherical shape is preferable because the zeolite of such shape is less prone to be crushed.

[0046] Next, a connecting apparatus of the replacing gas charging container will be explained in reference to Fig.3.

[0047] Fig.3 is a schematic view of the connecting apparatus of the replacing gas charging container according to one embodiment of the invention.

[0048] The connecting apparatus 30 is provided at its one end with a connecting portion 31 which is threadedly engaged with a male screw 81 of the refrigerant charge port 8b, and at the other end with a connecting portion 32 which is threadedly engaged with a male screw 21 formed on an opening of the replacing gas charging container 20. A female screw 33 is formed on an inner peripheral surface of the connecting portion 31, and a female screw 34 is formed on an inner peripheral surface of the connecting portion 32. A valve rod 35 and a seal member 36 comprising an O-ring or the like are provided in the connecting portion 31. The valve rod 35 abuts against a valve core 82 in the refrigerant charge port 8b, and has enough length to push the valve core 82. A blade 37 is formed in the connecting portion 32 such that a hole can be formed in the opening of the replacing gas charging container 20. It is preferable that outer diameters or inner diameters of the connecting portion 31 and the connecting portion 32 are different so that the refrigerant charge port 8b and the replacing gas charging container 20 will not be erroneously connected. Here, it is unnecessary that the screw for the refrigerant charge port 8b and the screw for the replacing gas charging container of the connecting apparatus 30 exist on the same axis. If these screws exist on two axes which intersect substantially at right angles as shown in Fig. 3, the flexibility of positioning at work site for connecting the replacing gas charging container 20 is greatly enhanced so that it makes easier to remove the air in the air conditioner by the replacing gas.

[0049] It is preferable that the connecting portion 31 connecting with the refrigerant charge port 8b is a screw type joint because the hermeticity is ensured. In order to further enhance the hermeticity, it is preferable to provide a rubber seal member 36 such as the O-ring. In this case, the female screw 33 is threadedly engaged with the male screw 81 of the refrigerant charge port 8b. At that time, it is preferable that the seal member 36 abuts against the male screw 81 before the valve rod 35 pushes the valve core 82 in the refrigerant charge port 8b, thereby hermetically closing the space between the screws 81 and 33. This is because that the air is less prone to remain in the refrigeration cycle. Comparably, when the screws 81 and 33 are removed, it is preferable that the seal member 36 is separated from the male screw 81 of the refrigerant charge port 8b after the valve rod 35 and the valve core 82 are separated from each other. Here, it is further preferable that the connecting portions 31 and 32 are rotatably mounted on the outer peripheral surfaces of the connecting portions 38 and 39 because it is unnecessary to rotate the connecting portions 31 and 32 together with the connecting apparatus 30.

[0050] The refrigerant charge port 8b is opened by pushing the valve core 82. And, the valve core 82 is pressed to a seat 84 by a resilient body 83 by being connected to the resilient body 83 via the connecting portion 85.

[0051] A connecting apparatus of the replacing gas collecting container will be explained with reference to Fig.4.

[0052] Fig.4 is a schematic view of the connecting apparatus of the replacing gas collecting container according to one embodiment of the invention.

[0053] The connecting apparatus 50 is provided at its one end with a connecting portion 51 which is threadedly engaged with a male screw 81 of the refrigerant charge port 8b, and at the other end with a connecting portion 52 which is threadedly engaged with a male screw 41 formed on an opening of the replacing gas collecting container 40. A female screw 53 is formed on an inner peripheral surface of the connecting portion 51, and a female screw 54 is formed on an inner peripheral surface of the connecting portion 52. A valve rod 55 and a seal member 56 are provided in the connecting portion 51. The valve rod 55 abuts against a valve core 82 in the refrigerant charge port 8b, and has enough length to push the valve core 82. A blade 57 is formed in the connecting portion 52 such that a hole can be formed in the opening of the replacing gas collecting container 40. It is preferable that outer diameters or inner diameters of the connecting portion 51 and the connecting portion 52 are different so that the refrigerant charge port 8b and the replacing gas collecting container 40 are not erroneously connected.

[0054] In this case also, it is preferable that the connecting portion 51 connecting to the refrigerant charge port 8b is a screw type joint because the hermeticity is ensured. In order to further enhance the hermeticity, it is preferable to provide a rubber seal member 56 such as the O-ring. In this case, the female screw 53 is thread-

edly engaged with the male screw 81 of the refrigerant charge port 8b. At that time, it is preferable that the seal member 56 abuts against the male screw 81 before the valve rod 55 pushes the valve core 82 in the refrigerant charge port 8b, thereby hermetically closing the space between the screws 81 and 33. This is because that the air is less prone to remain in the refrigeration cycle. Comparably, when the screws 81 and 53 are removed, it is preferable that the seal member 56 is separated from the male screw 81 of the refrigerant charge port 8b after the valve rod 55 and the valve core 82 are separated from each other. Here, it is further preferable that the connecting portions 51 and 52 are rotatably mounted on the outer peripheral surfaces of the connecting portions 58 and 59 because, in this manner, it is unnecessary to rotate the connecting portions 51 and 52 together with the connecting apparatus 50.

[0055] In the above embodiments, the connecting apparatus shown in Fig.3 was explained as the connecting apparatus 30 for connecting the replacing gas charging container 20, and the connecting apparatus shown in Fig.4 was explained as the connecting apparatus 50 for connecting the replacing gas collecting container 40. However, the connecting apparatus shown in Fig.3 can be used as the connecting apparatus 50 for connecting the replacing gas collecting container 40, and the connecting apparatus shown in Fig.,4 can be used as the connecting apparatus 30 for connecting the replacing gas charging container 20. Therefore, although the connecting apparatus 30 and the connecting 50 were explained as different members, the male screw 21 of the replacing gas charging container 20 and the male screw 41 of the replacing gas collecting container 40 are formed into the same size, the connecting apparatus 30 and the connecting 50 can be a common apparatus. Further, the refrigerant can be charged and collected using the connecting apparatus 30 and 50.

[0056] In the connecting apparatus 30, the screw on the side of the refrigerant charge port 8b and the screw on the side of the replacing gas collecting container 40 are formed on two axes which intersect substantially at right angles. The connecting apparatus 50 may have the same structure.

[0057] A replacing gas charging container according to another embodiment will be explained in reference to Fig.5 below.

[0058] Fig.5 is a schematic view of the replacing gas charging container and a gas-side three-way valve according to the embodiment.

[0059] A replacing gas comprising one kind or a plurality of kinds of gas mixture which is inert toward the refrigerant in the refrigeration cycle and which is gas state at room temperature and atmospheric pressure is charged into a replacing gas charge container 20A. The replacing gas charge container 20A is provided with a connecting port having a connecting portion 21A. And, the replacing gas charge container 20A can be connected to the refrigerant charge port 8b by the connecting portion 21A. Although the internal structure of the connecting portion 21A is not shown in Fig 5, the connecting portion 21 may be constructed such that a valve core which is normally closed by a resilient body is opened by an external pushing pressure like the inside structure of the refrigerant charge port 8b. If the valve core is disposed in the connecting portion 21A also, the valve core on the side of the refrigerant charge port 8b and the valve core on the side of the connecting portion 21A push against each other, and the respective connecting ports can be opened.

[0060] Although the replacing gas charging container was explained in Fig.5, the replacing gas collecting container may have the same structure.

[0061] Next, a method for installing the above-described air conditioner will be explained.

[0062] Before the air conditioner is installed, refrigerant gas is charged into the pipes on the side of the outdoor A such as the compressor 1 and the outdoor unit heat exchanger 3. At that time, refrigerant gas which is necessary for driving is charged into the outdoor unit A. On the other hand, the pipes on the side of the indoor unit B such as the indoor unit heat exchanger 6, as well as the connecting pipes 9 and 10 are not sealed and are opened to the atmosphere.

[0063] First, the outdoor unit A and the indoor unit B are connected through the connecting pipes 9 and 10. At that time, the liquid-side two-way valve 7 and the connecting pipe 9 are not hermetically connected to each other but are loosely connected such that gas can slightly leak. The screw 7a of the liquid-side two-way valve 7 and the screw 8a of the gas-side three-way valve 8 are closed.

[0064] Next, the connecting apparatus 30 is mounted to the refrigerant charge port 8b of the gas-side three-way valve 8. When the connecting apparatus 30 is mounted to the refrigerant charge port 8b, the valve core 82 in the refrigerant charge port 8b is pushed by the valve rod 35 in the connecting apparatus 30 so that the refrigerant charge port 8b is opened. Thereafter, by mounting the replacing gas charging container 20 to the connecting apparatus 30, the opening of the replacing gas charging container 20 is opened by the blade 37 of the connecting apparatus 30. As a result, carbon dioxide in the replacing gas charging container 20 is introduced into the connecting pipe 10 and the indoor unit B from the refrigerant charge port 8b through the connecting apparatus 30, and introduced into the connecting pipe 9. By the introduced carbon dioxide, the air in the connecting pipes 9 and 10 as well as in the indoor unit B is discharged into the atmosphere together with the introduced carbon dioxide from a loosened portion of flare portion of the liquid-side two-way valve 7.

[0065] Here, confirming that gas is leaking from a space between the liquid-side two-way valve 7 and the connecting pipe 9 and that a predetermined amount of gas has been discharged, then, the connecting portion between the liquid-side two-way valve 7 and the con-

necting pipe 9 is hermetically closed. The predetermined amount of discharged gas may be measured using a flowmeter, but if the amount of gas in the replacing gas charging container 20 is set slightly greater than the volume in the pipe in the indoor unit B and the connecting pipes 9 and 10 so that one air conditioner can be installed using one replacing gas charging container 20, the connecting portion between the liquid-side two-way valve 7 and the connecting pipe 9 may be hermetically closed when a sound of gas leaking out becomes small without using the flowmeter.

[0066] Next, the connecting apparatus 30 is detached from the refrigerant charge port 8b in a state where the replacing gas charging container 20 is left mounted to the connecting apparatus 30.

[0067] In the case that inert gas is not removed from the air conditioner, the screw 7a of the liquid-side two-way valve 7 and the screw 8a of the gas-side three-way valve 8 are opened in this state, and the refrigerant in the outdoor unit A is allowed to flow into the indoor unit B.

[0068] In the case that the introduced inert gas is removed, the screw 7a of the liquid-side two-way valve 7 and the screw 8a of the gas-side three-way valve 8 are not opened at this time, and the procedure proceeds to an inert gas absorbing step as shown in Fig.2.

[0069] The inert gas absorbing step is achieved by connecting the replacing gas collecting container 40 to the refrigerant charge port 8b.

[0070] One method therefor is to connect the connecting apparatus 50 to the replacing gas collecting container 40 by threadedly engaging the male screw 41 of the replacing gas collecting container 40 with the female screw 54 of the connecting apparatus 50. In this state, the replacing gas collecting container 40 is opened by the blade 57 of the connecting apparatus 50.

[0071] Then, confirming that a hole is formed in a tip end of the replacing gas collecting container 40, the other end of the connecting apparatus 50 is connected to the refrigerant charge port 8b. By threadedly engaging the connecting apparatus 50 with the refrigerant charge port 8b, the valve rod 55 of the connecting apparatus 50 pushes the valve core 82 in the refrigerant charge port 8b. Then, the replacing gas collecting container 40 and the refrigerant charge port 8b are brought into communication with each other, and the carbon dioxide in the connecting pipes 9 and 10 as well as the pipes in the indoor unit B is introduced from the refrigerant charge port 8b into the replacing gas collecting container 40. By first connecting the connecting apparatus 50 and the replacing gas collecting container 40 in this manner, it is possible to prevent the air in the atmosphere from mixing into the replacing gas by the replacing gas's flowing out from the refrigerant charge port 8b.

[0072] Another method is to first connect the other end of the connecting apparatus 50 to the refrigerant charge port 8b and then, to connect the replacing gas collecting container 40 to the connecting apparatus 50. By first connecting the connecting apparatus 50 to the refrigerant charge port 8b in this manner, the air in the connecting apparatus 50 can be pushed out by the replacing gas.

[0073] The introduced carbon dioxide is physically absorbed and collected by zeolite in the replacing gas collecting container 40.

[0074] Then, the connecting apparatus 50 is detached from the refrigerant charge port 8b, and the screw of the liquid-side two-way valve 7 is completely opened. The connecting apparatus 50 is detached from the refrigerant charge port 8b in a state where the replacing gas collecting container 40 is still connected to the connecting apparatus 50.

[0075] Lastly, the screw 8a of the gas-side three-way valve 8 is also opened completely, and the installing operation of the air conditioner is completed.

[0076] The air in the refrigeration cycle can be removed by carrying out the installation in accordance with the above-described step. Further, waste space between the outlet of replacing gas charging container 20 or the outlet of the replacing gas collecting container 40 and the refrigerant charge port 8b can be reduced by using the connecting apparatus 30 and 50 of the above embodiments, thereby, harmful air will not be mixed almost at all; the air in the refrigeration cycle can be removed without using a vacuum pump; and it is possible to prevent the refrigeration cycle from being deteriorated.

[0077] Although the method for installing the outdoor unit having the normal two-way valve and three-way valve was explained in the above embodiments, the present invention can also be applied to an outdoor unit having a three-way valve and another three-way valve. Further, the present invention should not be limited to the two-way valve and three-way valve, and the invention can also be applied to an air conditioner having a valve including a refrigerant charge port.

[0078] As described above, according to the present invention, the refrigerant charge port can be opened simply by connecting the connecting apparatus to the refrigerant charge port, and the replacing gas charging container can be opened simply by connecting the replacing gas charging container to the connecting apparatus. Therefore, the replacing gas in the replacing gas charging container can be allowed to flow from the refrigerant charge port simply by connecting the connecting apparatus to the refrigerant charge port and by connecting the replacing gas charging container to the connecting apparatus. Therefore, the operation for introducing the replacing gas in the replacing gas charging container into the air conditioner can be carried out simply by connecting the connecting apparatus. Therefore, it is unnecessary to operate the vacuum pump like the prior art, and even when the replacing gas is utilized, it is unnecessary to use a large-scale cylinder equipped with a valve, it is possible to use a throwaway type replacing gas container having no valve and thus, an

installation operation of the air conditioner can be greatly facilitated.

[0079] Further, according to the present invention, the refrigerant charge port can be opened simply by connecting the connecting apparatus to the refrigerant charge port, and the replacing gas collecting container can be opened simply by connecting the replacing gas collecting container to the connecting apparatus. Therefore, the replacing gas can be collected through the refrigerant charge port into the replacing gas collecting container simply by connecting the replacing gas collecting container to the connecting apparatus and by connecting the connecting apparatus to the replacing gas charge port. Therefore, the operation for collecting the replacing gas from the air conditioner into the replacing gas collecting container can be carried out simply by connecting the connecting apparatus. Therefore, it is unnecessary to operate the vacuum pump like the prior art, and even when the replacing gas is utilized, it is unnecessary to use a large-scale cylinder equipped with a valve, it is possible to use a throwaway type replacing gas collecting container having no valve and thus, an installing operation of the air conditioner can be greatly facilitated.

[0080] Further, according to the present invention, the refrigerant charge port can be opened simply by connecting the connecting apparatus to the refrigerant charge port and the replacing gas charging container or the replacing gas collecting container can be opened simply by connecting the replacing gas charging container or the replacing gas collecting container to the connecting apparatus. Therefore, since both the replacing gas charging container and replacing gas collecting container can be used, the operation for replacing the air in the air conditioner by the replacing gas as well operation for collecting the replacing gas can be carried out by using this connecting apparatus.

[0081] Furthermore, according to the present invention, the connecting port of the connecting apparatus and the refrigerant charge port can be connected without immixing the air in the atmosphere.

[0082] Further, according to the present invention, since the connecting apparatus can be screwed without rotating the connecting apparatus itself, the operability of the installation is excellent.

[0083] Further, according to the present invention, the charging device can be formed into throwaway type having no on-off valve, and the charging container can be reduced in size.

[0084] Further, according to the present invention, the collecting device can be formed into throwaway type having noon-off valve, and the collecting container can be reduced in size.

[0085] Further, the present invention has an advantage in global environment as compared with a case in which a refrigerant which has been charged is purged and the refrigerant is discharged out into the atmosphere.

Claims

1. A connecting apparatus for installing an air conditioner, through which replacing gas in a replacing gas charging container is allowed to flow through a refrigerant charge port, comprising: a first connecting port connected to said refrigerant charge port of a pipe connecting valve body provided in an outdoor unit of the air conditioner; and a second connecting port connected to said replacing gas charging container for installing the air conditioner; wherein said first connecting port includes a first connecting portion capable of being connected to said refrigerant charge port, said second connecting port includes a second connecting portion capable of being connected to said replacing gas charging container, said refrigerant charge port is opened by connecting said first connecting port and said refrigerant charge port to each other by said first connecting portion, and said refrigerant charge port is opened by connecting said second connecting portion and said replacing gas charging container to each other by said second connecting portion.

2. A connecting apparatus for installing an air conditioner, through which replacing gas is collected to a replacing gas collecting container by being allowed to flow through a refrigerant charge port, comprising: a first connecting port connected to said refrigerant charge port of a pipe connecting valve body provided in an outdoor unit of the air conditioner, and a second connecting port connected to said replacing gas collecting container for installing the air conditioner, wherein said first connecting port includes a first connecting portion capable of being connected to said refrigerant charge port, said second connecting port includes a second connecting portion capable of being connected to said replacing gas collecting container, said refrigerant charge port is opened by connecting said first connecting port and said refrigerant charge port to each other by said first connecting portion, and said refrigerant charge port is opened by connecting said second connecting portion and said replacing gas collecting container to each other by said second connecting portion.

3. A connecting apparatus for installing an air conditioner through which replacing gas in a replacing gas charging container is allowed to flow from a refrigerant charge port or said replacing gas being collected into a replacing gas collecting container from said refrigerant charge port, comprising: a first connecting port connectable to said refrigerant charge port of a pipe connecting valve body provided in an outdoor unit of the air conditioner, and a second connecting port connectable to a replacing

gas charging container and a replacing gas collecting container for installing the air conditioner, wherein said first connecting port includes a first connecting portion capable of being connected to said refrigerant charge port, said second connecting port includes a second connecting portion capable of being connected to said replacing gas charging container and said replacing gas collecting container, said refrigerant charge port is opened by connecting said first connecting port and said refrigerant charge port to each other by said first connecting portion, and said replacing gas charging container or said replacing gas collecting container is opened by connecting said second connecting portion and said replacing gas charging container or said replacing gas collecting container to each other by said second connecting portion.

4. A connecting apparatus for installing an air conditioner according to any one of claims 1 to 3, wherein said first connection port includes a seal member and a valve rod, and when said first connecting port and said refrigerant charge port are connected to each other by said first connection portion, after said first connecting portion and said refrigerant charge port are hermetically closed by said seal member, said valve rod pushes to open a valve core in said refrigerant charge port.

5. A connecting apparatus for installing an air conditioner according to any one of claims 1 to 3, wherein a screw is formed on an inner peripheral surface of said connecting portion, and said connecting portion is rotatably provided around an outer periphery of said connecting port.

6. A connecting apparatus for installing an air conditioner according to claim 5, wherein, said connecting portion includes a seal member which is located deeper than said screw, and after an end of said refrigerant charge port abuts against said seal member, said valve core in said refrigerant charge port is pushed to be opened.

7. A charging container connected to said connecting apparatus for installing an air conditioner according to claim 1 or 3 for charging replacing gas or refrigerant.

8. A collecting container connected to said connecting apparatus for installing an air conditioner according claim 2 or 3 for collecting replacing gas or refrigerant.

9. A method for installing an air conditioner for charging or collecting replacing gas or refrigerant using said connecting apparatus for installing an air conditioner according to any one of claims 1 to 3.

10. A replacing gas charging container for installing an air conditioner wherein, one or more kinds of replacing gas which is gas state at room temperature and atmospheric pressure and which is inert with respect to refrigerant used in a refrigeration cycle of the air conditioner is charged in said replacing gas charging container, a connecting port is connected to a refrigerant charge port of a pipe connecting valve body provided in an outdoor unit of the air conditioner, and said replacing gas is allowed to flow through said refrigerant charge port, wherein said connecting port includes a connecting portion capable of being connected to said refrigerant charge port, and by connecting said connecting port and said refrigerant charge port by said connecting portion, said connecting port is opened and said refrigerant charge port is opened.

11. A replacing gas collecting container for installing an air conditioner wherein, a material which absorbs one or more kinds of replacing gas which is gas state at room temperature and atmospheric pressure and which is inert with respect to refrigerant used in a refrigeration cycle of the air conditioner is contained in said replacing gas collecting container, a connecting port is connected to a refrigerant charge port of a pipe connecting valve body provided in an outdoor unit of the air conditioner, and said replacing gas charged in said connecting of said air conditioner is collected through said refrigerant charge port, wherein said connecting port includes a connecting portion capable of being connected to said refrigerant charge port, and by connecting said connecting port and said refrigerant charge port by said connecting portion, said connecting port is opened and said refrigerant charge port is opened.

12. A replacing gas charging container according to claim 10, wherein said replacing gas has global warming coefficient smaller than that of refrigerant used in said refrigeration cycle of said air conditioner.

13. A method for installing an air conditioner using said refrigerant charging container according to claim 10.

14. A method for installing an air conditioner using said refrigerant collecting container according to claim 11.

15. An installing apparatus for an air conditioner comprising an outdoor unit having a compressor and an outdoor unit heat exchanger into which refrigerant gas is charged, and an indoor unit having an indoor unit heat exchanger which is opened to atmosphere, in which said outdoor unit and said indoor

unit are connected by a connecting pipe, air in said indoor unit heat exchanger and said connecting pipe is replaced by replacing gas in a replacing gas charging container and then, said replacing gas is collected by a replacing gas collecting container, and after said replacing gas is collected, refrigerant in said outdoor unit is charged into said indoor unit heat exchanger and said connecting pipe to install the air conditioner, wherein said replacing gas charging container or said replacing gas collecting container includes a connection port provided with a connecting portion capable of being connected to a refrigerant charge port of a pipe connection valve body disposed in said outdoor unit, and by connecting said connecting port and said refrigerant charge port by said connecting portion, said connecting port is opened and said refrigerant charge port is opened.

16. A method for installing an air conditioner wherein, said air conditioner is installed using said installing apparatus according to claim 15.

FIG. 1

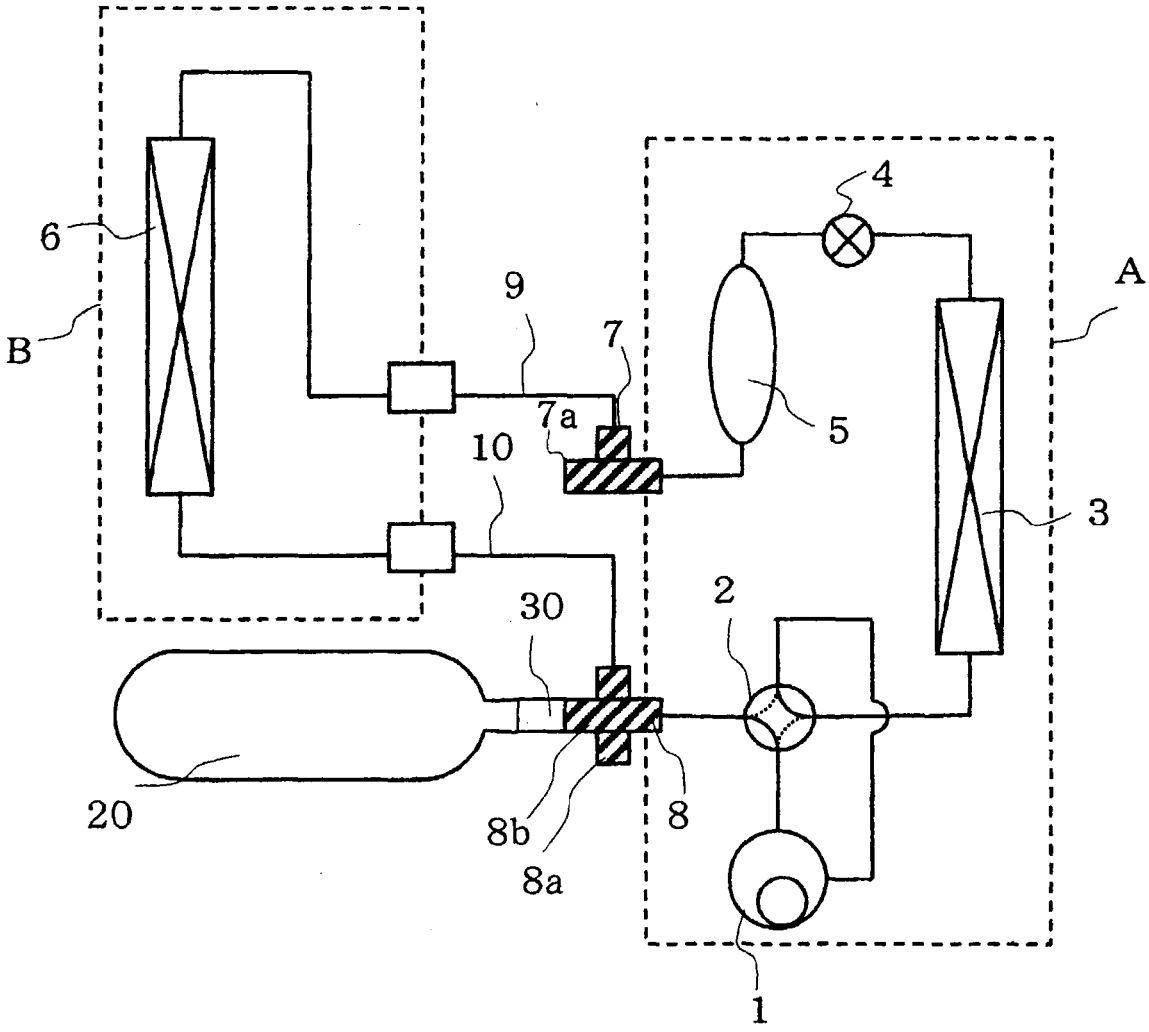

FIG.2

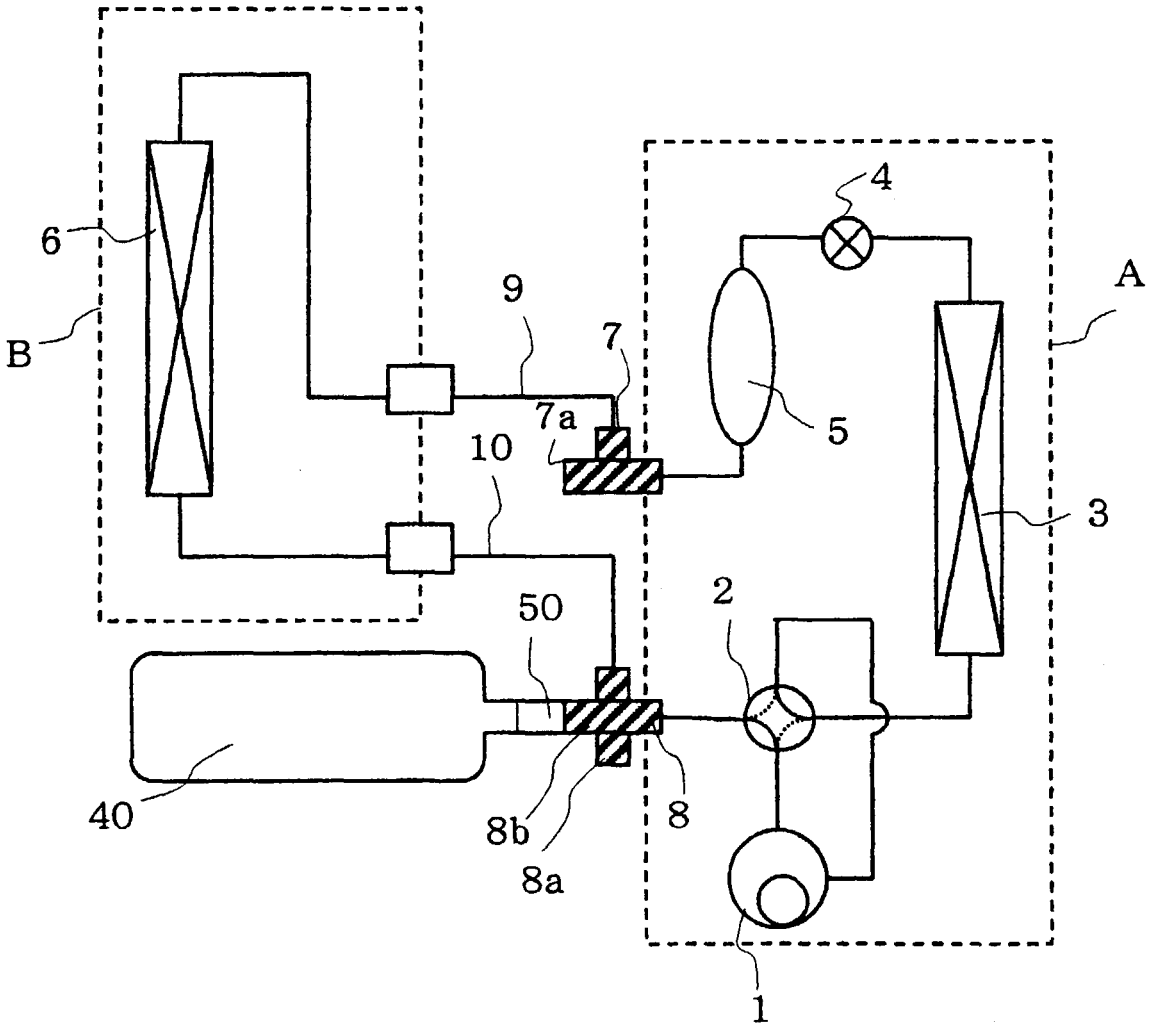

FIG.3

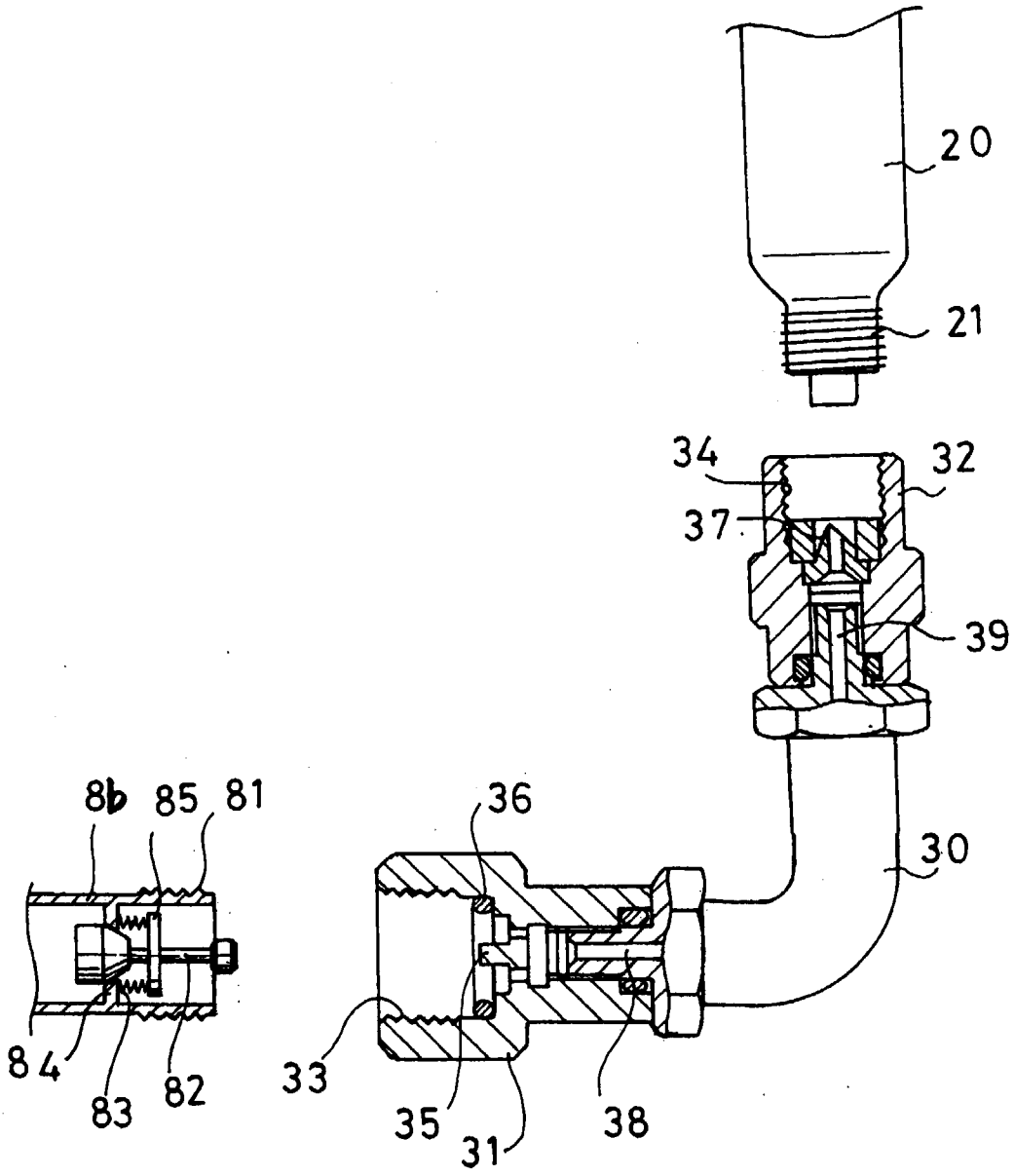

FIG.4

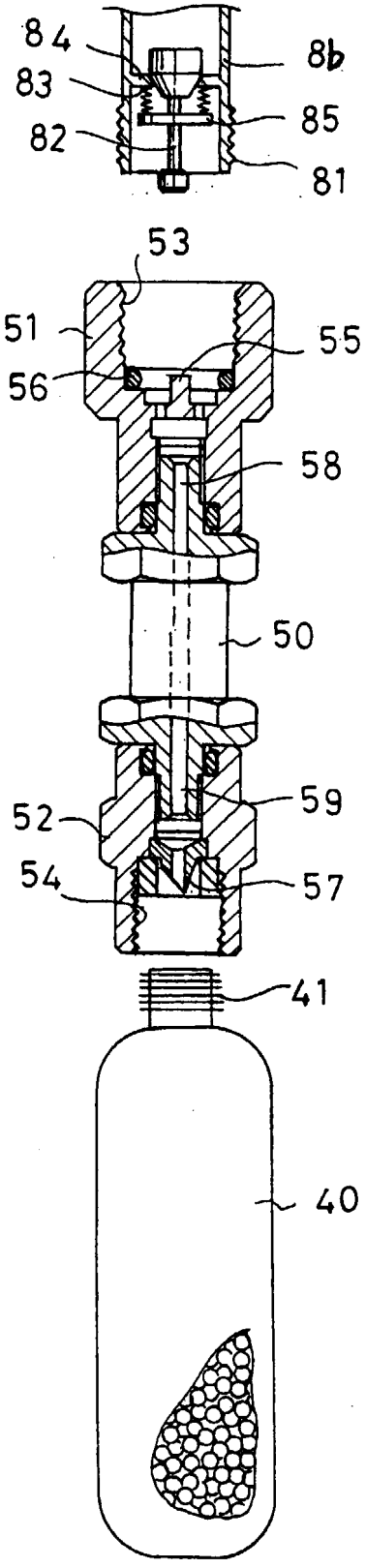

FIG.5