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

(11) EP 1 061 310 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
20.12.2000 Bulletin 2000/51

(51) Int. Cl.[7]: **F24F 1/00**

(21) Application number: **00112689.5**

(22) Date of filing: **15.06.2000**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **17.06.1999 JP 17042999**

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

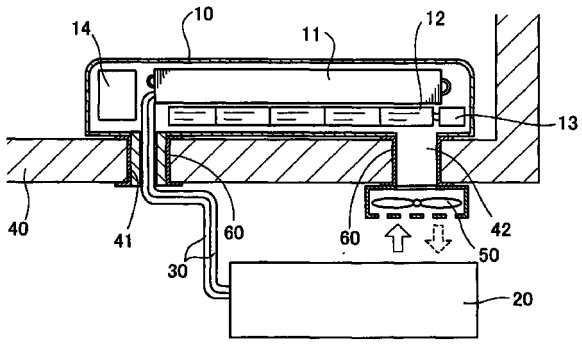
(72) Inventors:
- **Watanabe, Yukio,**
  R. 1108,Co-op Nomura Kyoto Minami
  Kyoto-shi, Kyoto 601-8037 (JP)
- **Fujitaka, Akira**
  Otsu-shi, Shiga 520-2144 (JP)
- **Kobayashi, Yoshinori**
  Moriyama-shi, Shiga 524-0021 (JP)
- **Kayano, Satoshi**
  Kurita-gun, Shiga 520-3031 (JP)
- **Yakumaru, Yuichi**
  Kusatsu-shi, Shiga 525-0055 (JP)

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

(54) Installation method for indoor unit of air conditioner

(57) An installation method of an indoor unit of an air conditioner is herein proposed, which is comprised of a step of forming two through holes on a wall surface of a building such that one of said through holes is used for connection pipes which connect said indoor unit and an outdoor unit and the other through hole is used for an exhaling air way through which air inside is exhaled to outside or for an inhaling air way through which air outside is inhaled.

FIG. 1



EP 1 061 310 A2

Description

Background of the Invention

(1) Field of the Invention

[0001] The present invention relates to an installation method of indoor unit of an air conditioner, an air conditioner installed by this method and an indoor unit suitable for this installation method.

(2) Description of the Prior Art

[0002] It has been proposed that a ventilation function is added to an air conditioner. (See, e.g., Japanese Laid Open Patent Application No. H8-385327 and Japanese Laid Open Patent Application No. H6-300312). For example, in Japanese Laid Open Patent Application No. H6-300312, it is proposed that a single through hole be used by disposing, within a single sleeve, connection pipes connecting the indoor unit and the outdoor unit as well as an air path for ventilation.

[0003] However, such method proposed in Japanese Laid Open Patent Application No. H6-300312 needs a large through hole and has poor installablility. Recently, it has been researched to use the HC system refrigerants such as propane or isobutene as refrigerant gases to be used for an air conditioner. However, since the HC system refrigerant is flammable, it is necessary to avoid the refrigerant staying inside a room which is airtight in case there is a leak of the refrigerant, and it is important to provide a ventilation function for ventilating the leaked refrigerant to the outdoor when such leakage is happened.

Detailed Description of the Invention

[0004] Therefore, it is one of the objectives of this invention to provide an easy method to install an air conditioner equipped with inhaling or exhaling function. Further, it is another objective of the invention to provide an installation method of an indoor unit of air conditioner which has good installability. Further, it is yet another objective of the present invention to provide an air conditioner which is equipped with sufficient exhaling or inhaling function and has good installability. Further, it is yet another objective of the invention to provide an indoor unit of an air conditioner which is capable of exhaling the leaked refrigerant to outside.

[0005] To achieve the above objects and other objects, according to the present invention, there is provided an installation method of an indoor unit of an air conditioner, as the first mode, which is comprised of a step of forming two through holes on a wall surface of a building such that one of the through holes is used for connection pipes which connects the indoor unit and an outdoor unit and the other through hole is used for an exhaling air way through which air inside is exhaled to outside or for an inhaling air way through which air outside is inhaled. With this mode of the invention, it is made possible to easily install an air conditioner which has an exhaling or inhaling function. In particular, according to this mode of the invention, by providing a through hole separate from a through hole for the connection pipes, it becomes possible to provide a sufficient exhaling or inhaling capability without forming a big diameter through hole. Further, by this mode, since it is not necessary to form a big diameter through hole, conventional tools may be used; and it becomes possible to install an air conditioner on a limited wall surface space; and it is not necessary to be concerned about the strength of a wall surface etc.

[0006] Further, according to the present invention, there is provided with an installation method of an indoor unit of an air conditioner, as the second mode, which is comprised of a step of forming two through holes on a wall surface of a building such that one of the through holes is used for connection pipes as well as for an inhaling air way through which air outside is inhaled and the other through hole is used for an exhaling airway through which air inside is exhaled to outside. With this mode of the invention, it is made possible to easily install an air conditioner which has an exhaling or inhaling function. In particular, according to this mode of the invention, by providing a through hole exclusively for an exhaling air way separate from a through hole for the connection pipes, it becomes possible to provide a sufficient exhaling capability without forming a big diameter through hole. Further, by this mode, since one through hole is used exclusively for exhaling air way, the flexibility in selecting an exhaling air way is increased, and therefore, it becomes possible to form it at a position where a high exhaling efficiency may be achieved. Further, by this mode, since it is not necessary to form a big diameter through hole, conventional tools may be used; and it becomes possible to install an air conditioner on a limited wall surface space; and it is not necessary to be concerned about the strength of a wall surface etc.

[0007] Further, according to the present invention, there is provided with an installation method of an indoor unit of an air conditioner, as the third mode, which is comprised of a step of forming two through holes on a wall surface of a building such that one of said through holes is used for connection pipes as well as for an exhaling air way through which air inside is exhaled to outside and the other through hole is used for an inhaling air way through which air outside is inhaled. With this mode of the invention, it is made possible to easily install an air conditioner which has an exhaling or inhaling function. In particular, according to this mode of the invention, by providing a through hole separate from a through hole for the connection pipes, it becomes possible to provide a sufficient inhaling capability without forming a big diameter through hole. Further, by this mode, since the same through hole is used for connection pipes as well as for an exhaling air way, exhaling

from portion in the vicinity of a connection pipe where some probability of refrigerant leakage exists is made easier. Further, by this mode, since it is not necessary to form a big diameter through hole, conventional tools may be used; and it becomes possible to install an air conditioner on a limited wall surface space; and it is not necessary to be concerned about the strength of a wall surface etc.

[0008] Further, according to the present invention, there is provided, as the fourth mode, with an installation method of an indoor unit of an air conditioner utilizing two through holes formed on a wall surface of a building for connecting connection pipes as well as for exhaling air inside to outside or for inhaling air outside, wherein the diameters of these through holes are the same. With this mode of the invention, since the diameters of the two through holes formed on a wall surface of a building are the same, it provides a better operability in performing the installation work, and thereby, it is made possible to easily install an air conditioner which has an exhaling or inhaling function.

[0009] Further, according to the present invention, there is provided, as the fifth mode, with an installation method of an indoor unit of an air conditioner utilizing two through holes formed on a wall surface of a building for connecting connection pipes as well as for exhaling air inside to outside or for inhaling air outside, wherein the diameters of these through holes are adjusted by using tubular parts which are inserted into these through holes. With this mode of the invention, by adjusting the diameters using the tubular parts which are inserted to the through holes, it is possible to adjust the diameters in response to the subject of construction, such as the connection pipes, the exhaling port or the inhaling port or combinations of these subjects; thereby, operability is enhanced and it becomes easier to install the air conditioner which has an exhaling or inhaling function.

[0010] Further, according to the present invention, there is provided, as the sixth mode, with an installation method of an indoor unit of an air conditioner utilizing two through holes formed on a wall surface of a building for connecting connection pipes as well as for exhaling air inside to outside or for inhaling air outside, wherein these holes are formed so as to have the same diameters and these diameters are adjusted by using tubular parts which are inserted into these through holes. With this mode of the invention, since the diameters of the two through holes are the same, it provides abetter operability in performing the through hole formation and the common tubular parts can be used. Further, with this mode of the invention, by adjusting the diameters using the tubular parts which are inserted into the through holes, it is possible to adjust the diameters in response to the subject of construction, such as the connection pipes, the exhaling port or the inhaling port or combinations of these subjects; thereby, operability is enhanced and it becomes easier to install the air conditioner which has an exhaling or inhaling function.

[0011] Further, according to the present Invention, in an installation method of an indoor unit of an air conditioner, as the seventh mode, in accordance with the above first to sixth mode, these through holes are formed on the wall surface in the horizontal direction with the predetermined distance in between. By this seventh mode of the invention, since these through holes are formed on the wall surface in the horizontal direction with a predetermined distance in between, it provides more flexibility in selecting where the indoor unit is installed; and in putting the connection pipes and in subsequent maneuvering thereof, either of the through holes 41, 42 may be utilized, thereby, the operability in installing is enhanced and it provides easy method of installation of an air conditioner having an exhaling or inhaling function.

[0012] Further, according to the present invention, in an installation method of an indoor unit of an air conditioner, as the eighth mode, in accordance with the above first to sixth mode, these through holes are formed on the wall surface in the vertical direction with the predetermined distance in between. By this eighth mode of the invention, since these through holes are formed on the wall surface in the vertical direction with a predetermined distance in between, in case that as a refrigerant, a flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is possible to use the through hole which is placed lower part for the purpose of an exhaling air way.

[0013] Further, according to the present invention, in an installation method of an indoor unit of an air conditioner, as the ninth mode, in accordance with the above first to sixth mode, these two through holes are formed on each of said adjoining wall surfaces. With this mode, since these two through holes are provided on the adjoining wall surfaces, respectively, in such cases that the indoor unit is provided at a place on the wall surface which is close to the adjoining wall surface or is provide at the corner made up of these two adjoining wall surfaces, it is possible to use either of through holes, each is formed on the different wall surface, for the connection pipes and the like (and subsequent maneuvering thereof); thereby, operability in installation process is enhanced so that it makes easier to install an air conditioner which has an inhaling or exhaling function.

[0014] Further, according to the present invention, there is provided with an installation method of an indoor unit of an air conditioner, as the tenth mode, which is comprised of a step of forming two through holes on a wall surface of a building such that one of these through holes formed at lower portion is used for connection pipes and for an exhaling air way through which air inside is exhaled to outside, and the other through hole formed at upper portion is used for an inhaling air way through which air outside is inhaled. With this mode of the invention, it is made possible to

easily install an air conditioner which has an exhaling or inhaling function. In particular, according to this mode of the invention, by providing a through hole separate from a through hole for the connection pipes, it becomes possible to provide a sufficient inhaling capability without forming a big diameter through hole. Further, by this mode, since the same through hole is used for connection pipes as well as for an exhaling air way, exhaling from a connection pipe portion where there is some probability of refrigerant leakage is made easier. Further, by providing the connection pipes and the exhaling air way in the through hole which is formed at the lower part, in case that as a refrigerant, a flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is possible to exhale efficiently the flammable refrigerant when it is leaked. Further, by this mode, since it is not necessary to form a big diameter through hole, conventional tools may be used; and it becomes possible to install an air conditioner on a limited wall surface space; and it is not necessary to be concerned about the strength of a wall surface etc.

[0015] Further, according to the present invention, there is provided with an installation method of an indoor unit of an air conditioner, as the eleventh mode, which is comprised of a step of forming two through holes on a wall surface of a building such that one of these through holes formed at upper portion is used for connection pipes as well as for an inhaling air way through which air outside is inhaled and the other through hole formed at lower portion is used for an exhaling air way through which air inside is exhaled to outside. With this mode of the invention, it is made possible to easily install an air conditioner which has an exhaling or inhaling function. In particular, according to this mode of the invention, by providing a through hole for exhaling port separate from a through hole for the connection pipes, it becomes possible to provide a sufficient exhaling capability without forming a big diameter through hole. Further, by this mode, since the through hole formed the lower part is used exclusively for an exhaling air way, in case that as a refrigerant, a flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is possible to provide it at a place where there is a high exhaling efficiency. Further, by this mode, since it is not necessary to form a big diameter through hole, conventional tools may be used; and it becomes possible to install an air conditioner on a limited wall surface space; and it is not necessary to be concerned about the strength of a wall surface etc.

[0016] Further, the twelfth mode of the invention is an air conditioner whose indoor unit is installed in accordance with either one of the modes of first through sixth, tenth and eleventh. With this mode of the invention, it is made possible to provide an air conditioner which has an exhaling or inhaling function and has the high installability.

[0017] Further, according to the present invention, there is provided with, as the thirteenth mode of the invention, an indoor unit of an air conditioner which is installed using two through holes formed on a wall surface, which is comprised of an indoor heat exchanger contained within a main body; connection pipes connecting to an outdoor unit provided at upper portion of the back of the main body; and an exhaling port which is used for exhaling air inside provided at lower portion of the back of the main body. With this mode of the invention, since the connection pipes are provided at the upper part and the exhaling port is positioned at the lower part, in case that as a refrigerant, a flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is easy to exhale such leaked refrigerant to the outdoor.

[0018] Further, according to the present invention, there is provided with, as the fourteenth mode of the invention, an indoor unit of an air conditioner which is installed using two through holes formed on a wall surface, which is comprised of an indoor heat exchanger contained within a main body; connection pipes connecting to an outdoor unit and an exhaling port which is used for exhaling air inside provided at lower portion of the back of the main body. With this mode of the invention, since the connection pipes and the exhaling port are provided at the lower part, in case that as a refrigerant, a flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is easy to exhale such leaked refrigerant to the outdoor.

[0019] Further, according to the present invention, there is provided with, as the fifteenth mode of the invention, an indoor unit of an air conditioner which is installed using two through holes formed on a wall surface, which is comprised of an indoor heat exchanger contained within a main body; connection pipes connecting to an outdoor unit and an inhaling port which is used for inhaling air our side provided at upper portion of the back of the main body; and an exhaling port which is used for exhaling air inside provided at lower portion of the back of the main body. With this mode of the invention, since the exhaling port is positioned at the lower part, in case that as a refrigerant, a flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is easy to exhale such leaked refrigerant to the outdoor. Further, according to this mode, by providing the connection pipes as well as the inhaling port at the upper part of the back of the main body, one through hole becomes easier to use as an exclusive exhaling port; thereby, the flexibility in selecting a place for the exhaling port is increased, and as a result, it is made possible to place it at a place having a high exhaling efficiency.

[0020] Further, according to the present invention, there is provided with, as the sixteenth mode of the invention, an indoor unit of an air conditioner which is installed using two through holes formed on a wall surface, which is comprised of an indoor heat exchanger

contained within a main body; connection pipes connecting to an outdoor unit and an exhaling port which is used for exhaling air inside provided at lower portion of the back of the main body; and an inhaling port which is used for inhaling air out side provided at upper portion of the back of the main body. With this mode of the invention, since the exhaling port is positioned at the lower part, in case that as a refrigerant, a flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is easy to exhale such leaked refrigerant to the outdoor. Further, in this mode, by providing the connection pipes and the exhaling port at the lower part of the back of the main body, the same through hole becomes easier to be used for connection pipes as well as for an exhaling air way; and thereby, exhaling from a connection pipe portion where there is some probability of refrigerant leakage is made easier.

[0021] Further, according to the present invention, there is provided with, as the seventeenth mode of the invention, an indoor unit of an air conditioner which is installed using two through holes formed on a wall surface, which is comprised of an indoor heat exchanger contained within a main body; and an exhaling port which is used for exhaling air inside provided at lower portion of the back of the main body. With this mode of the invention, since the exhaling port is positioned at the lower part, in case that as a refrigerant, a flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is easy to exhale such leaked refrigerant to the outdoor.

[0022] Further, according to the present invention, there is provided with, as the eighteenth mode of the invention, an indoor unit of an air conditioner which is installed using two through holes formed on a wall surface, which is comprised of an indoor heat exchanger contained within a main body; and an exhaling port which is used for exhaling air inside provided at the portion close to either one of the right or left side of the indoor heat exchanger. With this mode of the invention, since the exhaling port is provided at a place which is close to either one of right or left side of the indoor heat exchanger, exhaling from the location where there is some probability of refrigerant leakage because there are generally many welding parts on the connection pipes is made easier, and therefore, it becomes easier to exhale such leaked refrigerant to the outdoor.

[0023] Further, according to the present invention, there is provided with, as the nineteenth mode of the invention, an indoor unit of an air conditioner which is installed using two through holes formed on a wall surface, which is comprised of an indoor heat exchanger and a fan contained within a main body; connection pipes connecting to an outdoor unit and an exhaling port which is used for exhaling air inside provided at upper portion of the back of said main body; and an inhaling port which is used for inhaling air out side provided at lower portion of the back of said main body, wherein, exhaling of the air inside is carried out using said fan. With this mode of the invention, since the exhaling is carried out by a fan, in case that as a refrigerant, a flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is easy to exhale such leaked refrigerant to the outdoor. Further, with this mode, by providing the connection pipes and the exhaling port at the upper part of the back of the main body, the same through hole becomes easier to be used for connection pipes as well as for an exhaling air way; and thereby, exhaling from a connection pipe portion where there is some probability of refrigerant leakage is made easier.

[0024] Further, according to the present invention, there is provided with, as the twentieth mode of the invention, an indoor unit of an air conditioner which is installed using two through holes formed on a wall surface, which is comprised of an indoor heat exchanger and a fan contained within a main body; connection pipes connecting to an outdoor unit and an inhaling port which is used for inhaling air out side provided at lower portion of the back of the main body; and an exhaling port which is used for exhaling air inside provided at upper portion of the back of the main body, wherein, exhaling of the air inside is carried out using said fan. With this mode of the invention, since the exhaling is carried out by a fan, in case that as a refrigerant, a flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is easy to exhale such leaked refrigerant to the outdoor. Further, according to this mode, by providing the connection pipes as well as the inhaling port at the upper part of the back of the main body, one through hole becomes easier to use as an exclusive exhaling port; thereby, the flexibility in selecting a place for the exhaling port is increased, and as a result, it is made possible to place it at a place having a high exhaling efficiency.

[0025] Further, according to the present invention, there is provided with, as the twenty-first mode of the invention, an indoor unit of an air conditioner which is installed using two through holes formed on a wall surface, which is comprised of an indoor heat exchanger and a fan contained within a main body; and an exhaling port which is used for exhaling air inside provided at upper portion of the back of said main body, wherein, exhaling of the air inside is carried out using the fan. With this mode of the invention, since the exhaling is carried out by a fan, in case that as a refrigerant, a flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is easy to exhale such leaked refrigerant to the outdoor.

[0026] Further, according to the present invention, in an indoor unit of an air conditioner, as the twenty-second mode, in accordance with the above nineteenth to twenty-first mode, the fan is provided outside of the indoor unit. With this mode of the invention, since the fan is provided outside of the indoor unit, the size of the indoor unit can be maintained at the size of conventional

indoor unit.

[0027] Further, according to the present invention, in an indoor unit of an air conditioner, as the twenty-third mode, in accordance with the above twenty-second mode, a fan is provided on the wall's outside surface. With this mode of the invention, it is easy to use a large fan which has a high ventilation capacity.

[0028] Further, according to the present invention, in an installation method of an indoor unit of an air conditioner, as the twenty-fourth mode, in accordance with the above first to sixth mode, the tenth, and the eleventh mode, the HC system refrigerant such as propane or isobutene is used and as the connection pipes, flexible pipes or plastic pipes are used. With this mode of the invention, by using the HC system refrigerant, it is possible to reduce the diameters of the connection pipes in comparison to the case where the conventional refrigerant such as R22 is used such that the diameters are reduced to 75-80% in case of gas side connection pipe; to 15-58% in case of liquid side connection pipe. Due to the fact that the diameters of the pipes can be smaller, it becomes possible to reduce the strength required for the connection pipes. Therefore, as a result, it becomes possible to use the flexible pipes or plastic pipes. This contributes significantly to the operability in installing operation.

[0029] Further, according to the present invention, in an installation method of an indoor unit of an air conditioner, as the twenty-fifth mode, in accordance with the above thirteen to sixteen mode, the tenth mode and the eleventh mode, the HC system refrigerant such as propane or isobutene is used and as the connection pipes, flexible pipes or plastic pipes are used. With this mode of the invention, by using the HC system refrigerant, it is possible to reduce the diameters of the connection pipes in comparison to the case where the conventional refrigerant such as R22 is used such that the diameters are reduced to 75-80% in case of gas side connection pipe; to 15-58% in case of liquid side connection pipe. Due to the fact that the diameters of the pipes can be smaller, it becomes possible to reduce the strength required for the connection pipes. Therefore, as a result, it becomes possible to use the flexible pipes or plastic pipes. This contributes significantly to the operability in installing operation.

Brief Description of the Drawings

[0030]

Fig. 1 is a structural diagram to explain the installation method of an indoor unit of an air conditioner of an embodiment of the present invention;

Fig. 2 is a structural diagram to explain the installation method of an indoor unit of an air conditioner of another embodiment of the present invention;

Fig. 3 is a structural diagram to explain the installation method of an indoor unit of an air conditioner of another embodiment of the present invention;

Fig. 4 is a structural diagram to explain the installation method of an indoor unit of an air conditioner of another embodiment of the present invention;

Fig. 5 is a structural diagram to explain the installation method of an indoor unit of an air conditioner of another embodiment of the present invention;

Fig. 6 is a structural diagram to explain the installation method of an indoor unit of an air conditioner of another embodiment of the present invention;

Fig. 7 is a structural diagram to explain the installation method of an indoor unit of an air conditioner suitable for the embodiments shown in Figs. 1-3;

Fig. 8 is a structural diagram to explain the installation method of an indoor unit of an air conditioner suitable for the embodiments shown in Figs 5 or 6;

Fig. 9 is a structural diagram to explain an indoor unit of an air conditioner suitable for the embodiments shown in Fig. 1;

Fig. 10 is a structural diagram to explain an indoor unit of an air conditioner suitable for the embodiment shown either in Fig. 2 or 3;

Fig. 11 is a structural diagram to explain an indoor unit of an air conditioner suitable for the embodiment of installation method which employs two through holes provided in the vertical direction as shown either in Fig. 5 or 6;

Fig. 11 is a structural diagram to explain an indoor unit of an air conditioner suitable for the embodiment of installation method which employs two through holes provided in the vertical direction as shown either in Fig. 5 or 6;

Fig. 12 is a structural diagram to explain an indoor unit of an air conditioner suitable for the embodiment of installation shown in Fig. 5;

Fig. 13 is a structural diagram to explain an indoor unit of an air conditioner suitable for the embodiment of installation shown in Fig. 6;

Fig. 14 is a sectional diagram showing the configuration of the tubular parts which are used in the installation method of an indoor unit of an air conditioner in accordance with an embodiment of the present invention;

Fig. 15 is a sectional diagram showing the configuration of the tubular parts which are used in the installation method of an indoor unit of an air conditioner in accordance with an embodiment of the present invention; and

Fig. 16 is a sectional diagram showing the configuration of the tubular parts which are used in the installation method of an indoor unit of an air conditioner in accordance with an embodiment of the present invention.

Detailed Description of The Preferred Embodiments

[0031] One of the embodiments of the present invention will be explained with reference to the accom-

panying drawings.

[0032] Fig. 1 is a structural diagram to explain an installation method of an indoor unit of an air conditioner of an embodiment of the present invention.

[0033] First, the total configuration will be explained. An air conditioner is comprised of an indoor unit 10 and an outdoor unit 20 and the indoor unit 10, and the outdoor unit 20 is connected by connecting pipes. The indoor unit 10 is disposed on a wall surface 40 of the indoor side and the outdoor unit 20 is disposed outside of a building. In the indoor unit 10, there contains an indoor heat exchanging unit 11, a fan 12, a motor 13, a power supply controller 14 and so on. The indoor heat exchanging unit is a heat exchanger placed on the users' side which functions as an evaporator in cooling operation and as a condenser in warming operation. The fan 12 blows out the hear-exchanged air by the indoor heat exchanger 11 or inhales the air from the outside and blows it out to indoor. The fan 12 is driven by the motor 13. The power supply controller 14 controls the motor 13, compressor, a fan, a four way valve, etc., all contained in the outside unit 20. In the outside unit 20, there contains an outdoor heat exchanger, a decompressor and so on. The connecting pipes are comprised of a liquid side pipe and a gas side pipe.

[0034] Furthermore, the air conditioner of the present embodiment has inhaling/exhaling functions. The fan 50 is for such inhaling/exhaling functions, and disposed on the outside sidewall surface 40. Here, the fan 50 does not have to have both functions of inhaling and exhaling, but it may be sufficient if the fan has either one of those functions. Furthermore, by disposing the fan 50 in a through hole 42, it may prevent from the outside appearance becomes ruined and may make easier to take measures to prevent the intrusion of the rainwater. However, it is also appropriate to dispose the fan 50 inside the room, in particular, within the inside unit 10. Further, it is also possible to have the fan 12 to have the function of the fan 50.

[0035] Next, the installation method of an air conditioner in accordance with the present embodiment is explained.

[0036] For the installation of an air conditioner, two through holes 41, 42 are formed on the wall surface 40. And, the tubular parts 60 are inserted in the through holes 41, 42, respectively.

[0037] In this installation method of an indoor unit 10 of the present embodiment, the through hole 41 is used for connecting pipes 30 which connect between the indoor unit 10 and the outside unit 20 on the one hand; and the through hole 42 is used for the air way for exhaling the indoor air as well as for air way for inhaling the outside air on the other hand.

[0038] As, in this embodiment, a separate through hole 42 is provided for inhaling or exhaling air way separated from another through hole 41 used for installation of the connecting pipes 30, it makes easier to install the air conditioner which has an inhaling or exhaling air function. In particular, since the separate through hole 42 is provided in addition to the through hole 41 for the connection pipes 30, it is not necessary to make the diameters of the through holes 41, 42 bigger but yet providing a sufficient inhaling or exhaling function. Because it is not necessary to form bigger diameter through holes 41, 42, the conventional tools may be used and it makes possible to install an air conditioner even there is a limited wall surface space; and it is not necessary to be concerned about the strength of the wall surface.

[0039] Fig. 2 is a structural diagram to explain the installation method of an indoor unit of an air conditioner of another embodiment of the present invention.

[0040] The explanation of the parts which have the identical function as those in the above embodiment will not be repeated; but rather, the same numbers will be affixed. The same treatment will be given for the subsequent embodiments as well.

[0041] The installation method of this embodiment is different from the above embodiment in that a through hole 41 is used for the connection pipes 30 as well as for the air way of inhaling, and the other through hole 42 is used for the air way of exhaling.

[0042] Particularly, according to the present embodiment, a through hole 42 for the air way of exhaling separate from a through hole 41 for connection pipes 30 is provided, thereby, it is not necessary to make the diameter of these through holes 41, 42 big; but it is possible to make certain that there is a sufficient exhaling capacity. And, according to this embodiment, one through hole 42 is exclusively used for the exhaling air way, the level of freedom in choosing the exhaling air way is enhanced and it becomes possible to select a place where the exhaling efficiency will be high.

[0043] Furthermore, by disposing the fan 50 in the through hole 42, it may prevent from the outside appearance becomes ruined and may make easier to take measures to prevent the intrusion of the rainwater. However, it is also appropriate to dispose the fan 50 inside the room, in particular, within the inside unit 10. Further, it is also possible to have the fan 12 to have the function of the fan 50.

[0044] Fig. 3 is a structural diagram to explain the installation method of an indoor unit of an air conditioner of another embodiment of the present invention.

[0045] The installation method of this embodiment is different from the above embodiment in that a through hole 41 is used for the connection pipes 30 as well as for the air way of exhaling, and the other through hole 42 is used for the air way of inhaling.

[0046] In particular, according to this embodiment, by providing the connection pipes 30 and the exhaling air way in the same through hole 41, it makes easier to exhale the air at the vicinity of the connection pipes from which there is a possibility of refrigerant leakage.

[0047] It is appropriate to dispose the fan 50 inside the room, in particular, within the inside unit 10. Further, it is also possible to have the fan 12 to have the function

of the fan 50 without providing the fan 50.

[0048] Furthermore, although the present embodiment has been explained in reference to the case in which no inhaling fan within the inhaling air way is provided, it is possible to enhance the inhaling function by providing the similar fan as that used for the exhaling air way. Further, in this case, a place to put the fan can be on the wall surface 40 on the outside end, or it can be provided within the through hole 42. Further, it is also possible that the fan is provided indoor, in particular, within the indoor unit 10.

[0049] Fig. 4 is a structural diagram to explain the installation method of an indoor unit of an air conditioner of another embodiment of the present invention.

[0050] The installation method of the indoor unit 10 in this embodiment is as same as the above embodiment shown in Fig. 3 in that a through hole 41 is used for the connection pipes 30 as well as for the air way of exhaling, and the other through hole 42 is used for the air way of inhaling. However, it is different in that a different wall surface 40 is used for the through hole 42. That is, in this embodiment, the through hole 42 is provided on a wall surface 40 which adjoins the wall surface 40 where the through hole 41 is formed.

[0051] Particularly, according to the present embodiment, since these two through holes 41, 42 are provided on the adjoining wall surfaces 40, respectively, in such cases that the indoor unit 10 is provided at the place on the wall surface which is close to the adjoining wall surface or is provide at the corner made up of these two adjoining wall surfaces, it is possible to use either of throughholes 41 or 42, each is formed on the different wall surface 40, for the connection pipes 30 and electric wiring (and subsequent maneuvering thereof); thereby, operability in installation process is enhanced so that it makes easier to ins tall an air conditioner which has inhaling or exhaling function.

[0052] It is appropriate to dispose the fan 50 inside the room, in particular, within the inside unit 10. Further, it is also possible to have the fan 12 to have the function of the fan 50 without providing the fan 50.

[0053] Furthermore, although the present embodiment has been, as same as in the case of the explanation of the embodiment shown in Fig. 3, explained in reference to the case in which no inhaling fan within the inhaling air way is provided, it is possible to enhance the inhaling function by providing the similar fan as that used for the exhaling air way. Further, in this case, a place to put the fan can be on the wall surface 40 on the outside end, or it can be provided within the through hole 42. Further, it is also possible that the fan is provided indoor, in particular, within the indoor unit 10.

[0054] Fig. 5 is a structural diagram to explain the installation method of an indoor unit of an air conditioner of another embodiment of the present invention.

[0055] As shown in Fig. 5, the indoor unit 10 is comprised of an inlet port 15 through which the air in the room is inhaled, an outlet port 16 from which the heat-exchanged air or the outdoor air is blown out, and a louver 17 which changes the direction of outlet air. These inlet port 15, out let port 16 and louver 17 are also provided to the indoor units shown in Figs. 1-4.

[0056] In accordance with the present installation method of indoor unit 10, it is different from the above embodiment in that the through hole 43 which is formed lower part is used for the connection pipes and for the exhaling air way; and the through hole 44 formed upper part is used for the inhaling air way.

[0057] In particular, in accordance with the present embodiment, since the connection pipes 30 and the exhaling air way is provided in the through hole 43 which is formed lower part, in case that as refrigerant, flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is possible to exhale efficiently the flammable refrigerant when it is leaked.

[0058] It is appropriate to dispose the fan 50 inside the room, in particular, within the inside unit 10. Further, it is also possible to have the fan 12 to have the function of the fan 50 without providing the fan 50.

[0059] Furthermore, although the present embodiment has been explained in reference to the case in which no inhaling fan within the inhaling air way is provided, it is possible to enhance the inhaling function by providing the similar fan as that used for the exhaling air way. Further, in this case, a place to put the fan can be on the wall surface 40 on the outside end, or it can be provided within the through hole 42. Further, it is also possible that the fan is provided indoor, in particular, within the indoor unit 10.

[0060] Furthermore, by closing the outlet port 16 by the louver 17 or the like, it is possible to reduce the leakage of refrigerant into the room. Further, when the operation of the air conditioner is stopped, by closing the outlet port 16 by the louver 17 or the like, it is possible to further reduce the leakage of refrigerant into the room. Incidentally, this closing of outlet port has similar effect in the preceding embodiments.

[0061] Fig. 6 is a structural diagram to explain the installation method of an indoor unit of an air conditioner of another embodiment of the present invention.

[0062] In accordance with the present installation method of indoor unit 10, it is different from the above embodiment in that the through hole 44 which is formed upper part is used for the connection pipes and for the inhaling air way; and the through hole 43 formed lower part is used for the exhaling air way.

[0063] In particular, in accordance with the present embodiment, since the through hole 43 which is formed lower part is used exclusively for the exhaling air way, in case that as a refrigerant, a flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is possible to place the through hole 43 where it heightens the exhaling efficiency.

[0064] Furthermore, although the present embodiment has been explained in reference to the case in

which no fan 50 is provided neither in the inhaling air way or in the exhaling air way, it is possible to enhance the inhaling or exhaling function by providing a fan in either of the exhaling air way or the inhaling air way. Further, in this case, a place to put the fan can be on the wall surface 40 on the outside end, or it can be provided within the through hole 44. Further, it is also possible that the fan is provided indoor, in particular, within the indoor unit 10.

[0065] Furthermore, by closing the outlet port 16 by the louver 17 or the like, it is possible to reduce the leakage of refrigerant into the room. Further, when the operation of the air conditioner is stopped, by closing the outlet port 16 by the louver 17 or the like, it is possible to further reduce the leakage of refrigerant into the room. Incidentally, this closing of outlet port has similar effect in the preceding embodiments.

[0066] Fig. 7 is a structural diagram to explain the installation method of an indoor unit of an air conditioner suitable for the embodiments shown in Figs. 1-3.

[0067] This embodiment shows the case in which the through hole 41 and the through hole 42 are formed on the wall surface 40 in the lateral direction with the predetermined distance in between. The air conditioner is installed on the wall surface 40 by the indoor unit installation board 71. This indoor unit installation board 71 is comprised of a latch portion 71A on the upper part by which the air conditioner is hanged, and cutout portions 71B, 71C which are provided on the both side of lower part where the through holes 41, 42 will be accommodated. The indoor unit installation board 71 is fixed onto the wall surface 40 by screws or the like.

[0068] According to this embodiment, since these two through holes 41, 42 are provided in the lateral direction with the predetermined distance in between, it provides more flexibility in selecting where the indoor unit is installed; and in putting the connection pipes and in subsequent maneuvering thereof, either of the through holes 41, 42 may be utilized, thereby, the operability in installing is enhanced and it provides easy method of installation of an air conditioner having the exhaling or inhaling function.

[0069] It is possible to provide two circular holes on the indoor unit installation board 71 in place of the cutouts 71b, 71C employed in this embodiment. In case circular holes are used, these holes are formed to be a little bit bigger than the through hole 41, 42. By using such circular holes, it is possible to form the through holes 41, 42 at accurate positions.

[0070] Fig. 8 is a structural diagram to explain the installation method of an indoor unit of an air conditioner suitable for the embodiments shown in Figs 5 or 6.

[0071] This embodiment shows the case in which the through hole 43 and the through hole 44 are formed on the wall surface 40 in the vertical direction with the predetermined distance in between. The air conditioner is installed on the wall surface 40 by the indoor unit installation board 72. This indoor unit installation board 72 is comprised of a latch portion 72A on the upper part by which the air conditioner is hanged, and cutout portions 72B, 72C which are provided on either of the side parts in the vertical direction where the through holes 43, 44 will be accommodated. The indoor unit installation board 72 is fixed onto the wall surface 40 by screws or the like.

[0072] According to this embodiment, since these two through holes 43, 44 are provided in the vertical direction with the predetermined distance in between, in case that as a refrigerant, a flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is possible to use the through hole 43 which is placed at lower portion for the purpose of an exhaling air way.

[0073] It is possible to provide two circular holes on the indoor unit installation board 72 in place of the cutouts 72B, 72C employed in this embodiment. In case circular holes are used, these holes are formed to be a little bit bigger than the through hole 43, 44. By using such circular hole, it is possible to form the through holes 43. 44 at accurate positions.

[0074] Fig. 9 is a structural diagram to explain an indoor unit of an air conditioner suitable for the embodiments shown in Fig. 1.

[0075] In this embodiment, the indoor side connection pipes 30A and an opening 18A are provided at each lower side of the back of an indoor unit 10A. Here, the opening 19A functions as an exhaling port or an inhaling/exhaling port.

[0076] According to the present embodiment, since the indoor side connection pipes 30A and the opening 18A which functions as an exhaling port are positioned at the lower part, in case that as a refrigerant, a flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is easy to exhale such leaked refrigerant to the outdoor.

[0077] The specific positions of the indoor side connection pipes 30A and the opening 18A can be reversed from those explained as an embodiment. Further, when the indoor unit 10A of this embodiment is installed, it is preferable to use the indoor unit installation board 71 shown in Fig. 7.

[0078] Fig. 10 is a structural diagram to explain an indoor unit of an air conditioner suitable for the embodiment shown either in Fig. 2 or 3.

[0079] The indoor unit of this embodiment is provided with an opening 18B which is formed near the indoor side connection pipes 30A of the indoor unit 10A shown as the embodiment in connection with Fig. 9. It is preferable that the opening 18B is provided such that it consists an outside concentric circle with the hole for the indoor side connection pipes 30A. In this case, if the opening 18A consists an exhaling port, the opening 18B is used as an inhaling port; if the opening 18A consists an inhaling port, the opening 18B is used for an exhaling port.

[0080] According to the present embodiment, since

the indoor side connection pipes 30A and the opening 18A or opening 18B which functions as an exhaling port are positioned at the lower part, in case that as a refrigerant, a flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is easy to exhale such leaked refrigerant to the outdoor.

[0081] The positions of the indoor side connection pipes 30A may be on the right side part. Further, when the indoor unit 10A of this embodiment is installed, it is preferable to use the indoor unit installation board 71 shown in Fig. 7.

[0082] Fig. 11 is a structural diagram to explain an indoor unit of an air conditioner suitable for the embodiment of installation method which employs two through holes provided in the vertical direction as shown either in Fig. 5 or 6.

[0083] In this embodiment, the indoor side connection pipes 30B and an opening 19A are provided at one of the sides of the back of an indoor unit 10A in the vertical direction. Here, the opening 19A functions as an exhaling port or an inhaling/exhaling port.

[0084] According to the present embodiment, since the indoor side connection pipes 30B is provided at the upper and the opening 19A which functions as an exhaling port is positioned at the lower part, in case that as a refrigerant, a flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is easy to exhale such leaked refrigerant to the outdoor.

[0085] The positions of the indoor side connection pipes 30B and the opening 19 may be on the right side part. Further, when the indoor unit 10C of this embodiment is installed, it is preferable to use the indoor unit installation board 72 shown in Fig. 8.

[0086] Fig. 12 is a structural diagram to explain an indoor unit of an air conditioner suitable for the embodiment of installation shown in Fig. 5.

[0087] In this embodiment, the indoor side connection pipes 30B and an opening 19B are provided at the lower part of one of the sides of the back of an indoor unit 10D and the opening 19A is provided at the upper part. It is preferable that the opening 19B is provided such that it consists an outside concentric circle with the hole for the indoor side connection pipes 30B. In this case, the opening 19A functions as an inhaling port and the opening 19B functions as an exhaling port.

[0088] According to the present embodiment, since the opening 19B which functions as an exhaling port is positioned at the lower part, in case that as a refrigerant, a flammable refrigerant having specific gravity greater than that of the air, for example, propane is used, it is easy to exhale such leaked refrigerant to the outdoor. Further, since the indoor side connection pipes 30B and the opening 19B which consists an exhaling port are provided at the lower part of the back of the unit, the exhaling from a part where the possibility of the refrigerant leakage is high because of the connection pipes is made easier.

[0089] The positions of the indoor side connection pipes 30B may be on the right side part. Further, when the indoor unit 10D of this embodiment is installed, it is preferable to use the indoor unit installation board 72 shown in Fig. 8.

[0090] Fig. 13 is a structural diagram to explain an indoor unit of an air conditioner suitable for the embodiment of installation shown in Fig. 6.

[0091] In this embodiment, the indoor side connection pipes 30B and an opening 19B are provided at the upper part of one of the sides of the back of an indoor unit 10E and the opening 19A is provided at the lower part. It is preferable that the opening 19B is provided such that it consists an outside concentric circle with the hole for the indoor side connection pipes 30B. In this case, the opening 19A functions as an exhaling port and the opening 19B functions as an inhaling port.

[0092] According to the present embodiment, since the opening 19A which functions as an exhaling port is positioned at the lower part, in case that as a refrigerant, a flammable refrigerant having a specific gravity greater than that of the air, for example, propane is used, it is easy to exhale such leaked refrigerant to the outdoor. Further, since the indoor side connection pipes 30B and the opening 19B which consists an inhaling port are provided at the upper part of the back of the unit, the opening 19A is exclusively used as an exhaling port, thereby, the flexibility regarding where to form the exhaling port is increased; and therefore, it becomes possible to place it where high exhaling efficiency can be obtained.

[0093] The position of the indoor side connection pipes 30B may be on the right side part. Further, when the indoor unit 10E of this embodiment is installed, it is preferable to use the indoor unit installation board 72 shown in Fig. 8.

[0094] In the cases in which the openings are provided in the vertical direction as shown as the embodiments in Figs. 11-13, it has been explained such that the opening 19A which is provided at the lower part in the embodiment shown in Fig. 11, the opening 19B which is provided at the lower part in the embodiment shown in Fig. 12, and the opening 19A which is provided at the lower part in the embodiment shown in Fig. 13, are all for an exhaling port; and the opening 19B which is provided at the upper part in the embodiment shown In Fig. 11, the opening 19A which is provided at the upper part in the embodiment shown in Fig. 12, and the opening 19B which is provided at the upper part in the embodiment shown in Fig. 13, are all for an inhaling port. However, it is possible that such exhaling port and such inhaling port are exchanged. If such exchanged configuration is used and as a refrigerant, a flammable refrigerant having a specific gravity greater than that of the air, for example, propane is used, the exhaling of the leaked refrigerant is carried out by driving the fan 12 contained in the indoor unit if there is a leak. It is possi-

ble that a fan for exhaling may be provided in addition to the fan 12; and the fan 50 which was explained in connection with the above embodiments may be used. Furthermore, if the refrigerant whose specific gravity is smaller than that of the air is used, it is not necessary to use a fan.

[0095] Next, the embodiments of tubular part 60 which is inserted into the through hole that has been explained in the above embodiments will be explained in reference to Figs. 14-16.

[0096] As shown in these Figs, a tubular part 61, 62, 63 is comprised of a main body 61B, 62B, 63B which has a flange 61A, 62A, 63A at one end and a cap 61C, 62C, 63C which are connectable to the other end of the main bodies 61B, 62B, 63B. Here, the outer diameter of cap 61C, 62C, 63C is preferably the same outer diameter of the flange 61A, 62A, 63A. The main body 61B, 62B, 63B has a hollow tubular shape and the both ends are open.

[0097] Here, the tubular part 61 is of such dimensions that the inner diameter of main body 61B is R1 and the outer diameters of flange 61A and the cap 61C are S1. The tubular part 62 is of such dimensions that the inner diameter of main body 62B is R1 and the outer diameters of flange 62A and the cap 62C are S2. And, the tubular part 63 is of such dimensions that the inner diameter of main body 63B is R2 and the outer diameters of flange 63A and the cap 63C are S1. The dimensional relation between S1 and S2 is S1 < S2; the dimensional relation between R1 and R2 is R1 < R2.

[0098] In case that the diameters of the through holes which are formed on the wall surface 40 are different, it is possible to adjust the diameters using the tubular part 61 and the tubular part 62. In this way, by adjusting the diameters using the tubular parts 61, 62 which are inserted to the through holes, it is possible to adjust the diameters in response to the subject of construction, such as the connection pipes, the exhaling port or the inhaling port or combinations of these subjects; thereby, operability is enhanced and it becomes easier to install the air conditioner which has an exhaling or inhaling function.

[0099] Furthermore, it is possible to adjust the diameters by using the tubular part 61 and the tubular part 63 in case that the same diameter through holes are formed on the wall surface 40. In this way, the formation of the through holes becomes more convenient since the diameters are the same. By adjusting the diameters using the tubular parts 61, 63 which are inserted to the through holes, it is possible to adjust the diameters in response to the subject of construction, such as the connection pipes, the exhaling port or the inhaling port or combinations of these subjects; thereby, the operability is enhanced and it becomes easier to install the air conditioner which has an exhaling or inhaling function.

[0100] In the above explanations, the detailed explanations as to the connection pipes 30 and the indoor side connection pipes 30A are omitted. However, as such connection pipes, flexible pipes or plastic pipes may be used. As a refrigerant for an air conditioner, by using the HC system refrigerant such as propane or isobutene, it is possible to reduce the diameters of the connection pipes in comparison to the case where the conventional refrigerant such as R22 is used such that the diameters are reduced to 75-80% in case of gas side connection pipe; to 15-58% in case of liquid side connection pipe. Due to the fact that the diameter of the pipes can be smaller, it becomes possible to reduce the strength required for the connection pipes. Therefore, as a result, it becomes possible to use the flexible pipes or plastic pipes. This contributes significantly to the operability in installing operation. That is, by using the flexible pipes or plastic pipes, the similar treatment when cables are treated can be used, therefore, operability is enhanced. Furthermore, a long pipe can be used so that the number of connection potions may be reduced. This contributes to preventing the leakage. Further, as a plastic pipe, a plastic reinforced by glass fibers such as GF/ABS, GF/PP may be used.

Claims

1. An installation method of an indoor unit of an air conditioner comprising:

   forming two through holes on a wall surface of a building such that one of said through hole is used for connection pipes which connects said indoor unit and an outdoor unit and the other through hole is used for an exhaling air way through which air inside is exhaled to outside or for an inhaling air way through which air outside is inhaled.

2. An installation method of an indoor unit of an air conditioner comprising:

   forming two through holes on a wall surface of a building such that one of said through hole is used for connection pipes as well as for an inhaling air way through which air outside is inhaled and the other through hole is used for an exhaling air way through which air inside is exhaled to outside.

3. An installation method of an indoor unit of an air conditioner comprising:

   forming two through holes on a wall surface of a building such that one of said through hole is used for connection pipes as well as for an exhaling air way through which air inside is exhaled to outside and the other through hole is used for an inhaling air way through which air outside is inhaled.

4. An installation method of an indoor unit of an air conditioner utilizing two through holes formed on a wall surface of a building for connecting connection pipes as well as for exhaling air inside to outside or for inhaling air outside, wherein the diameters of said through holes are the same.

5. An installation method of an indoor unit of an air conditioner utilizing two through holes formed on a wall surface of a building for connecting connection pipes as well as for exhaling air inside to outside or for inhaling air outside, wherein the diameters of said through holes are adjusted by using tubular parts which are inserted into said through holes.

6. An installation method of an indoor unit of an air conditioner utilizing two through holes formed on a wall surface of a building for connecting connection pipes as well as for exhaling air inside to outside or for inhaling air outside, wherein said through holes are formed so as to have the same diameters and said diameters are adjusted by using tubular parts which are inserted into said through holes.

7. An installation method of an indoor unit of an air conditioner in accordance with either one of the claims 1 through 6, wherein said through holes are formed on said wall surface in the horizontal direction with the predetermined distance in between.

8. An installation method of an indoor unit of an air conditioner in accordance with either one of the claims 1 through 6, wherein said through holes are formed on said wall surface in the vertical direction with the predetermined distance in between.

9. An installation method of an indoor unit of an air conditioner in accordance with either one of the claims 1 through 6, wherein said through holes are formed on each of said adjoining wall surfaces.

10. An installation method of an indoor unit of an air conditioner comprising:

    forming two through holes on a wall surface of a building such that one of said through holes formed at lower portion is used for connection pipes and for an exhaling air way through which air inside is exhaled to outside and the other through hole formed at upper portion is used for an inhaling air way through which air outside is inhaled.

11. An installation method of an indoor unit of an air conditioner comprising:

    forming two through holes on a wall surface of a building such that one of said through holes formed at upper portion is used for connection pipes as well as for an inhaling air way through which air outside is inhaled and the other through hole formed at lower portion is used for an exhaling air way through which air inside is exhaled to outside.

12. An air conditioner whose indoor unit is installed in accordance with either one of the claims 1 through 6, 10 and 11.

13. An indoor unit of an air conditioner which is installed using two through holes formed on a wall surface comprising:

    an indoor heat exchanger contained within a main body thereof;
    connection pipes connecting to an outdoor unit provided at upper portion of the back of said main body; and
    an exhaling port which is used for exhaling air inside provided at lower portion of the back of said main body.

14. An indoor unit of an air conditioner which is installed using two through holes formed on a wall surface comprising:

    an indoor heat exchanger contained within a main body thereof;
    connection pipes connecting to an outdoor unit and an exhaling port which is used for exhaling air inside provided at lower portion of the back of said main body.

15. An indoor unit of an air conditioner which is installed using two through holes formed on a wall surface comprising:

    an indoor heat exchanger contained within a main body thereof;
    connection pipes connecting to an outdoor unit and an inhaling port which is used for inhaling air our side provided at upper portion of the back of said main body; and
    an exhaling port which is used for exhaling air inside provided at lower portion of the back of said main body.

16. An indoor unit of an air conditioner which is installed using two through holes formed on a wall surface comprising:

    an indoor heat exchanger contained within a main body thereof;
    connection pipes connecting to an outdoor unit and an exhaling port which is used for exhaling air inside provided at lower portion of the back

of said main body; and

an inhaling port which is used for inhaling air out side provided at upper portion of the back of said main body.

17. An indoor unit of an air conditioner which is installed using two through holes formed on a wall surface comprising:

an indoor heat exchanger contained within a main body thereof; and
an exhaling port which is used for exhaling air inside provided at lower portion of the back of said main body.

18. An indoor unit of an air conditioner which is installed using two through holes formed on a wall surface comprising:

an indoor heat exchanger contained within a main body thereof; and
an exhaling port which is used for exhaling air inside provided at the portion close to either one of the right or left side of said indoor heat exchanger.

19. An indoor unit of an air conditioner which is installed using two through holes formed on a wall surface comprising:

an indoor heat exchanger and a fan contained within a main body thereof;
connection pipes connecting to an outdoor unit and an exhaling port which is used for exhaling air inside provided at upper portion of the back of said main body; and
an inhaling port which is used for inhaling air out side provided at lower portion of the back of said main body,
wherein, exhaling of the air inside is carried out using said fan.

20. An indoor unit of an air conditioner which is installed using two through holes formed on a wall surface comprising:

an indoor heat exchanger and a fan contained within a main body thereof;
connection pipes connecting to an outdoor unit and an inhaling port which is used for inhaling air out side provided at lower portion of the back of said main body; and
an exhaling port which is used for exhaling air inside provided at upper portion of the back of said main body,
wherein, exhaling of the air inside is carried out using said fan.

21. An indoor unit of an air conditioner which is installed using two through holes formed on a wall surface comprising:

an indoor heat exchanger and a fan contained within a main body thereof; and
an exhaling port which is used for exhaling air inside provided at upper portion of the back of said main body,
wherein, exhaling of the air inside is carried out using said fan.

22. An indoor unit of an air conditioner in accordance with either one of the claims 19 through 21, wherein said fan is provided outside of said indoor unit.

23. An indoor unit of an air conditioner in accordance with either one of the claims 22, wherein said fan is provided on said wall's outside surface.

24. An installation method of an indoor unit of an air conditioner in accordance with either one of the claims 1 through 6, 10 and 11, wherein, the HC system refrigerant such as propane or isobutene is used and as said connection pipes, flexible pipes or plastic pipes are used.

25. An indoor unit of an air conditioner in accordance with either one of the claims 13 through 16, 19 and 20, wherein, the HC system refrigerant such as propane or isobutene is used and as said connection pipes, flexible pipes or plastic pipes are used.

FIG. 1

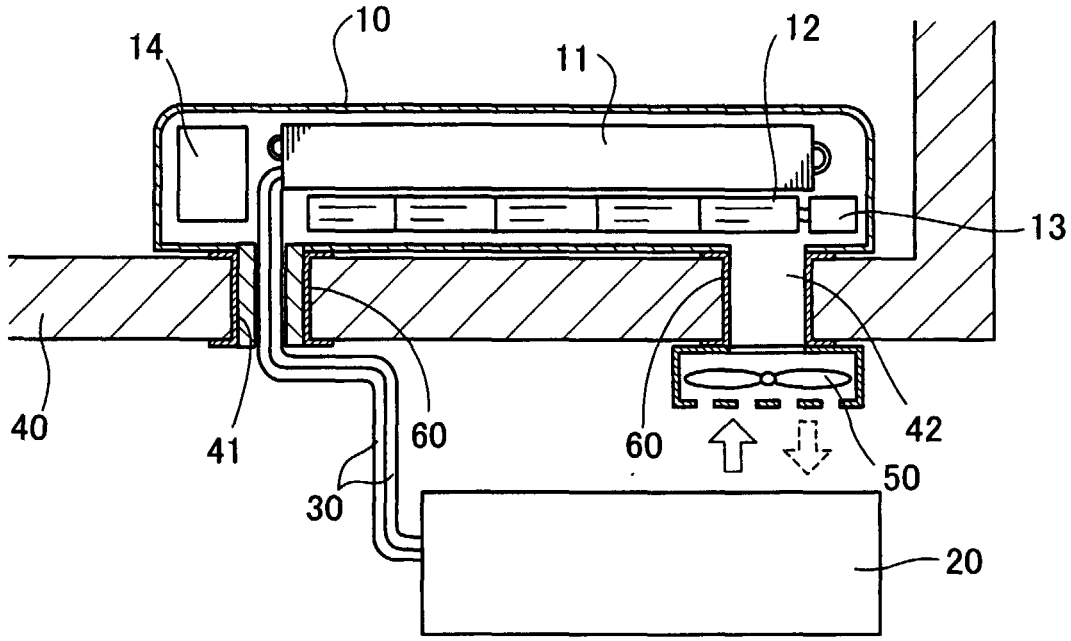

14
10
11
12
13
40
41
60
60
42
50
30
20

FIG. 2

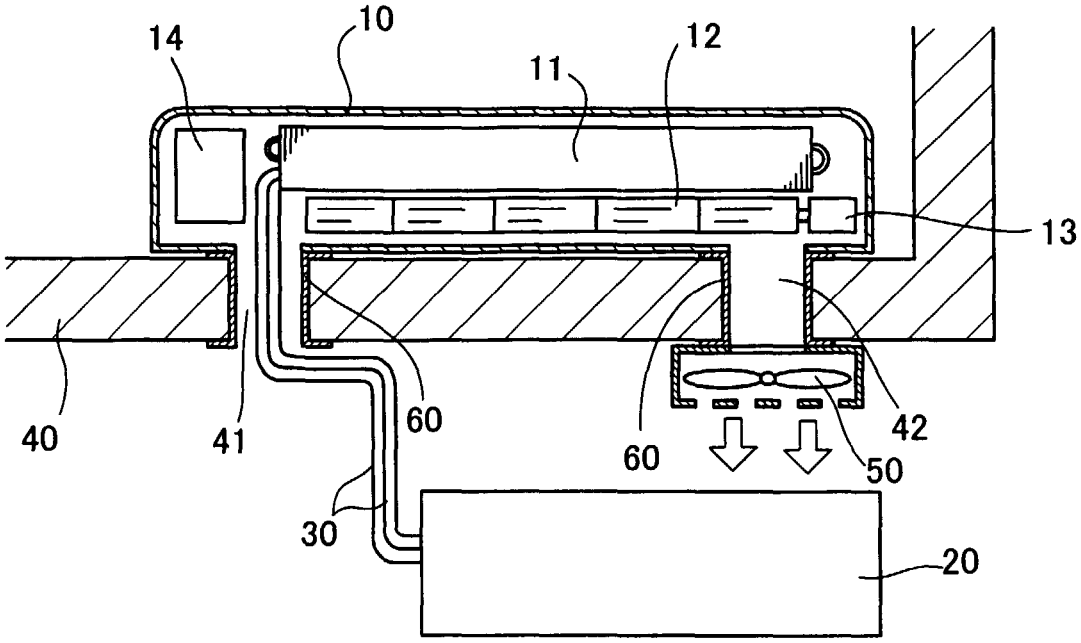

14
10
11
12
13
40
41
60
60
42
50
30
20

FIG. 3

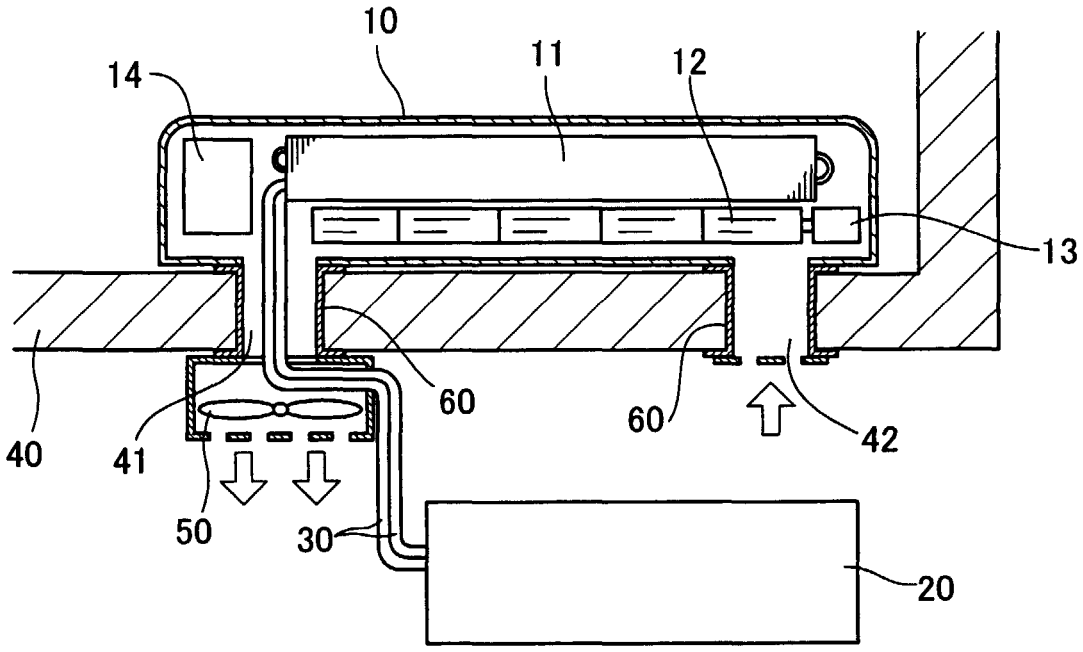

10
11
12
14
13
60
60
40
41
42
50
30
20

FIG. 4

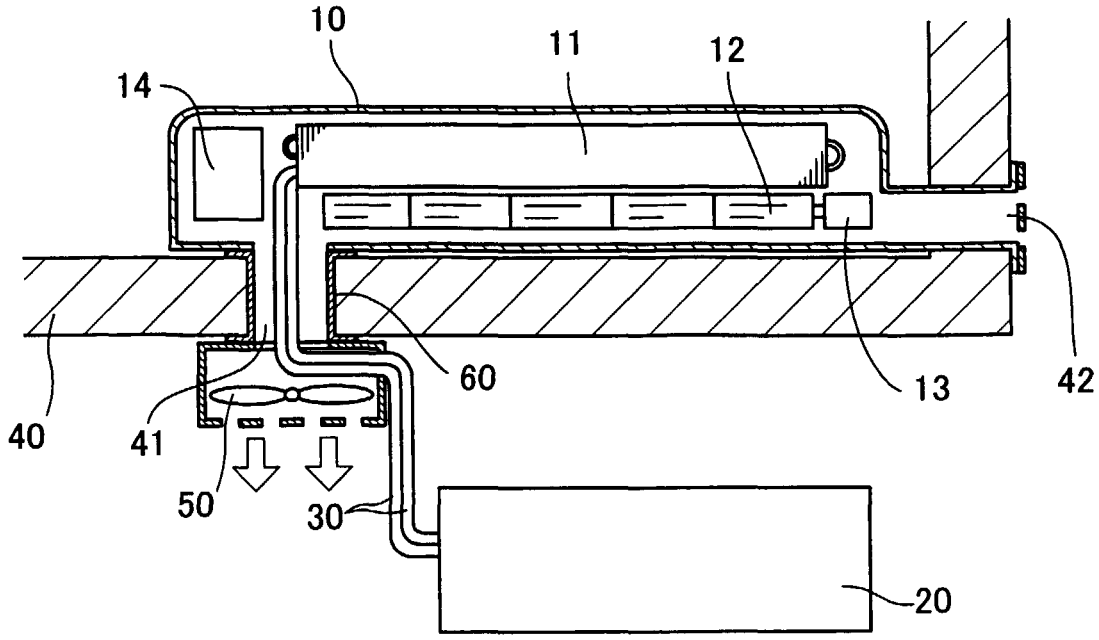

10
11
12
14
42
60
13
40
41
50
30
20

FIG. 5

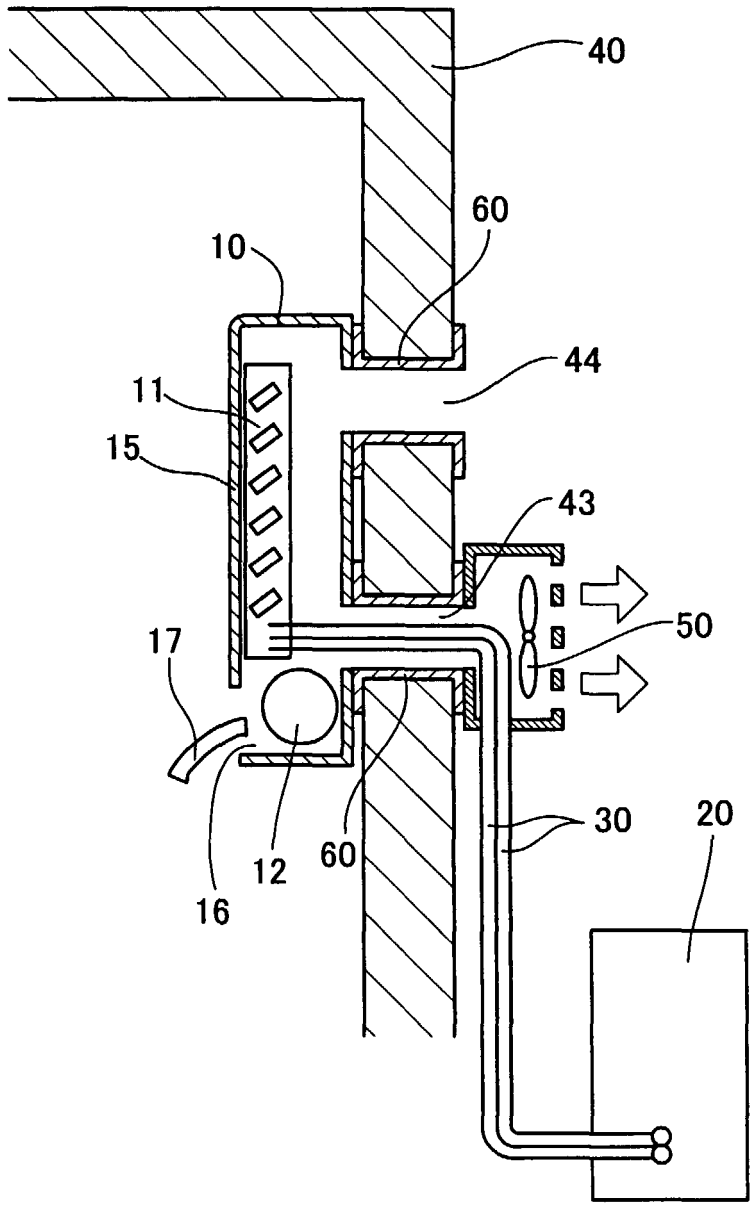


FIG. 6

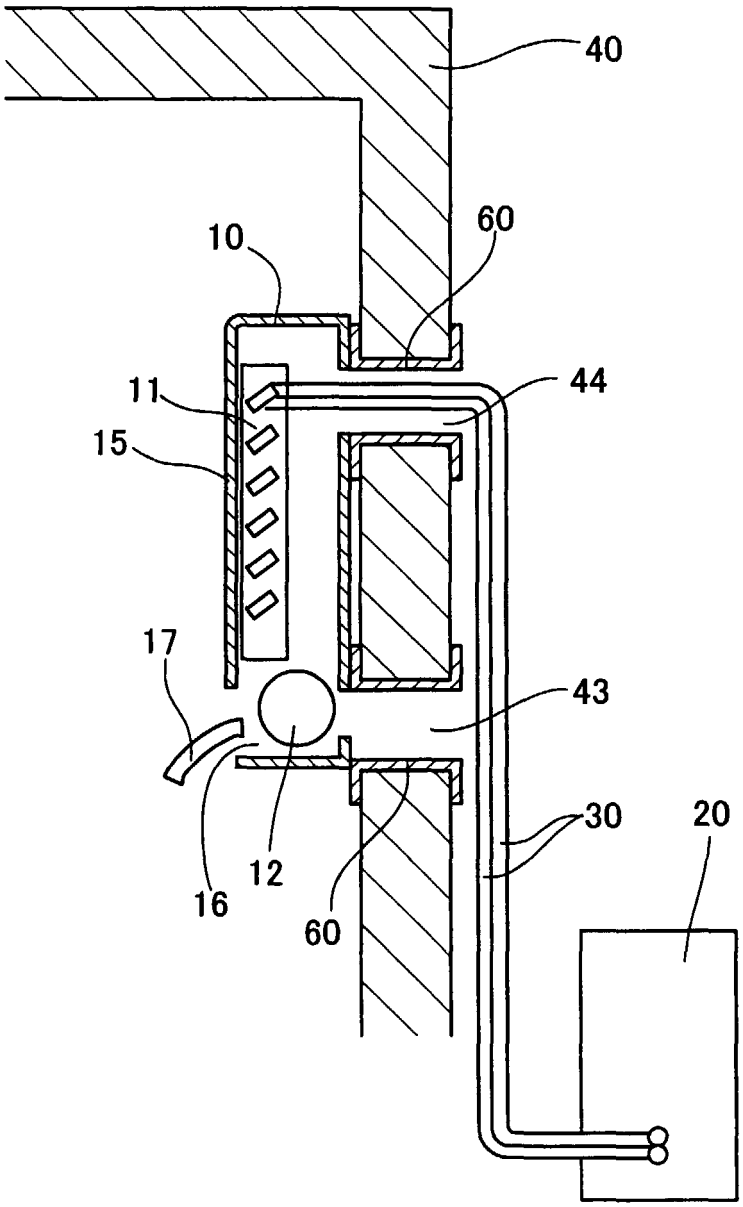


FIG. 7

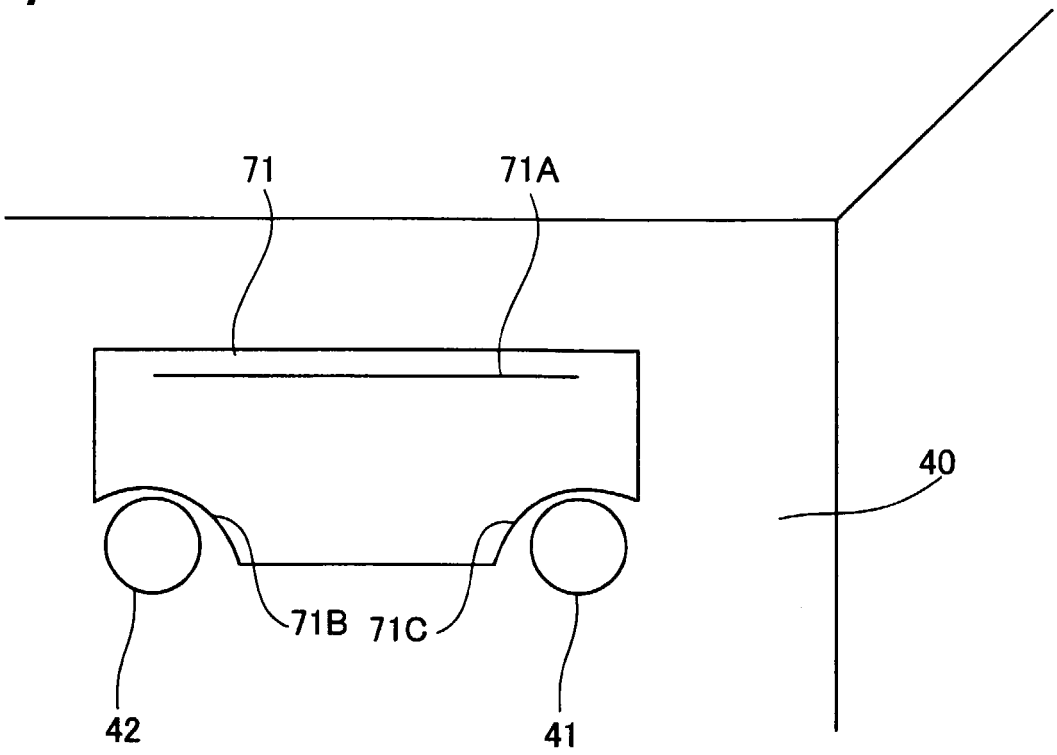


FIG. 8

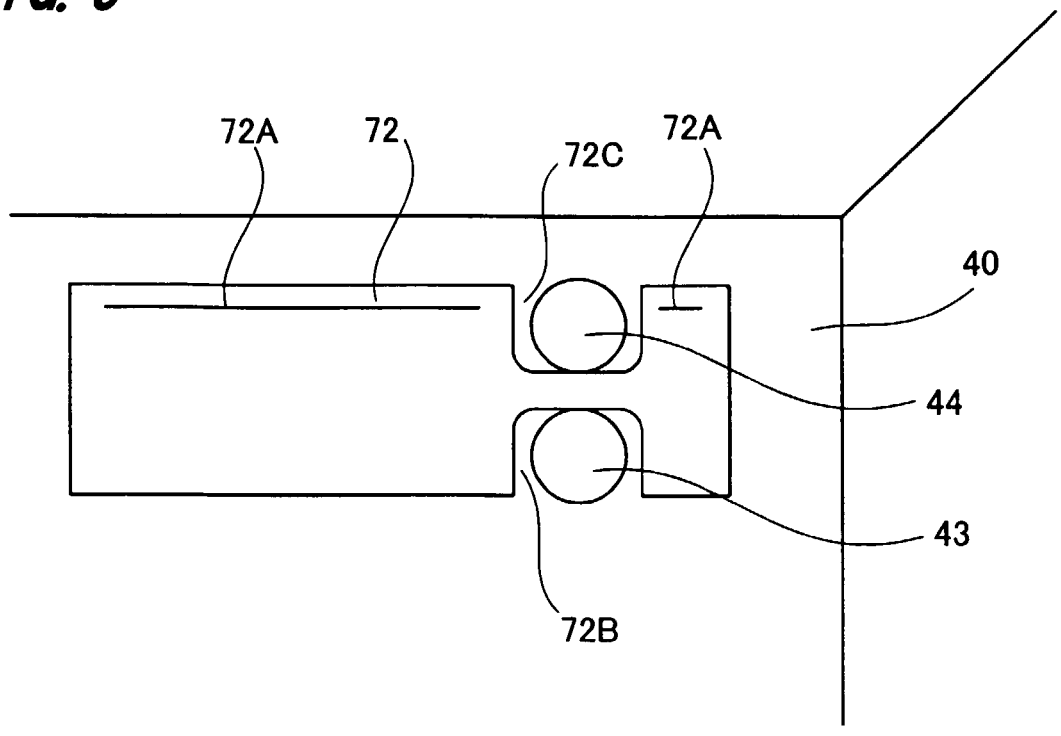


FIG. 9

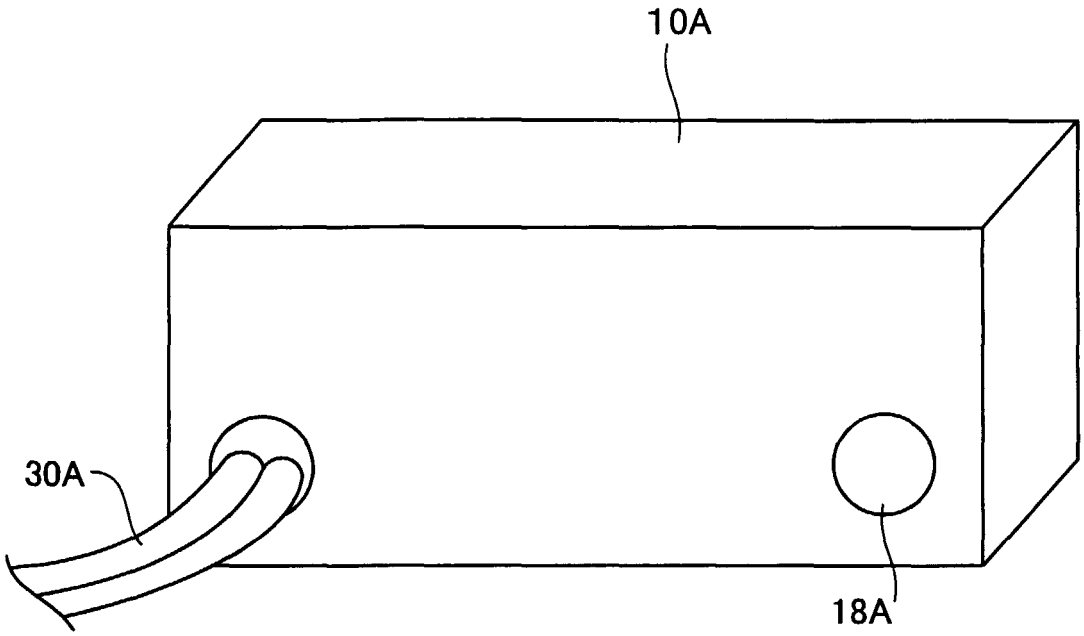


FIG. 10

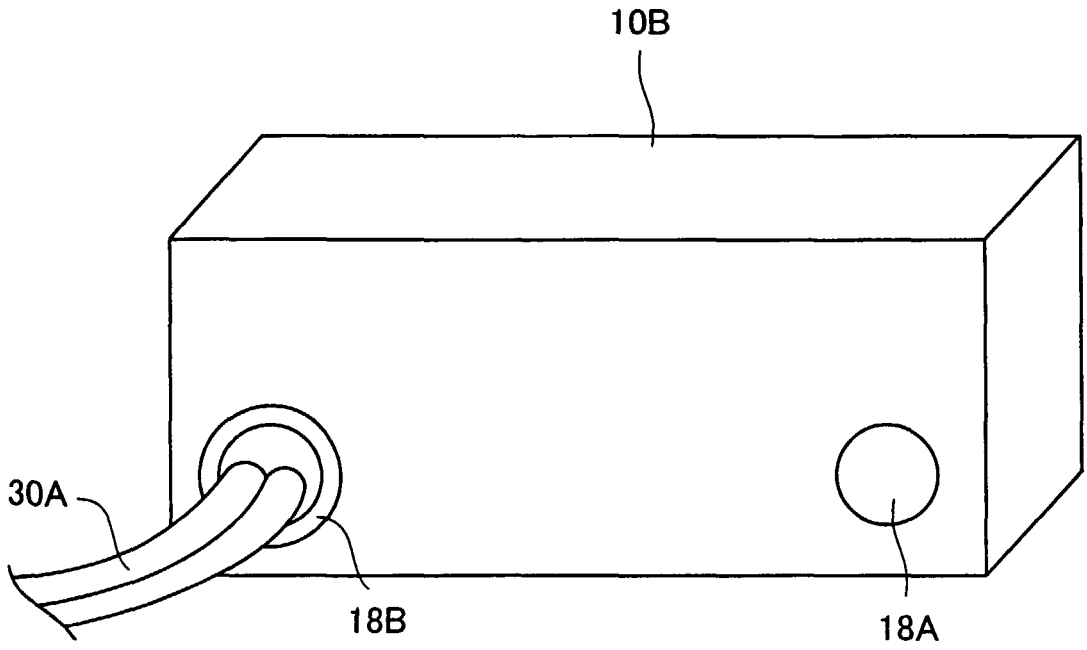


FIG. 11

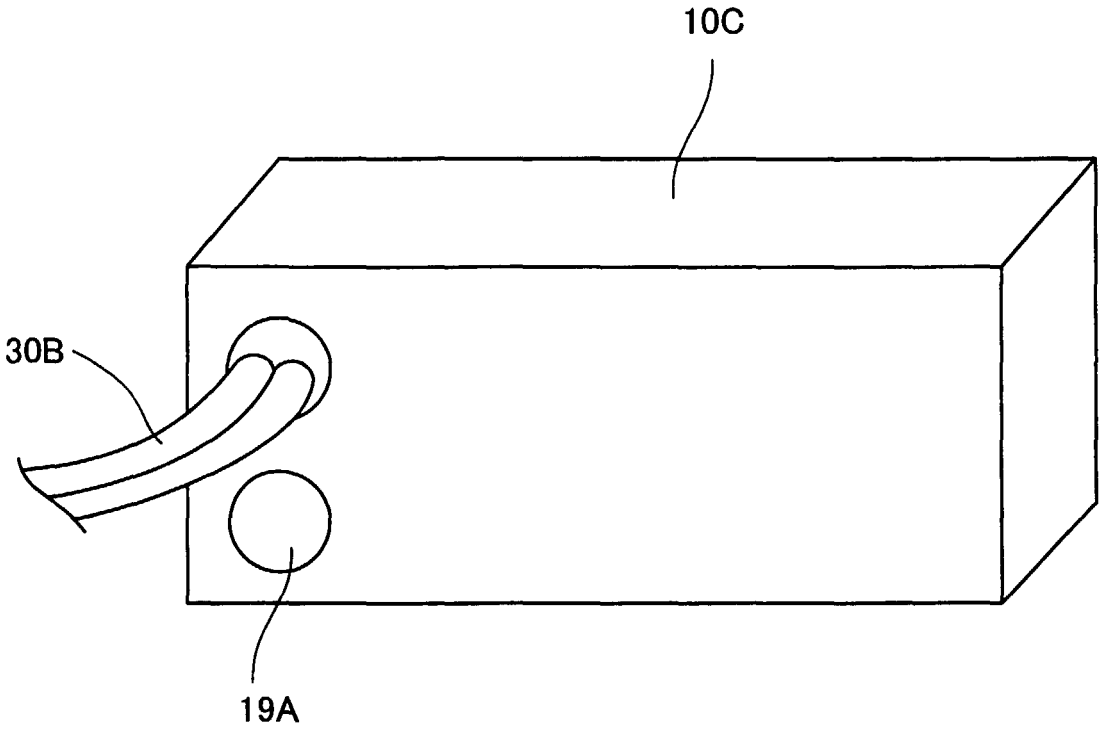


FIG. 12

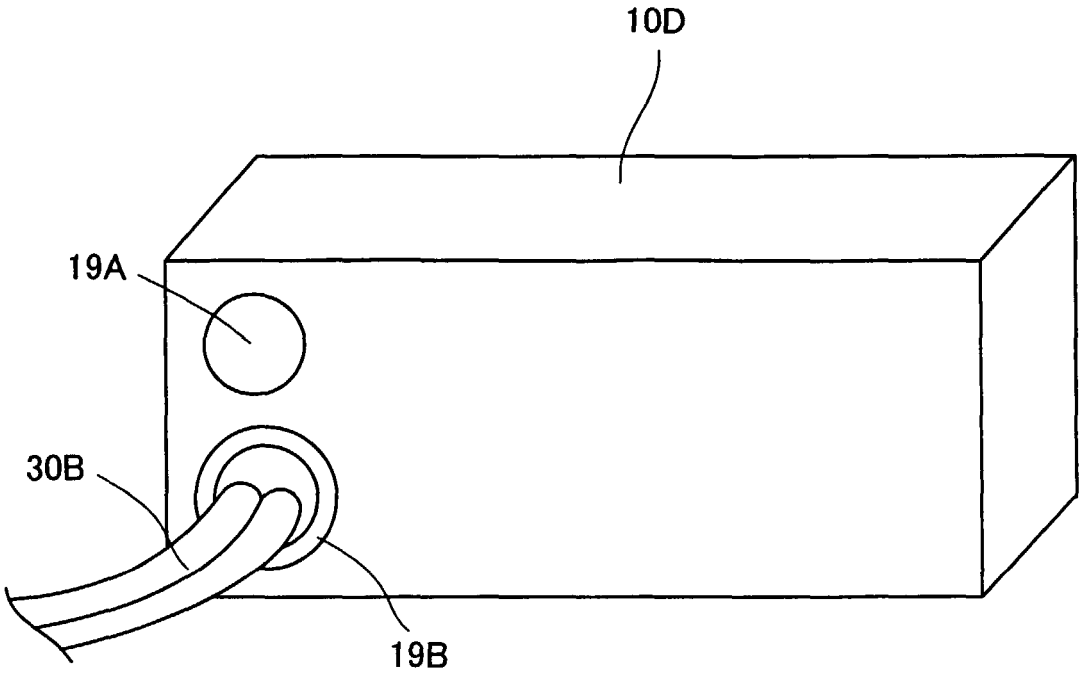


FIG. 13

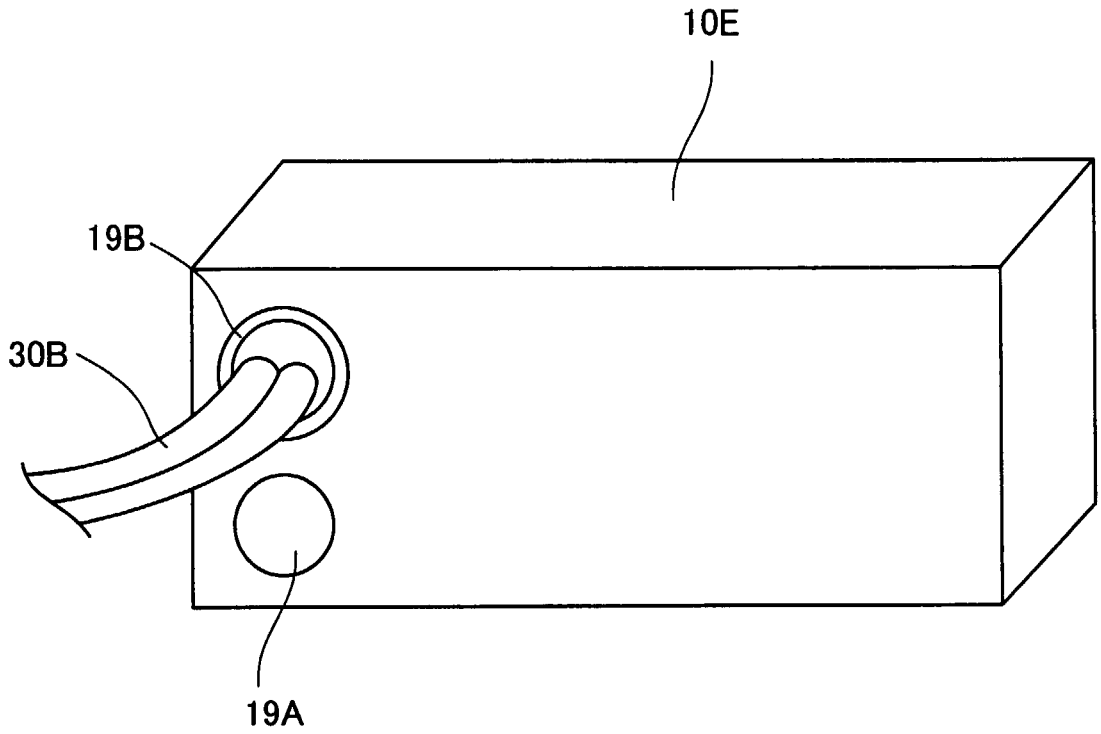


FIG. 14

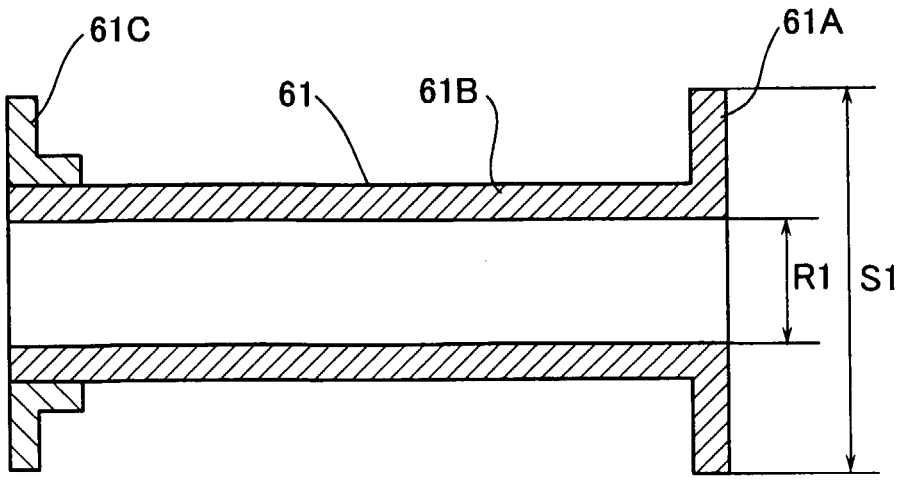


FIG. 15

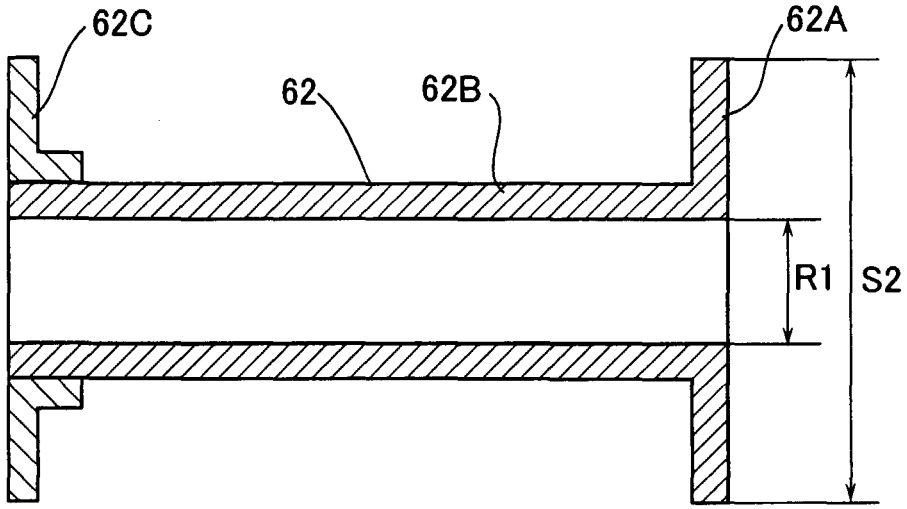


FIG. 16