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(54) **INTEGRAL AIR CONDITIONER**

(57) The present invention relates to an integral air conditioner. The air conditioner includes at least a compressor (1), an indoor unit heat exchanger (2), an expansion apparatus (3), an outdoor heat exchanger (4) and a circular pipe (5). The air conditioner is embedded into a wall body integrally. The outlet (21) of the indoor heat exchanger (2) opens inward the room; the outlet (41) of the outdoor heat exchanger (4) opens outward the room. The air conditioner combines into a building, and needs not some connecting copper pipes, and avoids the coolant from leaking.

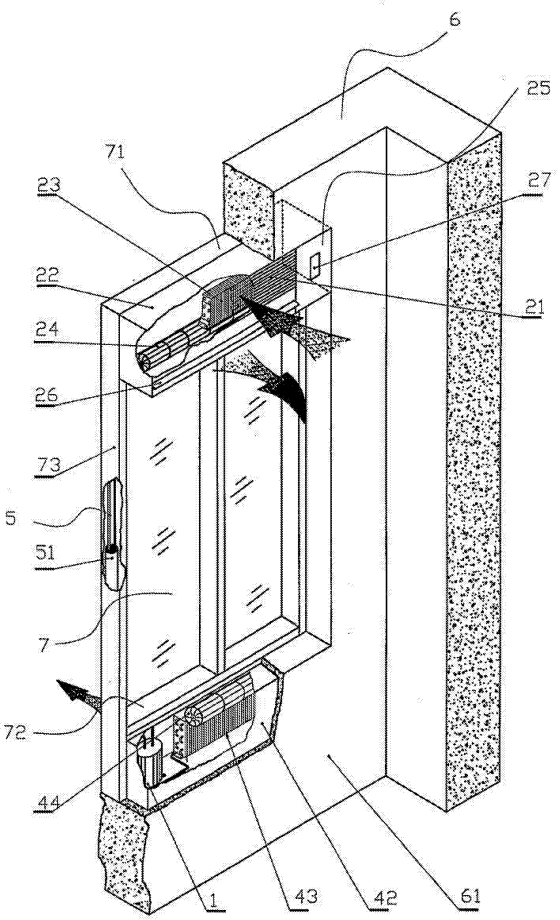

Fig. 2

EP 1 645 809 A1

Description

Technical Field

[0001] This invention refers to a kind of air-conditioning system. Specifically, it is a kind of integrated air conditioner that set in the wall.

Technical Background of the Invention

[0002] Split type and window type of air conditioners are products most often used to adjust the indoor temperature. However, they both have obvious defects either in their structures or in their usages. The shortcomings of split type of air conditioner are:

(1) The installation of the outdoor heat exchanger makes maintenance work difficult and dangerous, and makes the exterior of buildings disordered, therefore destroys the unity and harmony of the outside walls;
(2) The outdoor heat exchanger is supported by steel bracket with screws, which are easily corroded. After being long exposed to the air, it will become a hidden trouble in the windy weather.
(3) The indoor heat exchanger and the outdoor heat exchanger of the split type of air conditioner are connected by a copper pipe while installing in the room. The connection work is a complicated task, which requires the installation workers have high-level of techniques. Furthermore, because of the limitation of the on-the-spot installation, copper pipes are usually connected by screws, which will easily lead to leaking of refrigerant. As a result, refrigerant should be added frequently, therefore, decreases the service life of the machine;
(4) The copper pipe, connecting the indoor heat exchanger and the outdoor heat exchanger, together with the indoor heat exchanger that protrudes on the wall of the room, damage the artistic decoration of the room.
(5) As the indoor heat exchanger does not have the ventilation facility, the indoor air is not fresh enough for people to stay in. If people stay indoor with this kind of air conditioner for a long time, they are inclined to catch diseases related to air conditioner.

[0003] Although the window type of air conditioner integrates the indoor heat exchanger with the outdoor one to overcome the drawbacks of installing copper pipe on-the-spot, it still has some defects:

(1) It is too noisy to keep the room quiet;
(2) As the outside part of the window type of air conditioner protrudes on the outside-wall, it requires a tripod to support this part. Consequently, this will infect the elegance of the building;
(3) The indoor part of the window type of air conditioner also damage the overall decorations of the room;
(4) Different to the split type of air conditioner, the window type of the air conditioner can keep the room with fresh air, however, the air hasn't been dehumidified.

[0004] Considering the above drawbacks of both split type and window of air conditioner in the current industry, it is necessary to provide a brand new air conditioner to overcome the defects in them.

Summary of the Invention

[0005] The purpose of this invention is to overcome the defects in design, installation and usage aspects of the current window type and split type of air conditioners, to provide an integral air conditioner, which is integrated into the building without on-the-spot connection by the copper pipe, therefore, avoiding the leaking of refrigerant.

[0006] Another purpose of this invention is to enable an air conditioner to bring outdoor fresh air into indoor room while working, therefore, improve the quality of indoor air.

[0007] This invention is carried out by the following technical plans: an integral air conditioner includes at least a compressor, an indoor heat exchanger, an expansion apparatus, an outdoor heat exchanger, and circular pipes which connect all parts. Its characteristics are: the above mentioned new air conditioner is integrated with the window of the room so as to make up an integrated air conditioning window; the integrated air conditioner is embedded into the wall, the outlet of the indoor heat exchanger opens inwards the room; the outlet of outdoor heat exchanger opens outwards the room.

[0008] The indoor heat exchanger of the above mentioned new air conditioner is integrated with the upper part of the window frame, while the outdoor heat exchanger is integrated with the lower part of the window frame.

[0009] The circular pipe of the invention can be set into the hollow window frame, which is a new kind of window frame according to the inventor's design, so as to connect all parts of the air conditioner through this frame.

[0010] There is a fresh air entrance in the outdoor part of the indoor heat exchanger of the invention.

[0011] There is respectively a sound insulation device in the indoor part of the outdoor heat exchanger and the compressor of the present air conditioner, which is used to reduce the noise when the air conditioner is working.

[0012] The outlet of the indoor heat exchanger of the invention is coplanar with the inside wall. This design makes it feasible to avoid damages to the artistic interior decoration. The outlet of the outdoor heat exchanger of the invention is also coplanar with the outside wallagain, this further strengthens the integrity of the invention with the outside wall of the building.

[0013] The backboard in the outdoor part of the case

of the indoor heat exchanger can be made of glass board so as to strengthen the integrity of the invention with the window.

[0014] The effects of this invention are obvious:

(1) As the integrated air conditioner is embedded into the wall, it can be made in the factory, and then fixed integrally into the wall of the building; therefore, there are not any parts outside the building. In this case, the drawbacks of on-the-spot connection of copper pipe and leaking of refrigerant in the circular pipes can be avoided. Consequently, it can reduce the difficulty of installation and increases the service life of the air conditioner. What's more, since there is not any part of the air conditioner protruding outside the building, it will not be affected by the severe weather. Moreover, the invention makes it safe for the workers to install and maintain.

(2) Since the integrated air conditioner is embedded into the wall, it is not necessary to leave any more space for outdoor and indoor installation.

(3) It is integrated with the wall, so the decoration is not damaged;

(4) Since there is a fresh air entrance in the outdoor part of the indoor heat exchanger of the present air conditioner to complete the exchange work, the air quality in the room can be improved when the air conditioner is working.

(5) There is a sound insulation device in the indoor part of the outdoor heat exchanger and the compressor of the invention, which is used to reduce the noise when the air conditioner is working.

(6) The presented air conditioner is integrated with the window, so it can be embedded into the wall while fixing the window to the room. It is not only easy to install and repair, but also space-saving. Moreover, the invention is in line with the overall elegance of the room decoration.

[0015] In short, as the integrated air conditioner takes the benefits of the creative design and the integral manufacturing and installation to overcome the weakness of the current split type and window type of air conditioners, it is more practical and elegant.

Brief Description of the Appendix Drawings

[0016]

FIG 1 is the illustration of the structure of the presented invention embedded into the wall;

FIG 2 is the illustration of the structure of the presented invention integrated with the window that is embedded into the wall;

FIG 3 is the outside perspective view of the FIG 2;

FIG 4 is the functional diagram of the presented invention.

Detailed Ways of Carrying out the Invention

[0017] As illustrated in FIG 1 to FIG 4, the integrated air conditioner includes at least a compressor 1, an indoor heat exchanger 2, an expansion apparatus 3, an outdoor heat exchanger 4, and circular pipes 5 that connect all parts. Its operation principles and procedures are the same with the current air conditioners, so the detailed illustration is omitted. The characteristics of the presented invention are that the integrated air conditioner is embedded into the wall 6; the outlet 21 of the indoor heat exchanger 2 opens inwards the room, exchanging heat with indoor air; while as the outlet 41 of the outdoor heat exchanger 4 opens outwards the room, exchanging heat with outdoor air. In this way, the integrated air conditioner is integrated with the building; the air conditioner and the window of the room can be made in the factory as a whole, and then integrated into the wall of the building, so as to avoid connecting by copper pipe on-the-spot. As a result, the difficulty of on-the-spot installation can be reduced; in addition, because it is manufactured integrally in the factory, the leaking of refrigerant in the circular pipes 5 can be avoided and then to expand the service life of the air conditioner. What's more, since there is not any part of the invention outside the building, the air conditioner will not be damaged by the severe weather. Moreover, this design is able to solve the hidden trouble. Since the integrated air conditioner is embedded into the wall, it is not necessary to leave any more space for installation both indoor and outdoor so the overall decorations of the room and the building are not damaged.

[0018] According to the illustration in FIG 1, as the integrated air conditioner can be made integrally in the factory and embedded in the wall 6, so it can overcome the defects in the current split type and window type of air conditioners.

[0019] As illustrated in FIG 2, the air conditioner can be integrated with the window 7, making up an integral window with air conditioner. When the window 7 is fixed, the air conditioner can be embedded into the wall 6 at the same time. It has merits of easy installing, space saving and arctic out-looking.

[0020] Furthermore, as illustrated in FIG 2, the indoor heat exchanger 2 of the present air conditioner is fixed into the upper part 71 of the window 7, while the outdoor heat exchanger 4 is fixed into the lower part 72 of the window 7. While manufacturing the air conditioner together with window 7, the case 22 of the indoor heat exchanger 2 can be integrated with the upper part 71 of the window frame, then the fin coil pipes 23 of the indoor heat exchanger 2 and blower fan 24 are fixed in the case 22, making the indoor heat exchanger 2 and the window 7 integral. As what the current air conditioners have, there is an outlet 21 in the panel 25, which opens inwards the room, in the case 22 of the indoor heat exchanger 2. Inside the outlet 21 there is an air return filter screen and adjusting vanes 26 on lower part to adjust the direction of wind from the air conditioner. What's more, there is a

control panel 27 to control the mode of operation, which is the same as the current air conditioners, so detail description is omitted here. The same principle, while making the window 7, the case 42 of the outdoor heat exchanger 4 is integrated with the lower part 72 of the window 7, then the wing-like coil pipes 43 of the outdoor heat exchanger 4 and wind flowing machine 44 are fixed in the case 42, making the outdoor heat exchanger 4 and the window 7 integral. As illustrated in FIG 2, the compressor 1, as part of the air conditioner system, the expansion apparatus 3, and the circular pipes 5 are all integrated with the window 7, forming the integral window with air conditioner.

[0021] As illustrated in FIG 2, the compressor 1 and the outdoor heat exchanger 4 are actually integrated with the lower part 72 of window 7, the circular pipe 5 connecting the compressor 1 and the indoor heat exchanger 2 can be integrated into the side window frame 73. All the circular pipes 5 are wrapped with insulation covers 51, reducing the loss of heat exchange.

[0022] As illustrated in FIG 3, there is a fresh air entrance 28 in the outdoor part of the indoor heat exchanger 2 of the present air conditioner. When the air conditioner is working, the fresh air entrance 28 can be opened as needed. Through the entrance 28 the fresh air from outdoor comes into the case 22 of the indoor heat exchanger 2, exchanging heat with the wing-like coil pipe 23 in the indoor heat exchanger 2. After that, the air comes into the room. Not only is the quality of indoor air improved, but also the air from outdoor has been dehumidified and exchanged through the indoor heat exchanger 2. In this way can the defects in the split type of air conditioner, which is used in the non-circulated indoor environment, be avoided.

[0023] Furthermore, there is a sound insulation device in the indoor part of the outdoor heat exchanger 4 and the compressor 1 of the invention (this is not shown in the FIG), which can reduce the noise when the air conditioner is working.

[0024] Like what illustrated in FIG 2, the outlet 21 of the indoor heat exchanger 2 of the invention is coplanar with the inside wall 61, therefore to avoid the damage to the artistic interior decoration. Moreover, as illustrated in FIG 3, the outlet 41 of the outdoor heat exchanger 4 of the invention is coplanar with the outside wall 62. This design further strengthens the integrity of the invention with the wall 6. The coplanarity is not strictly coplanar in geometry point of view, but in decoration. Even if the air conditioner and the wall are not in the same vertical level, it can also achieve the same effects as mentioned above. As illustrated in FIG 3, the backboard 29 in the outdoor part of the case 21 of the indoor heat exchanger 2 can be made of glass to strengthen the integrity of the invention with the window 7.

[0025] The outside boards of case 22 and case 23 of the air conditioner can be dismantled as the current air conditioners. When they are broken down, the boards can be dismantled easily and repaired.

[0026] The presented air conditioner can be cooling system or both cooling and heating air conditioning system. Its structure of each part, operation principles and procedures are the same as those of current air conditioners, so detailed explanation is omitted.

[0027] The above statements are detailed ways of carrying out this invention. They are used to explain how the invention works instead of limiting the invention.

Claims

1. An integrated air conditioner, which includes at least a compressor, an indoor heat exchanger, an expansion apparatus, an outdoor heat exchanger, and circular pipes that connect all parts. Its characteristics are that the integrated air conditioner is embedded into the wall, the outlet of the indoor heat exchanger opens inwards the room; the outlet of outdoor heat exchanger opens outwards the room.

2. The integrated air conditioner according to claim 1, wherein said the air conditioner can be integrated into the wall, making up integral window with air conditioner.

3. The integrated air conditioner according to claim 2, wherein said the indoor heat exchanger is integrated with the upper part of the window, while the outdoor heat exchanger is integrated with the lower part of the window.

4. The integrated air conditioner according to claim 2 or 3, wherein said the circular pipes can be set into the hollow window frame, which is a new kind of window frame according to the inventor's design,

5. The integrated air conditioner according to the above claims, wherein said there is a fresh air entrance in the outdoor part of the indoor heat exchanger.

6. The integrated air conditioner according to the above claims, wherein said there is a sound insulation device in the indoor part of the outdoor heat exchanger and the compressor.

7. The integrated air conditioner according to the above claims, wherein said the outlet of the indoor heat exchanger is coplanar with the wall of the room so as to integrated with it visually.

8. The integrated air conditioner according to the above claims, wherein said the outlet of the outdoor heat exchanger is also coplanar with the outside wall of the building.

9. The integral air conditioner according to the claim 2 to 8, wherein said the backboard in the outdoor part

of the case in the indoor heat exchanger can be made of glass to strengthen the integrity of the invention with the window.

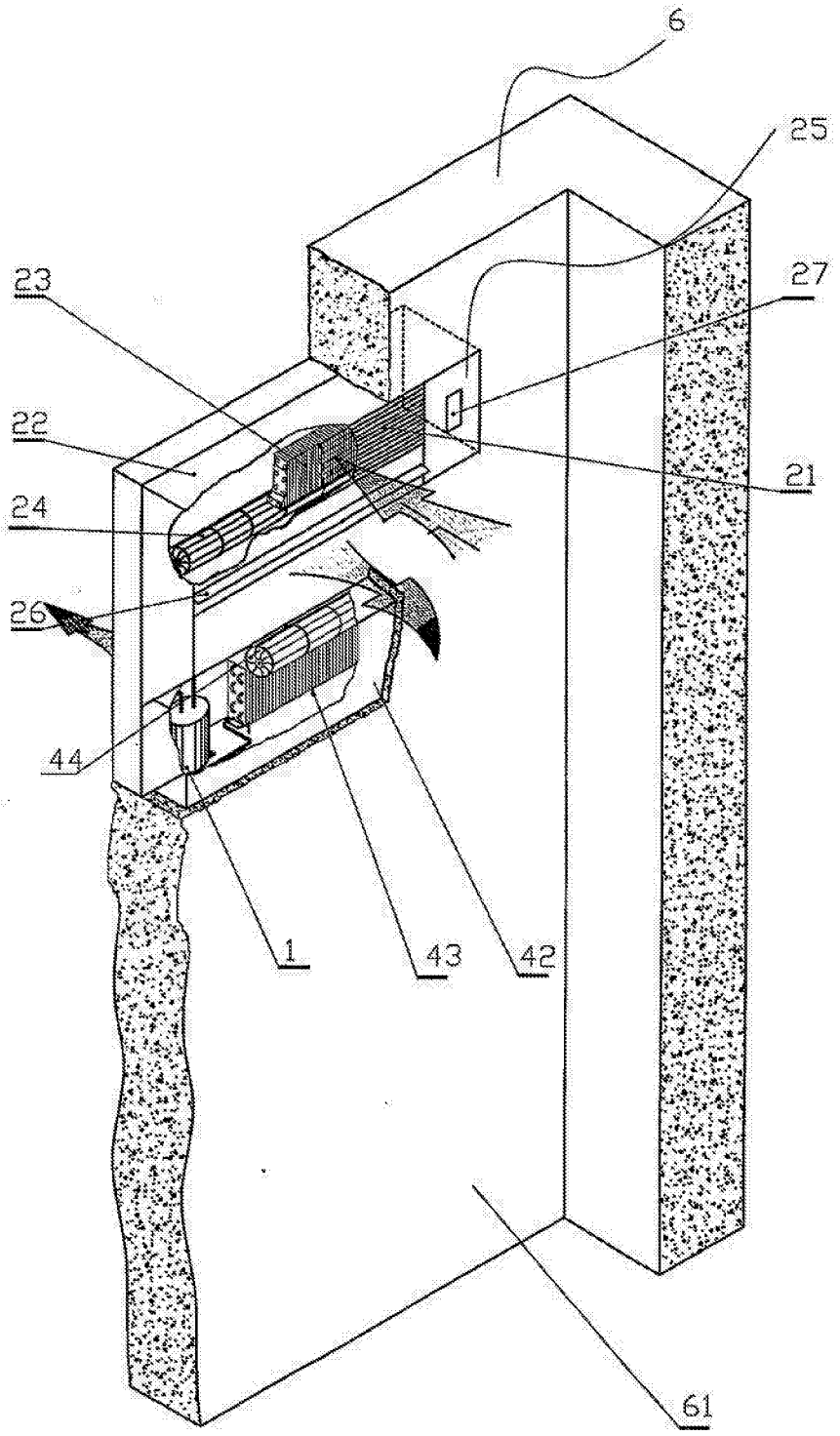

Fig. 1

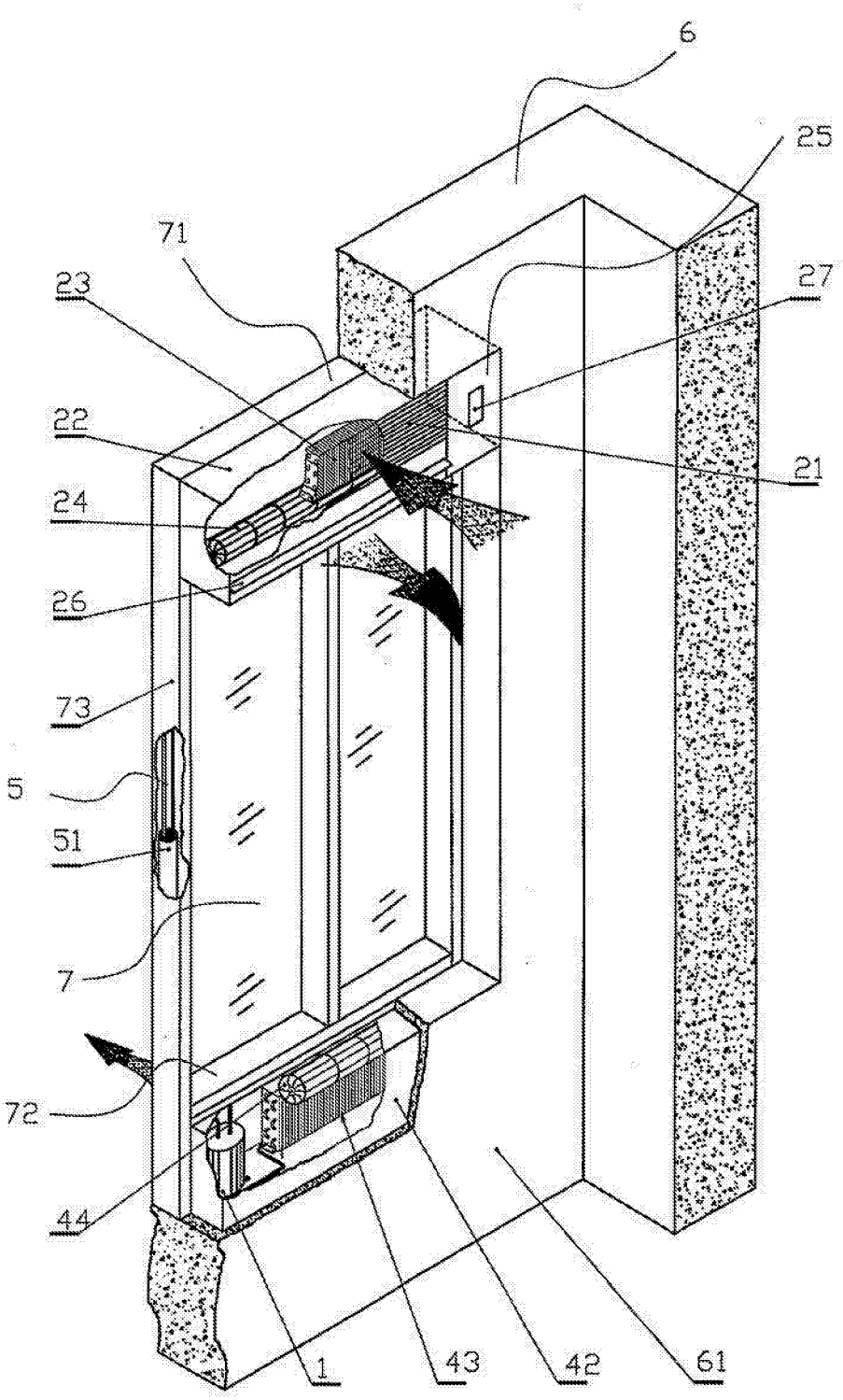

Fig. 2

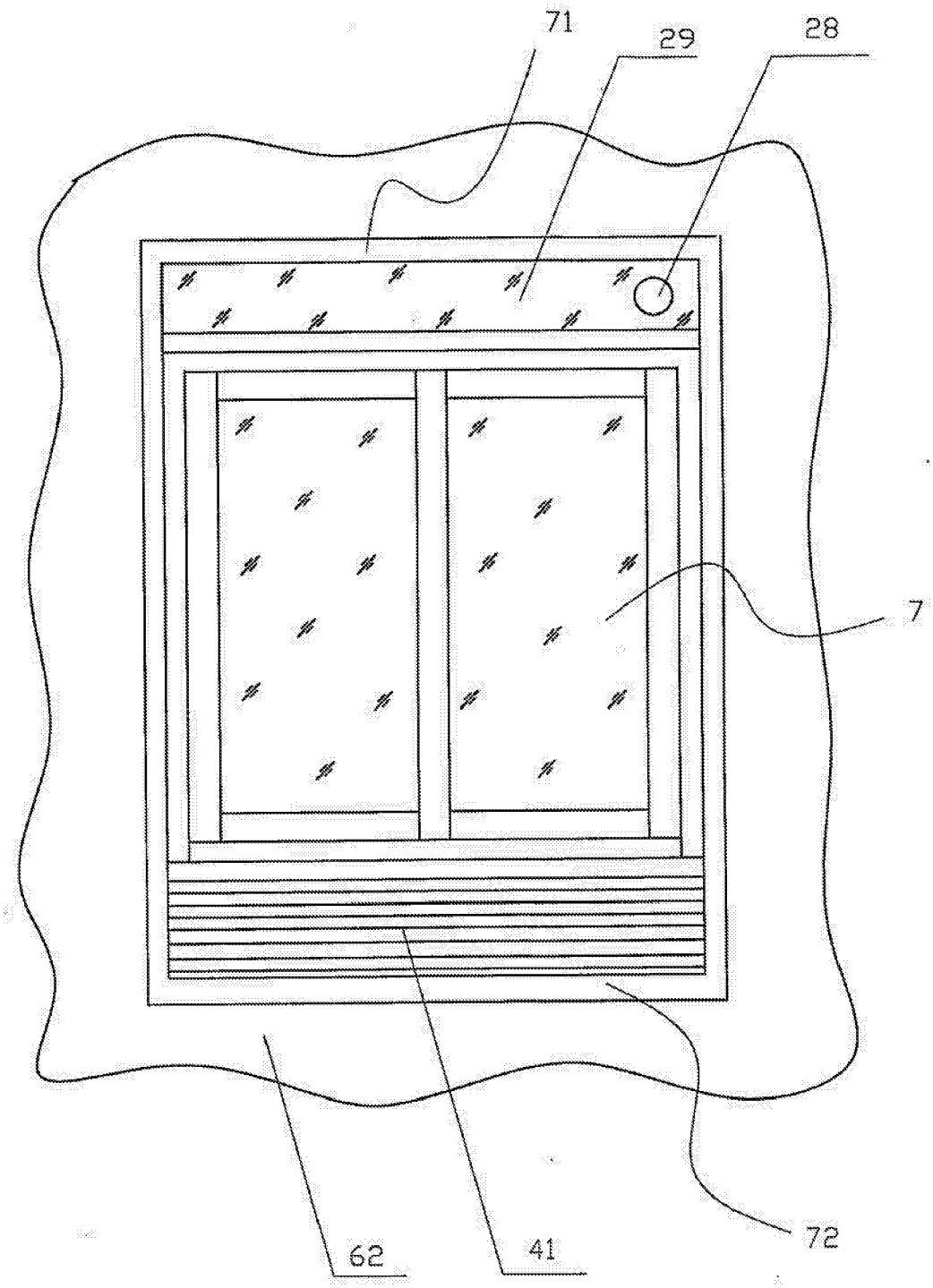

Fig. 3

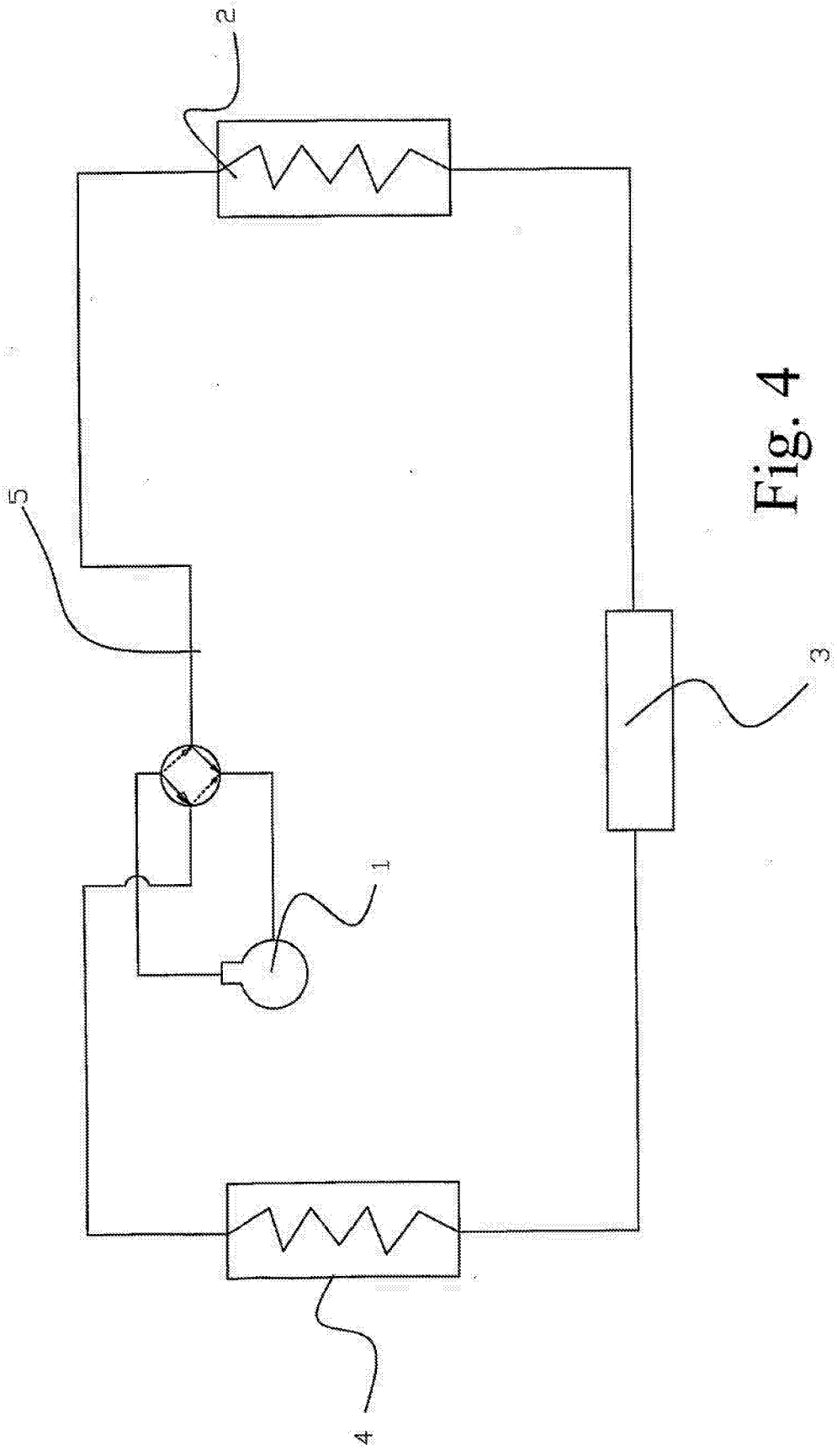

Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN03/00397

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 F24F1/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7 F24F1/02 1/01 1/04 1/00 13/32

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Chinese Patent Documents (1985-)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI PAJ CNPAT: air conditioner indoor unit outdoor unit wall body embeded

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN2380849Y, (JIANG LI etal) 31.May 2000(31.05.00), p1-2, Fig1-3	1-2,5-8
A		3-4,9
Y	CN2312419Y, (QU Hanxing) 31.Mar 1999(31.03.99), p1-8, Fig1-8	1-2 5-8
A		3-4,9

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24.Dec 2003(24.12.03)	15 · JAN 2004 (15 · 01 · 2004)
Name and mailing address of the ISA/CN 6 Xitucheng Rd., Jimen Bridge, Haidian District, 100088 Beijing, China Facsimile No. 86-10-62019451	Authorized officer YANG Xiuhua Telephone No. 010-62085023

Form PCT/ISA /210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
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CN2380849Y	20000531	NONE
CN2312419Y	19990331	NONE

Form PCT/ISA /210 (patent family annex) (July 1998)