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(54) **ELECTRIC COMPONENT UNIT**

(57) The present invention aims to prevent an outdoor unit casing of an air conditioner from becoming large and to reduce the cost. An electrical component unit (5) houses a plurality of electrical components (52) including a specific heat generating component in an outdoor unit (3) of an air conditioner (1). The electrical component unit includes a support member (51) and a reactor (521).

The support member (51) has an arrangement portion (511) in which some of the plurality of electrical components (52) can be arranged, and a projecting portion (512) outwardly projecting from the arrangement portion (511). The reactor (521) is one of the plurality of electrical components (52). It is disposed away from other electrical components (52) and attached to the projecting portion (512).

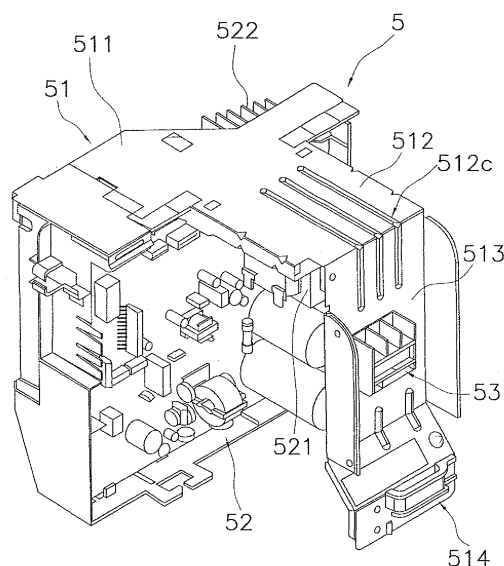


FIG. 4

Description

TECHNICAL FIELD

[0001] The present invention relates to an electrical component unit. More specifically, the present invention relates to an electrical component unit that supports electrical components including a specific heat generating component in an outdoor unit of an air conditioner.

BACKGROUND ART

[0002] Often an outdoor unit of an air conditioner includes a heat exchanger, an outdoor fan, a compressor, a reactor, and the like in an outdoor unit casing generally made of a fire retardant material. In addition, an electrical component unit in which various electrical components such as a power transistor and a capacitor are embedded is disposed in the outdoor unit casing. A control circuit in the electrical component unit supplies drive power to the outdoor fan, the compressor, and the like, and also controls driving of these components.

[0003] Here, it is generally preferable that the reactor be disposed in the vicinity of the electrical component unit in terms of a wire, however, because it is necessary to make the electrical component unit less subject to heat generated by the reactor, it is problematic to dispose the reactor at a position too close to the electrical component unit (see Patent Document 1). Accordingly, the reactor is attached to a position away from the electrical component unit.

<Patent Document 1>

[0004] Japanese Patent Application Publication No. 2004-93085

DISCLOSURE OF THE INVENTION

<OBJECT TO BE ACHIEVED BY THE INVENTION>

[0005] In a conventional outdoor unit of an air conditioner, because the reactor is attached to a position away from the electrical component unit, the outdoor unit casing may become large.

[0006] In addition, because the reactor is disposed at a position away from the electrical component unit, a wire between the electrical component unit and the reactor becomes long. This requires high cost.

[0007] Objects of the present invention are to prevent an outdoor unit casing of an air conditioner from becoming large and to reduce the cost.

<MEANS TO ACHIEVE THE OBJECTS>

[0008] An electrical component unit according to a first aspect of the present invention is an electrical component unit that houses a plurality of electrical components in-

cluding a specific heat generating component in an outdoor unit of an air conditioner, the electrical component unit including a support member and a reactor. The support member includes an arrangement portion in which some of the plurality of electrical components can be arranged, and a projecting portion outwardly projecting from the arrangement portion. The reactor is one of the plurality of electrical components. It is disposed away from other electrical components and attached to the projecting portion.

[0009] With this electrical component unit, some of the plurality of electrical components are arranged in the arrangement portion of the support member, and the reactor is attached to the projecting portion so as to be away from other electrical components.

[0010] Here, because the reactor is attached to the projecting portion of the support member to which, as the electrical component unit, the plurality of electrical components are attached, it is possible to reduce materials necessary for a wire and reduce the size and cost of the outdoor unit.

[0011] An electrical component unit according to a second aspect of the present invention is the electrical component unit according to the first aspect of the present invention, wherein the support member further includes a lower plate-like portion disposed so as to extend downwardly from a second end portion of the projecting portion, the second end portion being located oppositely to a first end portion on the arrangement portion side of the projecting portion, and the lower plate-like portion being configured such that a terminal plate including terminals of the plurality of electrical components can be arranged thereon.

[0012] With this electrical component unit, the terminal plate is attached to the lower plate-like portion that extends from the second end portion of the projecting portion, the second end portion being located oppositely to the first end portion on the arrangement portion side of the projecting portion.

[0013] Here, the terminal plate can be integrally supported by the electrical component unit. In addition, it is possible to further reduce materials and the like necessary for a wire.

[0014] An electrical component unit according to a third aspect of the present invention is the electrical component unit according to the first or second aspect of the present invention, wherein the arrangement portion includes a plate-like portion disposed above the electrical components other than the reactor, and a lateral side support portion disposed laterally to the electrical components other than the reactor so as to hang down from the plate-like portion. A bottom end portion of the lateral side support portion and a bottom end portion of the lower plate-like portion are located at substantially the same height.

[0015] With this electrical component unit, when mounting the electrical component unit to the outdoor unit of the air conditioner, the electrical component unit

may be temporarily placed on a table or the like to perform such work. In such a case, because the bottom end portion of the lateral side support portion and the bottom end portion of the lower plate-like portion are located at substantially the same height, the electrical component unit can be placed keeping its position (a state in which bottom end portion of the lateral side support portion and the bottom end portion of the lower plate-like portion are in contact with the table), which improves workability.

[0016] An electrical component unit according to a fourth aspect of the present invention is the electrical component unit according to any one of the first through third aspects of the present invention, wherein the support member is made of a fireproof member.

[0017] With this electrical component unit, the support member is made of a fireproof member. Accordingly, even if the plurality of electrical components are burned, it is possible to reduce a risk of burning other components.

[0018] An electrical component unit according to a fifth aspect of the present invention is the electrical component unit according to any one of the first through fourth aspects of the present invention, the electrical component unit having a depression-shaped portion formed on the top surface thereof so as to extend in a projection direction of the projecting portion.

[0019] With this electrical component unit, a depression-shaped portion is formed on the top surface of the projecting portion so as to extend along the projecting direction. Accordingly, the strength in the projecting direction is further increased. Accordingly, it is possible to further stabilize the support of the reactor.

<EFFECTS OF THE INVENTION>

[0020] With the electrical component unit according to the first aspect of the present invention, because the reactor is attached to the projecting portion of the support member to which, as the electrical component unit, the plurality of electrical components are attached, it is possible to reduce materials necessary for a wire and reduce the size and cost of the outdoor unit.

[0021] The electrical component unit according to the second aspect of the present invention, the terminal plate can be integrally supported by the electrical component unit. In addition, it is possible to further reduce materials and the like necessary for a wire.

[0022] With the electrical component unit according to the third aspect of the present invention, because the bottom end portions of some of the electrical components and the bottom end portion of the lower plate-like portion are located at substantially the same height, the electrical component unit can be placed keeping its position (in a standing position with the bottom end portions of some of the electrical components and the bottom end portion of the lower plate-like portion used as the legs), which improves workability.

[0023] With the electrical component unit according to

the fourth aspect of the present invention, even if the plurality of electrical components are burned, it is possible to reduce a risk of burning other components.

[0024] With the electrical component unit according to the fifth aspect of the present invention, it is possible to further stabilize the support of the reactor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025]

Figure 1 is an entire external view of an air conditioner.

Figure 2 is an external view of an outdoor unit with parts of a casing removed.

Figure 3 is a view showing the outdoor unit with the casing removed.

Figure 4 is a perspective view showing an electrical component unit.

Figure 5 is a lateral view of the electrical component unit.

Figure 6 is a view showing the electrical component unit and a partition plate.

EXPLANATION OF THE REFERENCE SYMBOLS

[0026]

1	Air conditioner
3	Outdoor unit
5	Electrical component unit
51	Support member
52	Electrical component
53	Terminal plate
511	Arrangement portion
512	Protecting portion
513	Lower plate-like portion
521	Reactor
513e	Lower end portion of the lower plate-like portion
511 b	Lateral side support portion
511c	Bottom end portion of the lateral side support portion
512c	Groove (depression-shaped portion)

BEST MODE FOR CARRYING OUT THE INVENTION

1. STRUCTURE

[0027] Figure 1 shows an air conditioner 1 including an electrical component unit 5 (see Figure 3 and the like) according to an embodiment of the present invention. The air conditioner 1 includes an indoor unit 2 mounted in a building, an outdoor unit 3 disposed outside, and a refrigerant pipe 4 that connects the outdoor unit 3 to the indoor unit 2. Because the present invention relates to the electrical component unit 5 disposed inside the outdoor unit 3, the outdoor unit 3 is mainly described.

[0028] Figures 2 and 3 show the outdoor unit 3. The

outdoor unit 3 includes a casing 31, a heat exchanger 32, a compressor 33, an air blowing unit 34, and the electrical component unit 5. The inside of the outdoor unit 3 is divided by a partition plate 35 into a machine space 37 where the electrical component unit 5 and the compressor 33 are disposed and a ventilation space 36 where the heat exchanger 32, a fan 343, and the like are disposed. The partition plate 35 is a flat plate shaped member and includes a cutout 351 in a substantially rectangular shape. As shown in Figure 6, rails 352 each having a predetermined length is provided to the upper portion of the cutout 351, and a plate-like member 354 having a rectangular opening 353 is provided to the lower portion of the cutout 351. Note that the electrical component unit 5 is described later.

[0029] The casing 31 is a member having a substantially rectangular parallelepiped shape, and is made of sheet metal and a resin. In addition, the casing 31 includes an air blowing port 311a and an air intake (not shown). The casing 31 sucks in air from the air intake and blows out the air from the air blowing port 311a. The air blowing port 311a and the air intake are disposed on the ventilation space 36 side. In addition, as shown in Figure 2, the casing 31 includes a case main body 311, a case lateral wall portion 312, and a resin cover 313. The case main body 311 is a member that covers the compressor 33 and the heat exchanger 32. The case lateral wall portion 312 is disposed to the lateral end portion on the machine space 37 side of the case main body, and is a plate shaped member having an opening 312a. The resin cover 313 is attached to the outside of the lateral wall portion 312, and is a plate-like member that covers a part of the refrigerant pipe 4.

[0030] As shown in Figure 3, the heat exchanger 32 is an L-shaped device. The heat exchanger 32 includes a fin portion 321 in which a plurality of fins are arranged in an L-shape, and a pipe 322 bent several times and disposed in a supported manner by the fin portion 321. A refrigerant, such as a fluorocarbon flows through the inside of the pipe 322.

[0031] The compressor 33 is disposed in the vicinity of the partition plate 35 of the machine space 37, and is a machine to compress the refrigerant. It is a machine that, for example, to compress low pressure refrigerant gas into high pressure refrigerant gas. In addition, the compressor 33 is disposed below the electrical component unit 5. Further, the compressor 33 includes a cylindrical case 331 and devices such as a mechanism and an electric motor (not shown) for compressing the refrigerant. The devices such as the mechanism and the electric motor for compressing the refrigerant are disposed inside the cylindrical case 331.

[0032] The air blowing unit 34 is a member disposed in the ventilation space 36, and is configured to blow out air from the inside of the ventilation space 36 to the outside. In addition, the air blowing unit 34 includes a fan motor 341, a fan table 342, and the fan 343. The fan motor 341 generates power to rotate the fan 343, and

includes a cylindrical motor portion 341a, and a rotation shaft 341b rotated by the cylindrical motor portion 341a and projects from the cylindrical motor portion 341a to the air blowing port 311 a side. The fan table 342 is a member attached to the fin portion 321, and includes a fixed portion 342a, a support member projecting portion 342b, and a fan motor support portion 342c. The fixed portion 342a is a portion disposed on the upper side of the heat exchanger 32. The support member projecting portion 342b is a portion that projects from the fixed portion 342a to the air blowing port 311 a side. In addition, the leading end on the air blowing port 311a side of the support member projecting portion 342b is bent in the downward direction of Figure 3. Further, the support member projecting portion 342b has a large and substantially rectangular shaped opening in the center thereof. The fan motor support portion 342c is a plate-like portion that extends in a vertically downward direction from the support member projecting portion 342b to the bottom of the casing 31, and is a portion to which the fan motor 341 is attached. Note that, the majority of the weight of the fan motor 341, the fan table 342, and the fan 343 is supported by the bottom of the casing 31 by the fan motor support portion 342c. In addition, the fan motor support portion 342c is configured such that its both ends in a direction perpendicular to the longitudinal direction are bent, thus increasing the strength compared to the case where the fan motor support portion is formed by a flat plate. The fan 343 is a member attached to the rotation shaft 341 b of the fan motor 341, and is configured to blow out air in the outdoor unit 3 through the air blowing port 311 a. In addition, the fan 343 includes a tubular portion 343a attached to the rotation shaft 341b in a manner incapable of performing relative rotation and three blade members 343b attached to the lateral surface of the tubular portion 343a. Further, the fan 343 is disposed so as to face the air blowing port 311a in order to discharge air in the ventilation space 36 to the outside.

2. ELECTRICAL COMPONENT UNIT

[0033] The electrical component unit 5 is disposed above the compressor 33, and is supported by the partition plate 35 and the casing 31. In addition, as shown in Figures 4 and 5, the electrical component unit 5 includes a support member 51, a plurality of electrical components 52 including a reactor 521, and a terminal plate 53.

[0034] The support member 51 is a member that supports the electrical components 52 and the terminal plate 53, and is disposed adjacent to the top surface of the casing 31. In addition, the support member 51 includes an arrangement portion 511, a projecting portion 512, and a lower plate-like portion 513. The arrangement portion 511 is a portion that supports the electrical components 52 other than the reactor 521, and includes: an upper plate-like portion 511a having a plate-like disposed above the electrical components 52 other than the reac-

tor 521; a lateral side support portion 511b disposed laterally to the electrical components 52 other than the reactor 521; and a lower support plate portion 511d disposed below the electrical components 52 other than the reactor 521. The electrical components 52 are disposed between the upper plate-like portion 511a and the lower support plate portion 511d of the arrangement portion 511. The projecting portion 512 is a plate-like portion that projects from the upper plate-like portion 511a of the arrangement portion 511 in a direction opposite to the direction where the ventilation space 36 is arranged. In addition, the projecting portion 512 is a hollow member formed by bending a first flat plate 512a projecting from the upper plate-like portion 511a such that the first flat plate 512a is in a substantially U shape and by connecting a second flat plate 512b to both ends of the first flat plate 512a so as to connect the both ends. Further, three grooves 512c are disposed in a parallel manner on the upper side surface of the projecting portion 512. The lower plate-like portion 513 is a portion extending downwardly from an end portion of the projecting portion 512, the end portion being located oppositely to another end on the arrangement portion 511 side of the projecting portion 512. The lower plate-like portion 513 includes a terminal plate attachment portion 513a, a support portion 513b, and lateral wall portions 513c. The terminal plate attachment portion 513a is a portion formed in a flat plate shape, to which the terminal plate 53 is attached. The support portion 513b is a portion disposed below the terminal plate attachment portion 513a, and is a portion supported by the casing 31. The support portion 513b is provided with a wire support portion 513d for supporting wires of the terminal plate 53. The lateral wall portions 513c are plate-like portions outwardly extending from both lateral sides of the terminal attachment portion 513a. Note that a bottom end portion 511c of the lateral side support portions 511b and a lower end portion 513e of the lower plate-like portion 513 are located at substantially the same height. Here, the casing 31 has the opening 312a at a portion corresponding to the position where the terminal plate attachment portion 513a is disposed. The opening 312a is disposed such that a wire is passed through the opening 312a for connecting to the external power supply (see Figure 2). Additionally, a shielding plate 6 made of a nonflammable resin material so as to cover the opening 312a is disposed. Accordingly, even if the inside of the machine space 37 catches fire, the impact of the fire on the outside of the machine space 37 is reduced. The shielding plate 6 is configured to support the wire connected to the terminal plate 53 and also to block between the machine space 37 side and the outside.

[0035] The plurality of electrical components 52 are the members supported by the arrangement portion 511, and includes the reactor 521, a power transistor, a plurality of capacitors, and the like. The reactor 521 is a substantially cubic shaped member which is attached to the projecting portion 512 of the support member 51. In

addition, the reactor 521 is disposed with a slight distance from other electrical components 52. Heat radiating fins 522 are mounted to the power transistor. As shown in Figure 6, the heat radiating fins 522 are provided as a device to transfer heat from the power transistor, and are supported by the cutout 351 of the partition plate 35. An insertion opening 523 is provided in the vicinity of the heat radiating fin 522. The insertion opening 523 is formed between the support member 51 of the electrical component unit 5 and an insertion plate 523a provided with a predetermined space from the support member 51. The electrical component unit 5 is supported by the partition plate 35 as the rails 352 of the partition plate 35 are slid into the insertion opening 523. Here, the insertion plate 523a is formed to extend a predetermined distance from the upper end portion of the partition plate 35 in Figure 6, and has the same length as the rails 352 of the partition plate 35. Accordingly, the insertion plate 523a will not cover the entire periphery of the cutout 351 of the partition plate 35. Further, the heat radiating fin 522 has an engaging portion (not shown) at the bottom thereof that engages with the rectangular opening 354 of the plate-like portion provided to the cutout 351 of the partition plate 35.

[0036] The terminal plate 53 is a member attached to the terminal plate attachment portion 513a of the support member 51, and two power supply lines and one signal line are connected to the terminal plate 53. The two power supply lines are connected to the indoor unit 2 of the air conditioner 1, and the electric power is supplied from the power supply via the indoor unit 2 of the air conditioner 1. One signal line is a line for exchanging signals with the indoor unit 2 of the air conditioner 1.

3. CHARACTERISTICS

[0037] The support member 51 of the electrical component unit 5 includes the arrangement portion 511 that supports the electrical components 52 and the projecting portion 512 that projects from the arrangement portion 511 toward the end portion of the casing 31, and the reactor 521 is attached to the projecting portion 512. Accordingly, the electrical components 52 other than the reactor 521 can be disposed at a position near the reactor 521. Accordingly, the electrical components 52 other than the reactor 521 and the reactor 521 can be handled as one unit, which increases the design flexibility. Further, because the reactor 521 is disposed at a position away and above the electrical components 52, the electrical components 52 are less subject to heat generated by the reactor 521. Additionally, because the terminal plate 53 can be disposed to the electrical component unit 5, it is possible to reduce materials for a wire and the like and lower the cost. The bottom end portion 511c of the lateral side support portion 511b and the lower end portion 513e of the lower plate-like portion 513 are located at substantially the same height, so that the electrical component unit 5 can be kept in the position shown in

Figure 5 when placing the electrical component unit 5 on the table or the like. In addition, workability improves because of such a structure, which thus makes it easy to perform maintenance and repairing. Because the projecting portion 512 is a hollow shaped plate member and the three grooves 512c are formed on the upper surface of the projecting portion 512, the strength is increased, and thus even a heavy member such as the reactor 521 can be supported. Further, because the support member 51 is made of a fireproof material, even if the electrical components 52 catch fire, the impact of the fire on other members can be reduced. In addition, because only a part of the insertion plate 523a is located on the ventilation space 36 side with the electrical component unit 5 supported by the partition plate 35, even if fire occurs in the machine space 37 side, the impact of the fire on the ventilation space 36 is reduced.

4. OTHER EMBODIMENT

[0038] In the above embodiment, the lower plate-like portion 513 to which the terminal plate 53 is disposed is attached to the end portion of the projecting portion 512. However, the present invention is not limited thereto. The electrical component unit 5 may be configured without the lower plate-like portion 513.

Claims

1. An electrical component unit (5) that houses a plurality of electrical components (52) including a specific heat generating component in an outdoor unit (3) of an air conditioner (1), the electrical component unit comprising:
 - a support member (51) including an arrangement portion (511) in which some of the plurality of electrical components (52) can be arranged, and a projecting portion (512) outwardly projecting from the arrangement portion (511); and
 - a reactor (521) as one of the plurality of electrical components (51), disposed away from other electrical components (52) and attached to the projecting portion (512).
2. The electrical component unit (5) according to claim 1, wherein
 - the support member (51) further includes a lower plate-like portion (513) disposed so as to extend downwardly from a second end portion of the projecting portion (512), the second end portion being located oppositely to a first end portion on the arrangement portion (511) side of the projecting portion (512), and the lower plate-like portion being configured such that a terminal plate (53) can be arranged thereon.
3. The electrical component unit (5) according to claim 2, wherein
 - the arrangement portion (511) includes a plate-like portion (511a) disposed above the electrical components (52) other than the reactor (521), and a lateral side support portion (511b) disposed laterally to the electrical components (52) other than the reactor (521) so as to hang down from the plate-like portion (511a), and
 - a bottom end portion (511c) of the lateral side support portion (511b) and a lower end portion (513e) of the lower plate-like portion (513) are located at substantially the same height.
4. The electrical component unit according to any one of claim 1 through claim 3, wherein
 - the support member (51) is made of a fireproof member.
5. The electrical component unit according to any one of claim 1 through claim 4, wherein
 - the projecting portion (512) has a depression-shaped portion (512c) formed on the top surface thereof so as to extend in a projection direction of the projecting portion (512).

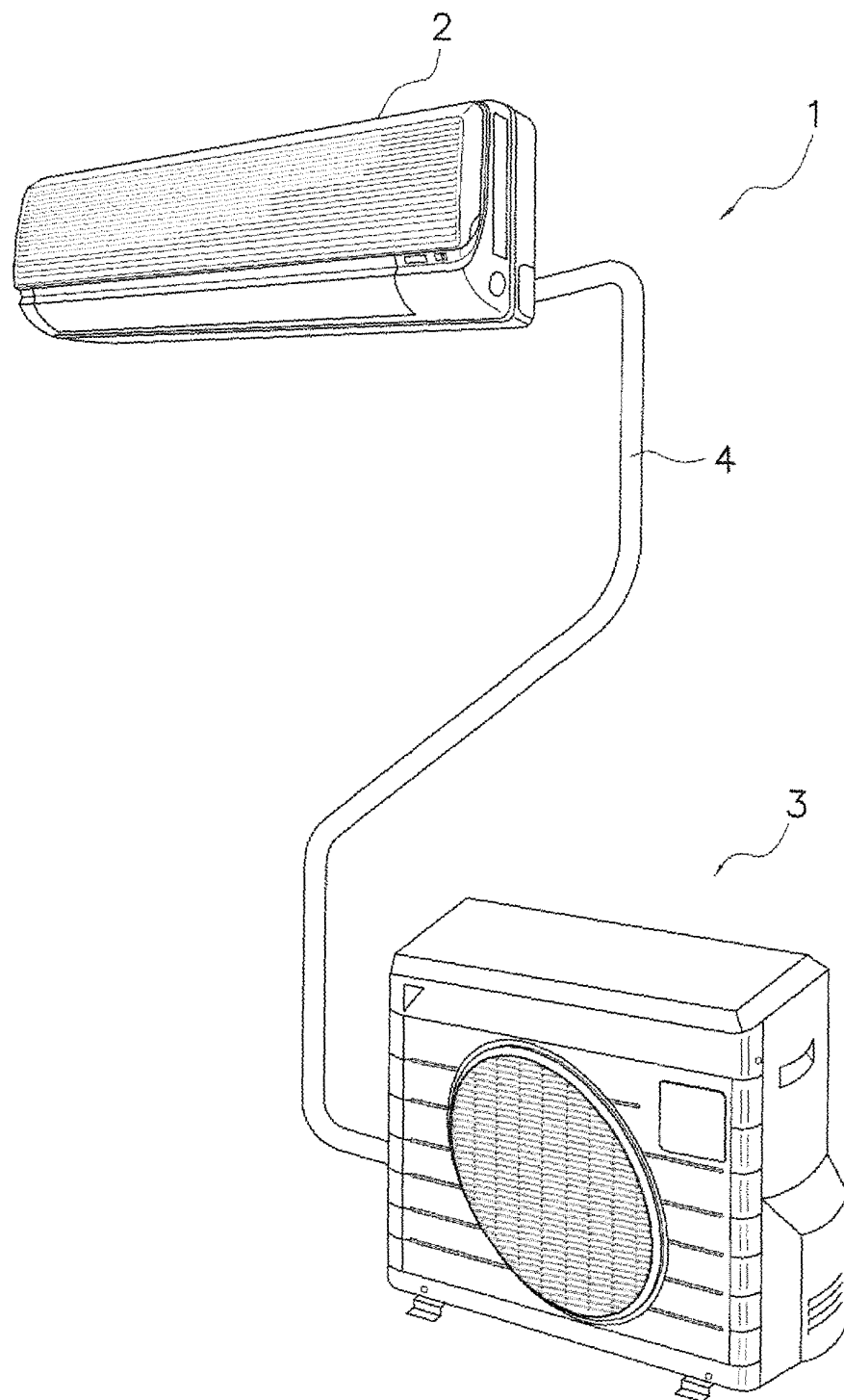


FIG. 1

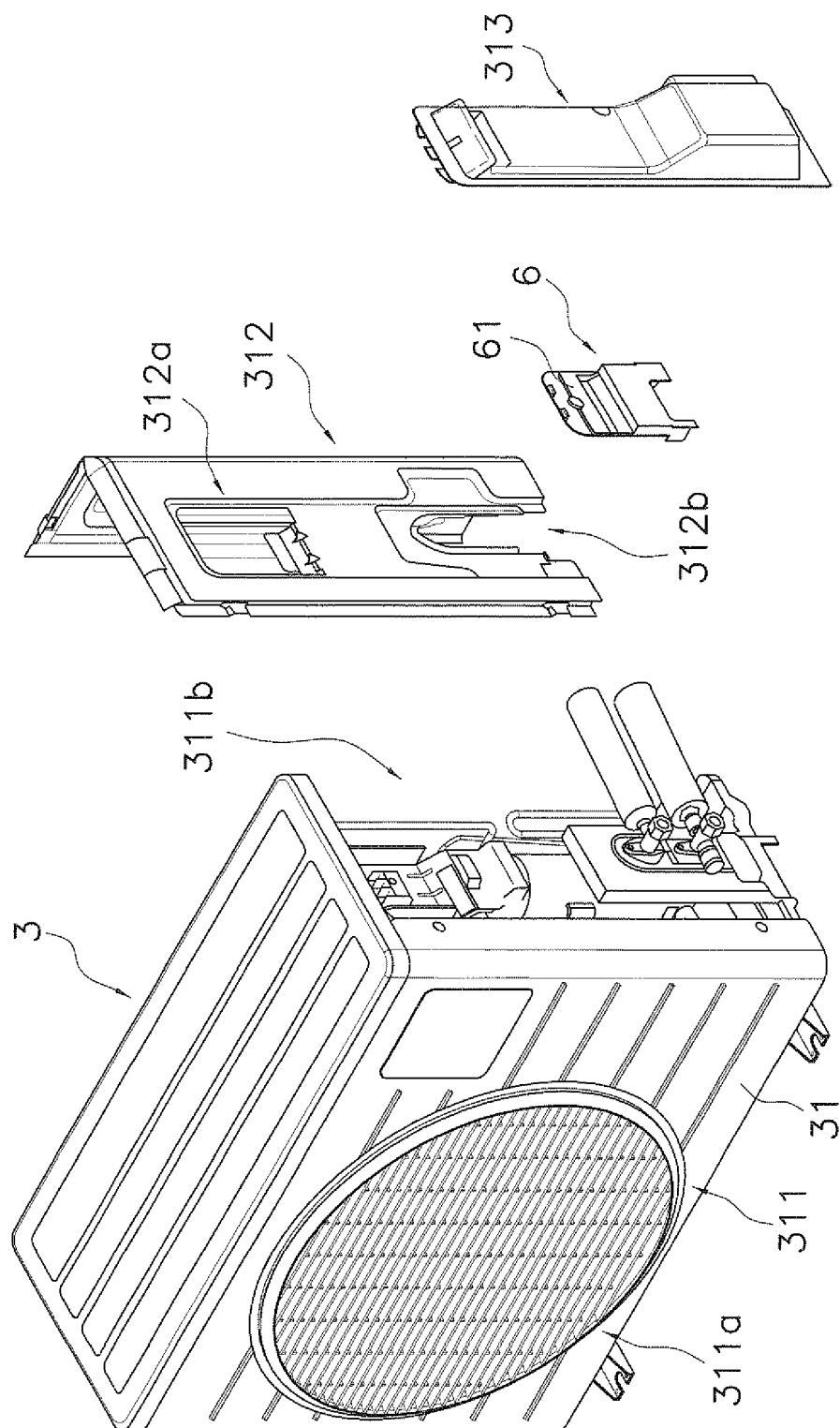


FIG. 2

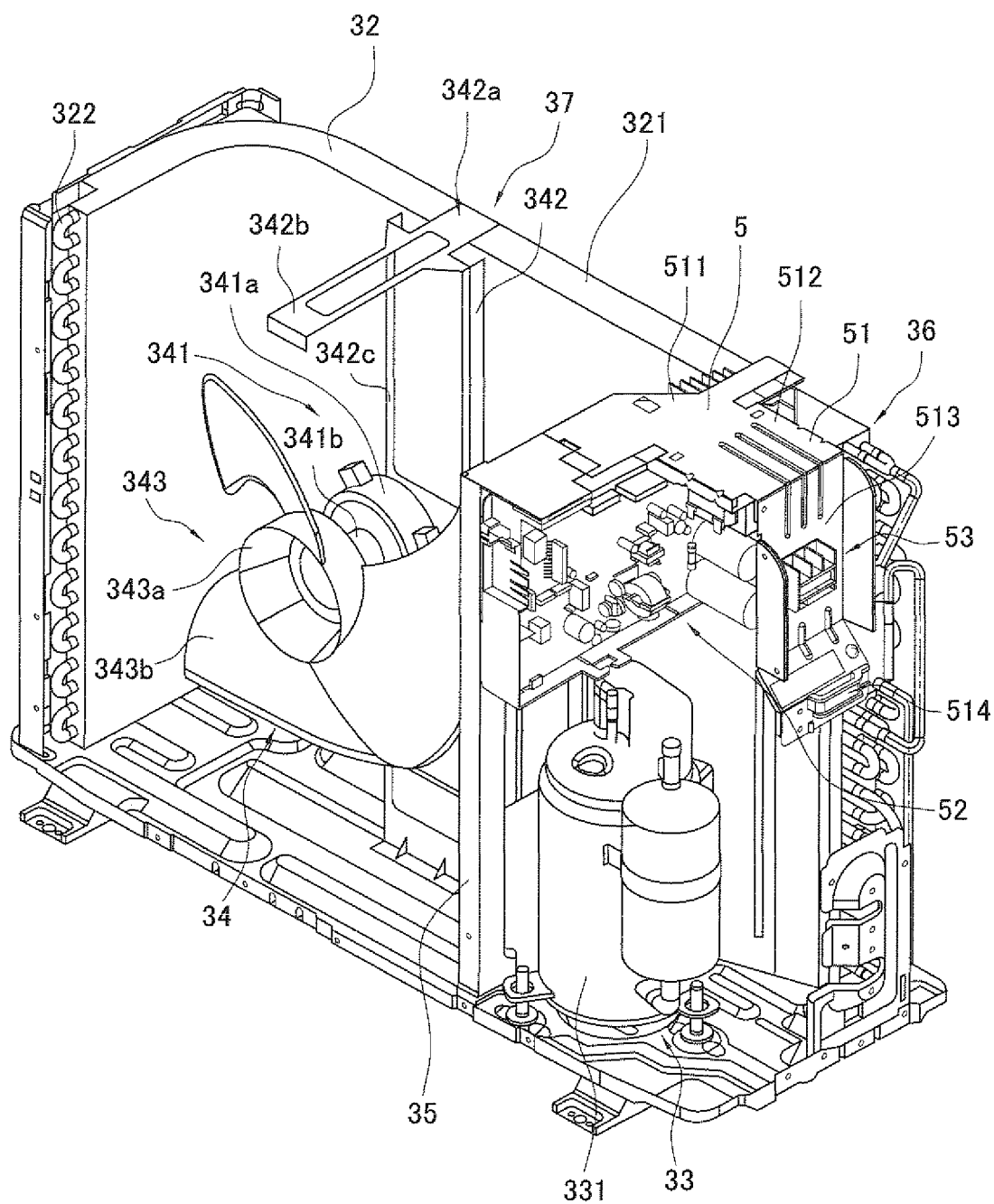


FIG. 3

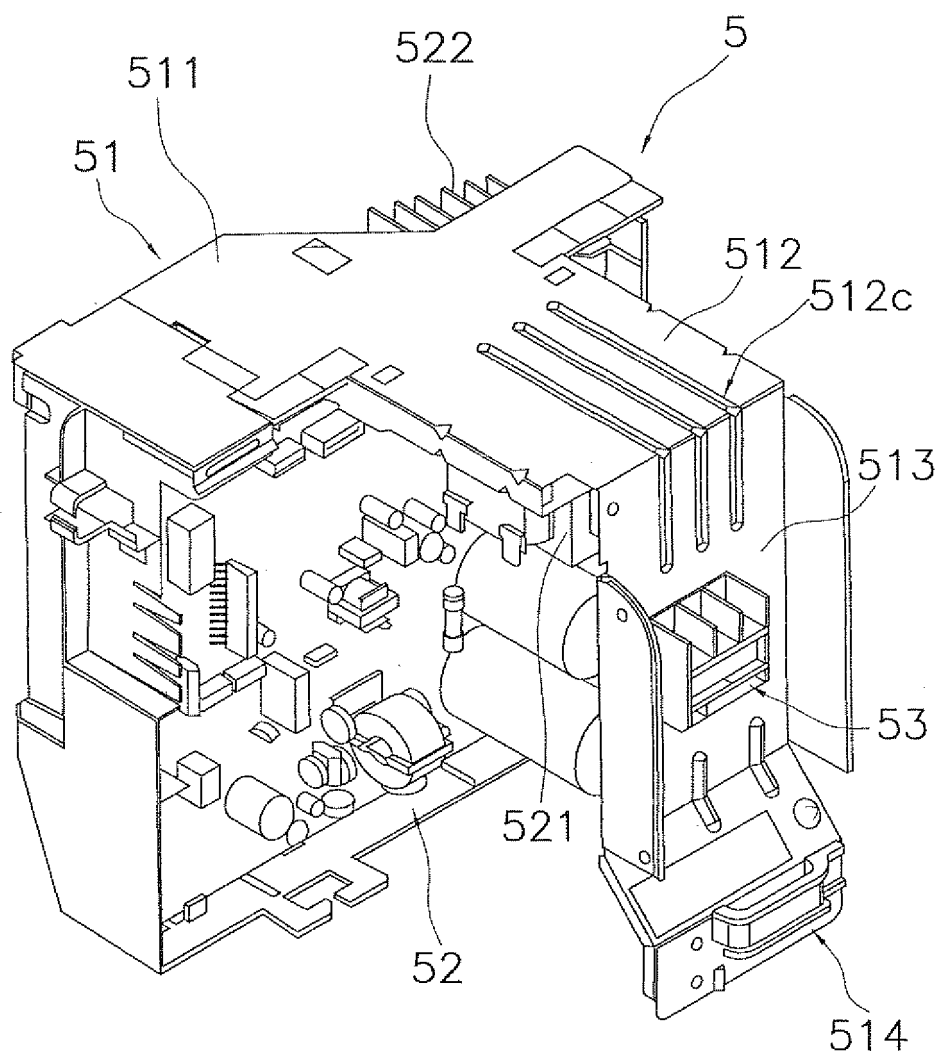


FIG. 4

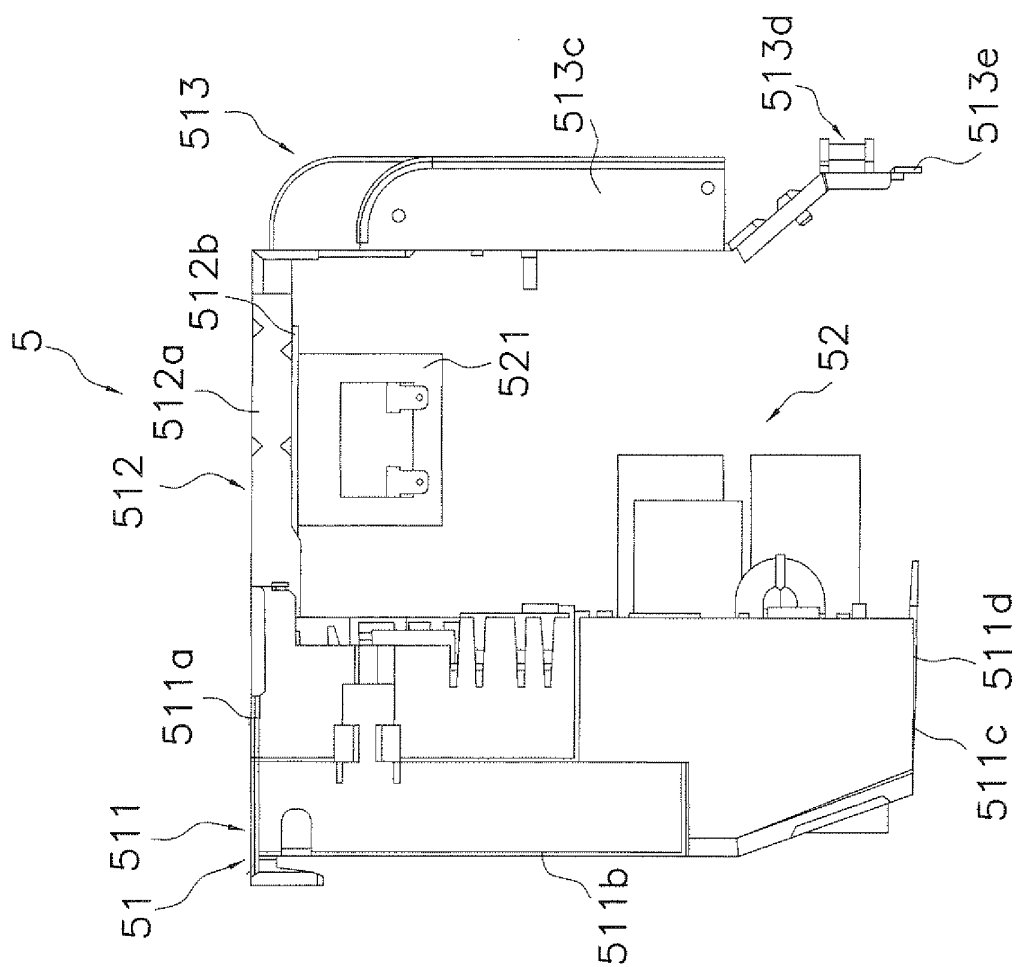


FIG. 5

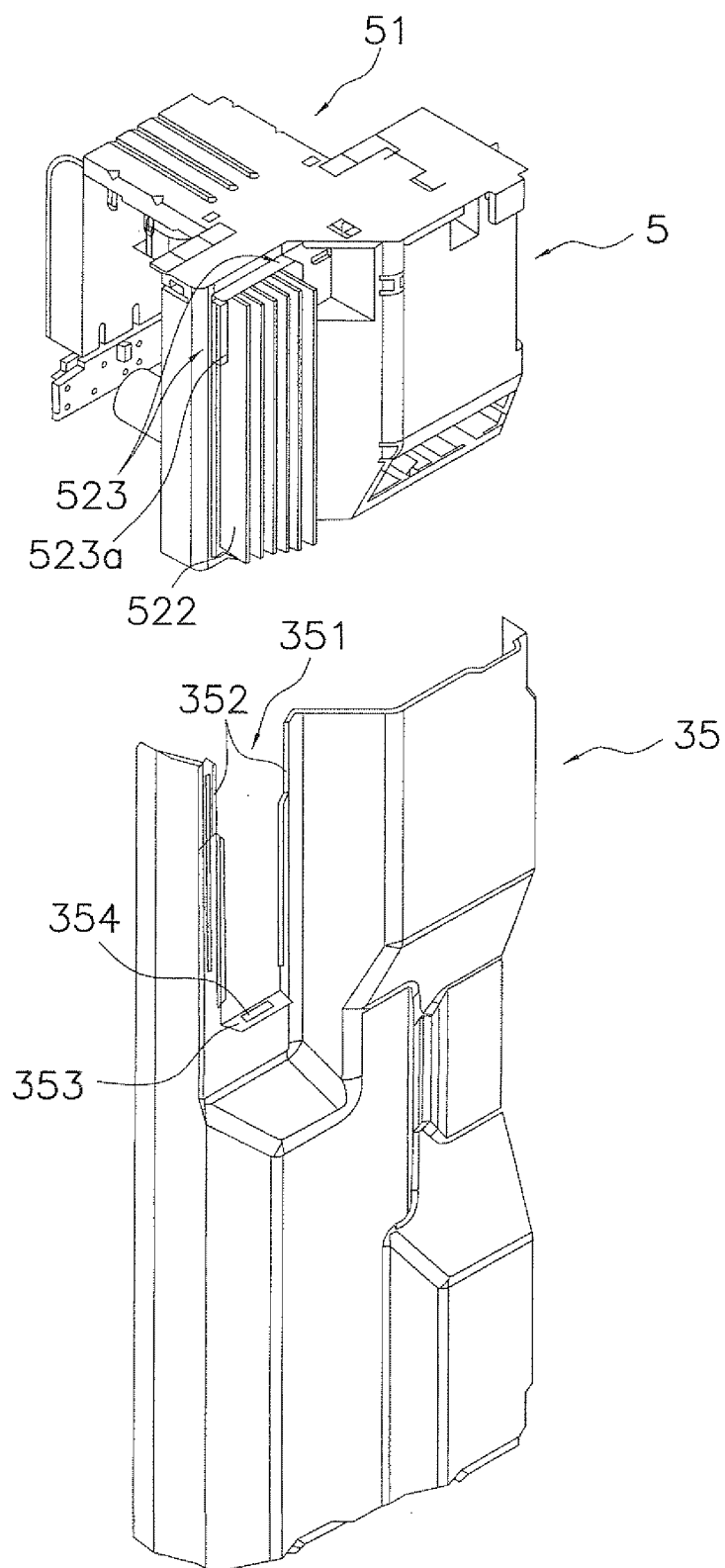


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2007/068309

A. CLASSIFICATION OF SUBJECT MATTER

F24F5/00 (2006.01) i

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)

F24F5/00

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

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2007
Kokai Jitsuyo Shinan Koho	1971-2007	Toroku Jitsuyo Shinan Koho	1994-2007

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 9-236286 A (Daikin Industries, Ltd.), 09 September, 1997 (09.09.97), Figs. 4 to 5 (Family: none)	1, 2 4
Y	JP 2003-124646 A (Mitsubishi Heavy Industries, Ltd.), 25 April, 2003 (25.04.03), Par. No. [0027]; Fig. 3 (Family: none)	4

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

* Special categories of cited documents:

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"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

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Date of the actual completion of the international search
09 October, 2007 (09.10.07)Date of mailing of the international search report
23 October, 2007 (23.10.07)Name and mailing address of the ISA/
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Patent documents cited in the description

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