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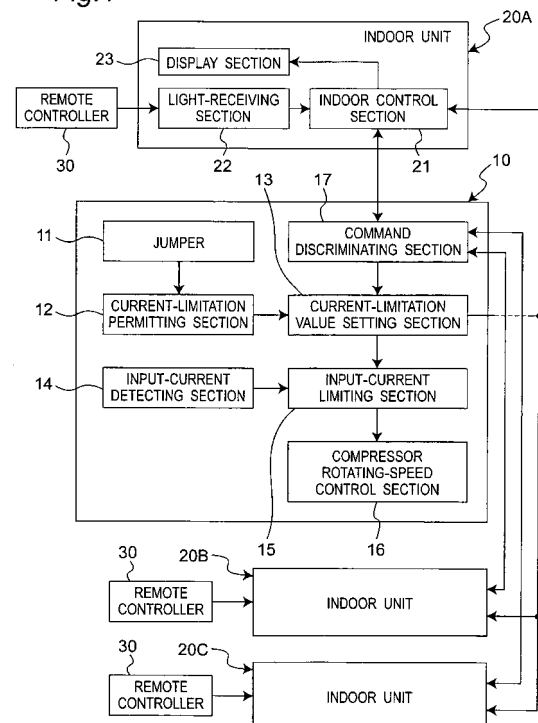
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(54) **AIR CONDITIONER**

(57) An air conditioner includes indoor units 20A, 20B, 20C, an outdoor unit 10 connected to the indoor unit 20A, 20B, 20C, and a remote controller 30 for transmitting a current-limiting command signal to the indoor unit 20A, 20B, 20C. The outdoor unit 10 has an input-current limiting section 15 for limiting an input current to a specified current-limitation value or lower according to the current-limiting command signal derived from the remote controller 30. The outdoor unit 10 also has a current-limitation prohibit setting section 11 for setting prohibition of any current limitation against the input-current limiting section 15.

Fig. 1



Description

TECHNICAL FIELD

[0001] The present invention relates to an air conditioner.

BACKGROUND ART

[0002] Heretofore, there is provided an air conditioner in which an input current is kept limited to a set value or lower for a specified time period by a current-limiting command of a wireless remote control (see, e.g., JP 3-207946 A).

[0003] When the air conditioner is applied to a multi-type air conditioner system having a plurality of indoor units and an outdoor unit, a current set value lowered by one user present in one room would lead to an impairment of comfort of the other rooms, as a problem.

SUMMARY OF THE INVENTION

[0004] Accordingly, an object of the present invention is to provide an air conditioner in which whether or not a current-limiting function to be operated by a command from a remote controller is to be made effective can easily be set, and particularly in which in a system having a plurality of indoor units, the current-limiting operation can be made ineffective so that comfortableness is not impaired.

[0005] In order to achieve the above object, according to the present invention, there is provided an air conditioner comprising:

- an indoor unit;
- an outdoor unit connected to the indoor unit; and
- a remote controller for transmitting a current-limiting command signal to the indoor unit, wherein the outdoor unit has an input-current limiting section for limiting an input current to a specified current-limitation value or lower according to the current-limiting command signal derived from the remote controller, and
- at least one of the indoor unit and the outdoor unit has a current-limitation prohibit setting section for setting prohibition of any current limitation against the input-current limiting section.

[0006] According to the above constitution, a setting for prohibiting any current limitation of the input-current limiting section is performed by the current-limitation prohibit setting section of at least one of the indoor unit and the outdoor unit, even in a multi-type air conditioner system having a plurality of indoor units and the outdoor unit, even though a user in one room has operated the remote controller to issue a command for current limitation, the comfort of the other rooms is never impaired because the current limitation is prohibited. Thus, whether or not

the current-limiting function to be operated by a command from the remote controller is to be made effective can easily be set by using the current-limitation prohibit setting section of at least one of the indoor unit and the outdoor unit. Particularly in a system having a plurality of indoor units, the current-limiting operation can be made ineffective so that the comfort is not impaired.

[0007] In one embodiment, the indoor unit has a display section for, under current-limiting operation by the input-current limiting section of the outdoor unit, displaying an ongoing current limitation according to a signal representing an ongoing current limitation derived from the outdoor unit.

[0008] In this embodiment, under a current-limiting operation of the input-current limiting section of the outdoor unit, the display section of the indoor unit keeps a display of the ongoing current limitation based on a signal representing the ongoing current limitation derived from the outdoor unit. Therefore, the user is enabled to confirm that the current limitation is going on. In particular, in the case of a system having a plurality of indoor units, users in the rooms other than the room from which the current limitation has been issued are also enabled to know that the current limitation is going on.

[0009] In one embodiment, the indoor unit is provided in a plurality, either one of the plurality of indoor units and the outdoor unit has a priority setting section for setting a priority among the plurality of indoor units, and the outdoor unit has a command discriminating section for discriminating the current-limiting command signal coming only from an indoor unit of a highest priority among the plurality of indoor units as an effective command according to the priority set by the priority setting section.

[0010] In this embodiment, based on priorities set by the respective priority setting sections of the plurality of indoor units, the command discriminating section of the outdoor unit discriminates the current-limiting command signal derived only from the indoor unit of the highest priority among the plurality of indoor units as an effective command signal. Even if a user on one indoor unit side of a lower priority has operated the remote controller to transmit a current-limiting command signal, the command discriminating section does not discriminate the signal as an effective command signal. Accordingly, the event that remote controllers may randomly be operated in a plurality of rooms to command or cancel the current limitation can be prevented. Preferably, while the indoor unit of the highest priority among the plurality of indoor units is at a halt, the command discriminating section discriminates a current-limiting command signal derived from an indoor unit of the next highest priority as an effective command signal.

[0011] In one embodiment, the indoor unit is provided in a plurality, the outdoor unit has a current-limitation value setting section for setting the current-limitation value according to a

number of in-operation indoor units among the plurality of indoor units or a power total of the in-operation indoor units.

[0012] In this embodiment, since the current-limitation value is set by the current-limitation value setting section according to a number of in-operation indoor units among the plurality of indoor units or a power total of the in-operation indoor units, any excesses and deficiencies due to increases and decreases of operation rooms can be eliminated. For example, the larger the number of in-operation indoor units is, the higher the current-limitation value is set; on the other hand, the smaller the number of in-operation indoor units is, the lower the current-limitation value is set.

[0013] In one embodiment, the current-limitation value setting section sets the current-limitation value in such a fashion that rated powers of all the in-operation indoor units, respectively, are lowered at a specified ratio.

[0014] In this embodiment, since the current-limitation value is so set as to lower the rated powers of all of in-operation indoor units, respectively, at a specified ratio by the current-limitation value setting section, an optimum current-limitation value for the limitation of the input current of the whole system can be obtained.

[0015] In one embodiment, the input-current limiting section limits the input current stepwise by using a plurality of the specified current-limitation values.

[0016] In this embodiment, the plurality of the current-limitation values are preliminarily prepared, and the input current is limited stepwise. Therefore, the control for controlling the input current can be simplified.

[0017] As apparent from the above description, according to the air conditioner of the present invention, there can be realized an air conditioner in which whether or not the current-limiting function to be operated by commands from the remote controllers is to be made effective can easily be set, and in which particularly in a system having a plurality of indoor units, the current-limiting operation can be made ineffective so that the comfort is not impaired.

[0018] According to the air conditioner of one embodiment, under a current-limiting operation of the input-current limiting section of the outdoor unit, the display section of the indoor unit keeps a display of the ongoing current limitation based on a signal representing the ongoing current limitation derived from the outdoor unit. Therefore, the user is enabled to confirm that the current limitation is going on. In particular, in the case of a system having a plurality of indoor units, users in the rooms other than the room from which the current limitation has been issued are also enabled to know that the current limitation is going on.

[0019] According to the air conditioner of one embodiment, based on priorities set by the respective priority order setting sections of the plurality of indoor units, the command discriminating section of the outdoor unit discriminates only a current-limiting command signal derived from an indoor unit of the highest priority among

the plurality of indoor units as an effective command signal. As a result, the event that the remote controllers may randomly be operated in a plurality of rooms to command or cancel the current limitation can be prevented.

[0020] According to the air conditioner of one embodiment, since a current-limitation value is set by the current-limitation value setting section according to a number of in-operation indoor units among the plurality of indoor units or a power total of the in-operation indoor units, any excesses and deficiencies due to increases and decreases of operation rooms can be eliminated.

[0021] According to the air conditioner of one embodiment, since the current-limitation value is so set as to lower the rated powers of all of in-operation indoor units, respectively, at a specified ratio by the current-limitation value setting section, an optimum current-limitation value for the limitation of the input current of the whole system can be obtained.

[0022] Also, according to the air conditioner of one embodiment, a plurality of current-limitation values are preliminarily prepared, and the input current is limited stepwise. As a result, the control for controlling the input current can be simplified so that the cost can be reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

Fig. 1 is a block diagram showing a construction of an air conditioner according to one embodiment of the present invention;

Fig. 2 is a flowchart for explaining operation of an outdoor unit according to a priority among indoor units of the air conditioner; and

Fig. 3 is a flowchart for explaining current-limiting process shown in Fig. 2.

DETAILED DESCRIPTION OF THE INVENTION

[0024] Hereinbelow, the air conditioner of the present invention will be described in detail by an embodiment thereof illustrated in the accompanying drawings.

[0025] Fig. 1 is a block diagram showing a construction of an air conditioner according to one embodiment of the invention. The air conditioner, as shown in Fig. 1, includes an outdoor unit 10, a plurality of indoor units 20A, 20B, 20C, and a plurality of remote controllers 30 for controlling the indoor units 20A, 20B, 20C, respectively. The outdoor unit 10 and the plurality of indoor units 20A, 20B, 20C are connected to each other via interconnecting lines (including communication lines).

[0026] The outdoor unit 10 includes a jumper 11 as a current-limitation prohibit setting section, a current-limitation permitting section 12 for permitting current limitation based on a setting of the jumper 11, a current-limitation value setting section 13 for setting a current-limitation value based on a permission signal derived from the current-limitation permitting section 12, an input-cur-

rent detecting section 14 for detecting an input current, an input-current limiting section 15 for, based on an input current detected by the input current detecting section 14 as well as on a current-limitation value set by the current-limitation value setting section 13, outputting a control signal so that the input current is limited to the current-limitation value or lower, a compressor rotating-speed control section 16 for, based on a control signal derived from the input-current limiting section 15, controlling the rotating speed of a compressor (not shown), and a command discriminating section 17 for discriminating current-limiting command signals coming from the indoor units 20A, 20B, 20C. Upon discrimination that a current-limiting command signal derived from any one of the indoor units 20A, 20B, 20C is an effective command signal, the command discriminating section 17 outputs a current-limiting command signal to the current-limitation value setting section 13. It is noted here that the term "input current" refers to an input current fed from power supply to an inverter circuit or the like that drives the compressor.

[0027] Also, each of the indoor units 20A, 20B, 20C has an indoor control section 21 having an additional function as a priority setting section, a light-receiving section 22 for, upon reception of a control signal emitted from a light-emitting section (not shown) of the remote controllers 30, transforming the received control signal into an electric signal and outputting the electric signal to the indoor control section 21, and a display section 23 for performing display based on a display signal from the indoor control section 21. A priority among the indoor units 20A, 20B, 20C is set based on control signals derived from the remote controllers 30.

[0028] Fig. 2 is a flowchart for explaining operation of the outdoor unit 10 based on a current-limiting command from the indoor units 20A, 20B, 20C. It is noted that the indoor units 20A, 20B, 20C are expressed as 'A', 'B', and 'C', respectively, in the description of Fig. 2.

[0029] First, upon a start of processing, at step S1, if it is decided by the command discriminating section 17 that A is in operation, then the program goes to step S4. On the other hand, if it is decided that A is not in operation, the program goes to step S2.

[0030] Therefore, at step S4, if it is decided that a current-limiting command from A has not been received, then the program goes to step S2.

[0031] At step S2, if it is decided by the command discriminating section 17 that B is in operation, then the program goes to step S5. If it is decided that B is not in operation, the program goes to step S3.

[0032] At step S5, if it is decided by the command discriminating section 17 that a current-limiting command from B has been received, then the program goes to step S7.

[0033] At step S3, if it is decided by the command discriminating section 17 that C is in operation, then the program goes to step S6. If it is decided that C is not in operation, the program goes to step S7.

[0034] At step S6, if it is decided by the command dis-

criminating section 17 that a current-limiting command from C has been received, then the program goes to step S7, where a current-limiting process is performed by the current-limitation value setting section 13 and the input-current limiting section 15. Thus, the processing is ended.

[0035] Fig. 3 is a flowchart for explaining the current-limiting process shown in Fig. 2.

[0036] First, upon a start of the current-limiting process, if it is decided at step S11 shown in Fig. 3 that a priority has been set for the indoor units, then the program goes to step S16. If it is decided at step S11 that no priority has been set, the program goes to step S12.

[0037] At step S16, if it is decided that a current-limiting command has been received from an indoor unit of the highest priority, the program goes to step S13. If it is decided that no current-limiting command has been received from the indoor unit of the highest priority, the current-limiting process is ended.

[0038] Meanwhile, at step S12, if it is decided that a current-limiting command has been received from any one of the indoor units 20A, 20B, 20C, then the program goes to step S13. If no current-limiting command has been received, the current-limiting process is ended.

[0039] At step S13, a power total of operation rooms is calculated by the current-limitation value setting section 13. It is noted that the power total of the operation rooms is calculated by using a table containing a list of preliminarily prepared powers of the indoor units of the rooms.

[0040] Next, the program goes to step S14, where a current-limitation value is calculated by the current-limitation value setting section 13 based on the power total of the operation rooms determined in step S13.

[0041] Next, the program goes to step S15, where the input current is limited to the current-limitation value or lower by the input-current limiting section 15. Thus, the current-limiting process is ended.

[0042] In the air conditioner described above, not only whether or not a current-limiting command from each of the indoor units 20A, 20B, 20C is effective is decided based on a priority among the indoor units 20A, 20B, 20C, but also whether or not a command for the operation mode or the like from each of the indoor units 20A, 20B, 20C is effect is decided based on the priority. In this case, when the operation mode involving no current limitation (an operation mode in which the operation is done at a maximum power) is set for the indoor unit 20A of the highest priority under current limitation, as an example, any current-limitation setting is canceled and a set operation mode is executed.

[0043] In the air conditioner constructed as described above, given a setting for prohibiting any current limitation of the input-current limiting section 15 set by the jumper 11 as a current-limitation prohibit setting section of the outdoor unit 10, even in a multi-type air conditioner system having a plurality of the indoor units 20A, 20B, 20C and the outdoor unit 10, even though a user in one room has operated the remote controller 30 to issue a

command for current limitation, the comfort of the other rooms is never impaired because the current limitation is prohibited. Thus, whether or not the current-limiting function to be operated by commands from the remote controllers 30 is to be made effective can easily be set by using the jumper 11 of the outdoor unit 10.

[0044] Under a current-limiting operation of the input-current limiting section 15 of the outdoor unit 10, the display section 23 of the indoor unit 20A, 20B, 20C keeps a display of the ongoing current limitation based on a signal representing the ongoing current limitation derived from the outdoor unit 10. Therefore, the user is enabled to confirm that the current limitation is going on. Further, users in the rooms other than the room from which the current limitation has been issued are also enabled to know that the current limitation is going on.

[0045] Based on priorities set by the respective indoor control sections 21 of the indoor units 20A, 20B, 20C, the command discriminating section 17 of the outdoor unit 10 discriminates a current-limiting command signal derived from an indoor unit of the highest priority among the indoor units 20A, 20B, 20C as an effective command signal. Even if a user on one indoor unit side of a lower priority has operated the remote controller 30 to transmit a current-limiting command signal, the command discriminating section 17 does not discriminate the signal as an effective command signal. Accordingly, the event that remote controllers 30 may randomly be operated in a plurality of rooms to command or cancel the current limitation can be prevented. In addition, in this embodiment, while the indoor unit of the highest priority among the indoor units 20A, 20B, 20C is at a halt, the command discriminating section 17 discriminates a current-limiting command signal derived from an indoor unit of the next highest priority as an effective command signal.

[0046] Further, since a current-limitation value is set by the current-limitation value setting section 13 of the outdoor unit 10 based on a power total of indoor units in operation among the indoor units 20A, 20B, 20C, any excesses and deficiencies due to increases and decreases of operation rooms can be eliminated.

[0047] Moreover, the current-limitation value may also be set by the current-limitation value setting section 13 of the outdoor unit 10 based on the number of in-operation indoor units among the indoor units 20A, 20B, 20C. For example, the larger the number of in-operation indoor units is, the higher the current-limitation value is set; the smaller the number of in-operation indoor units is, the lower the current-limitation value is set. In this case, by setting a current-limitation value based on the number of in-operation indoor units, a more optimal current-limitation value can be obtained.

[0048] Further, since the current-limitation value is so set as to lower the rated powers of all of in-operation indoor units, respectively, at a specified ratio by the current-limitation value setting section 13, an optimum current-limitation value for the limitation of the input current of the whole system can be obtained.

[0049] The foregoing embodiment has been described on an air conditioner in which the jumper 11 as an example of the current-limitation prohibit setting section is provided on the outdoor unit 10. However, without being limited to the jumper 11 as an example of the current-limitation prohibit setting section, the current-limitation prohibit setting section has only to be setting means such as a switch, remote controller and so on. In addition, the current-limitation prohibit setting section may be provided on the indoor unit side or otherwise the setting may be done by the indoor units through operation of the remote controllers.

[0050] Further, although the function as a priority setting section is provided in each indoor control section 21 of the indoor units 20A, 20B, 20C in the embodiment, the priority setting section is not limited to this and may also be provided on the outdoor unit side.

[0051] Further, in the foregoing embodiment, the current-limitation value is set by the current-limitation value setting section 13 of the outdoor unit based on a power total of the in-operation indoor units among the indoor units 20A, 20B, 20C. However, the input-current limiting section may limit an input current stepwise by using a plurality of preliminarily prepared current-limitation values. In this case, the control for controlling the input current can be simplified so that the cost can be reduced.

[0052] Furthermore, the embodiment has been described on an air conditioner including the three indoor units 20A, 20B, 20C as well as the outdoor unit 10 connected to the indoor units 20A, 20B, 20C. However, the invention may be applied to air conditioners including one indoor unit and one outdoor unit connected to the indoor unit. In this case, as the function of setting a priority among the indoor units becomes unnecessary, whether or not the current-limiting function to be operated according to a command from the remote controller is to be made effective can easily be set by providing a current-limitation prohibit setting section of at least one of the indoor unit and the outdoor unit.

Claims

1. An air conditioner comprising:

an indoor unit (20A, 20B, 20C);
an outdoor unit (10) connected to the indoor unit (20A, 20B, 20C); and
a remote controller (30) for transmitting a current-limiting command signal to the indoor unit (20A, 20B, 20C), wherein
the outdoor unit (10) has an input-current limiting section (15) for limiting an input current to a specified current-limitation value or lower according to the current-limiting command signal derived from the remote controller (30), and
at least one of the indoor unit (20A, 20B, 20C) and the outdoor unit (10) has a current-limitation

prohibit setting section (11) for setting prohibition of any current limitation against the input-current limiting section (15).

2. The air conditioner as claimed in Claim 1, wherein the indoor unit (20A, 20B, 20C) has a display section (23) for, under current-limiting operation by the input-current limiting section (15) of the outdoor unit (10), displaying an ongoing current limitation according to a signal representing an ongoing current limitation derived from the outdoor unit (10). 5
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3. The air conditioner as claimed in Claim 1, wherein the indoor unit (20A, 20B, 20C) is provided in a plurality, 15
either one of the plurality of indoor units (20A, 20B, 20C) and the outdoor unit (10) has a priority setting section (21) for setting a priority among the plurality of indoor units (20A, 20B, 20C), and 20
the outdoor unit (10) has a command discriminating section (17) for discriminating the current-limiting command signal coming only from an indoor unit of a highest priority among the plurality of indoor units (20A, 20B, 20C) as an effective command according to the priority set by the priority setting section (21). 25

4. The air conditioner as claimed in Claim 1, wherein the indoor unit (20A, 20B, 20C) is provided in a plurality, 30
the outdoor unit (10) has a current-limitation value setting section (13) for setting the current-limitation value according to a number of in-operation indoor units (20A, 20B, 20C) among the plurality of indoor units (20A, 20B, 20C) or a power total of the in-operation indoor units (20A, 20B, 20C). 35

5. The air conditioner as claimed in Claim 4, wherein the current-limitation value setting section (13) sets the current-limitation value in such a fashion that rated powers of all the in-operation indoor units (20A, 20B, 20C), respectively, are lowered at a specified ratio. 40

6. The air conditioner as claimed in Claim 1, wherein the input-current limiting section (15) limits the input current stepwise by using a plurality of the specified current-limitation values. 45

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Fig. 1

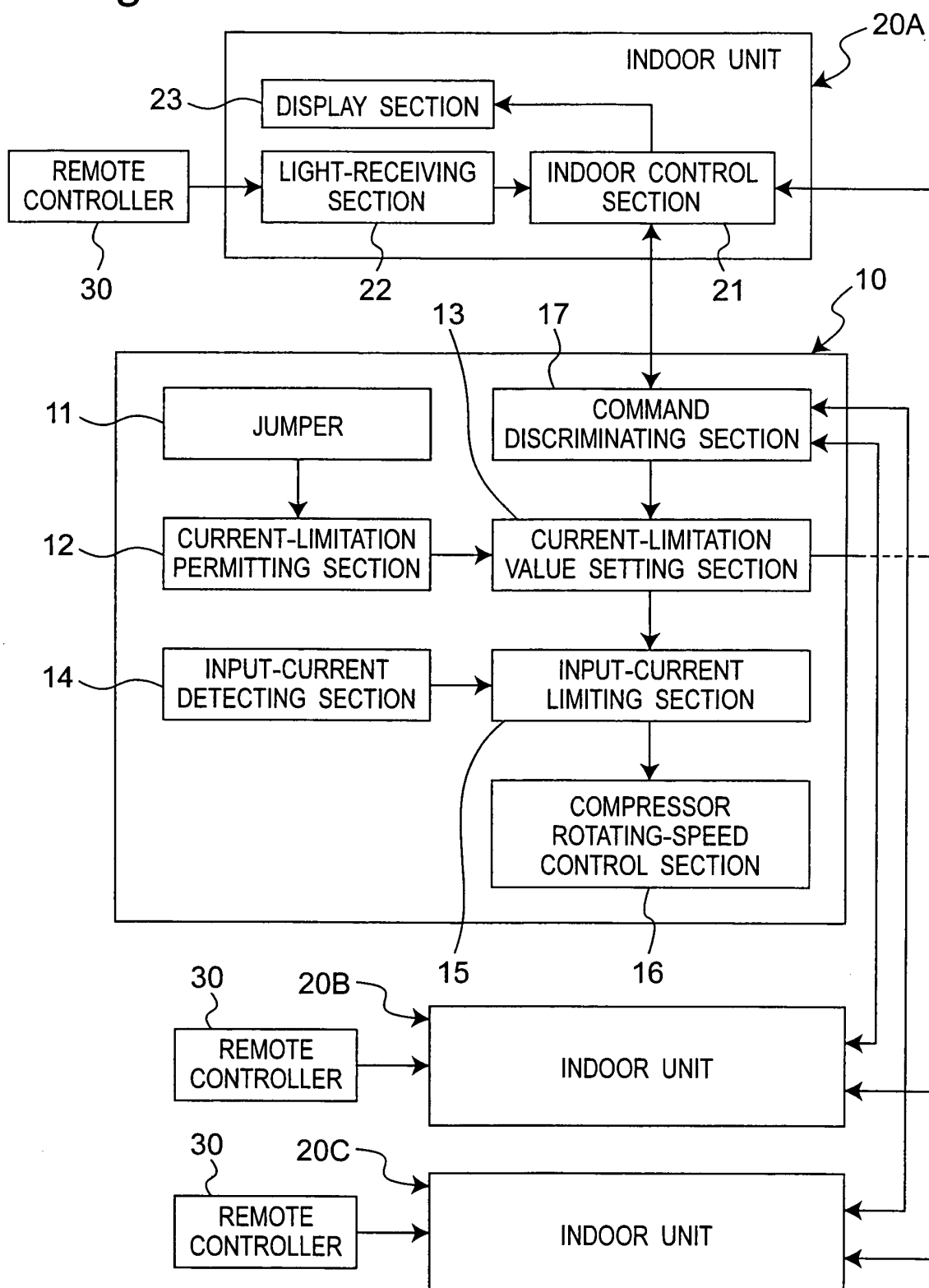


Fig.2

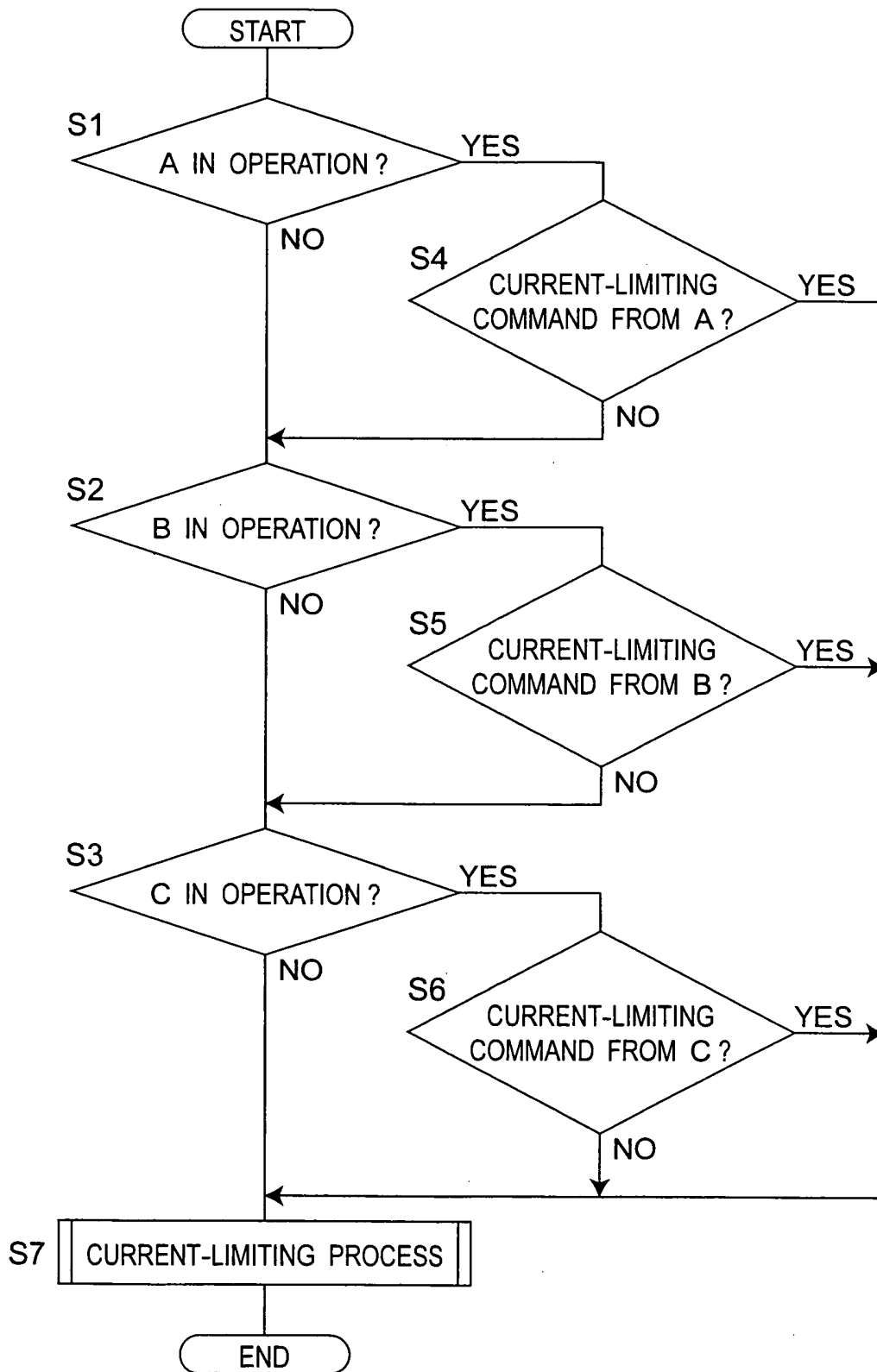
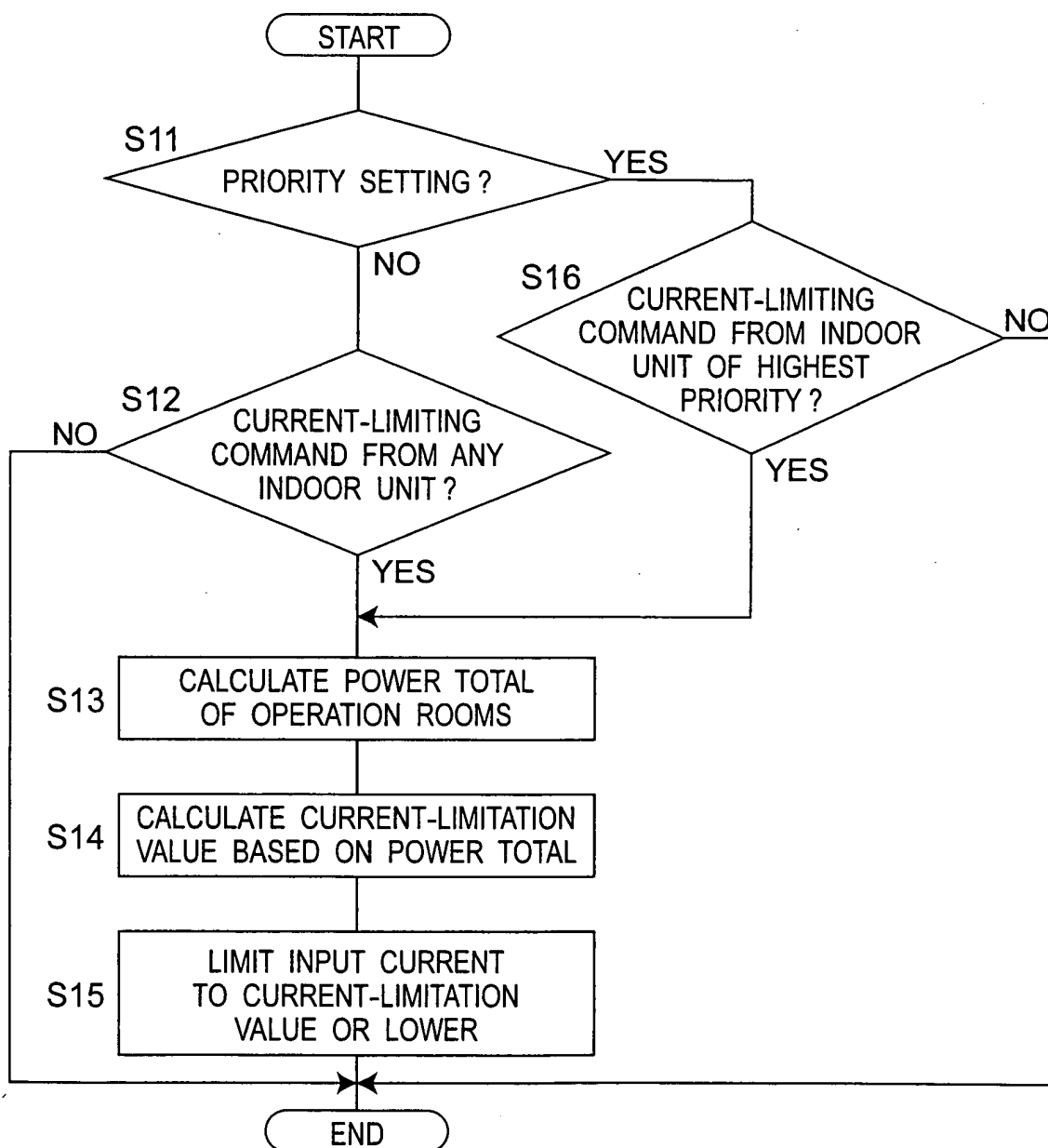


Fig.3



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/315474

A. CLASSIFICATION OF SUBJECT MATTER

F24F11/02 (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)

F24F11/02

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	1996-2006
Kokai Jitsuyo Shinan Koho	1971-2006	Toroku Jitsuyo Shinan Koho	1994-2006

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.
Y	JP 3-207946 A (Toshiba Corp.), 11 September, 1991 (11.09.91), Full text (Family: none)	1-6
Y	JP 2002-31393 A (Sanyo Electric Co., Ltd.), 31 January, 2002 (31.01.02), Full text (Family: none)	1-6
Y	JP 5-5545 A (Toshiba Corp.), 14 January, 1993 (14.01.93), Full text (Family: none)	2-6

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

* Special categories of cited documents:

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Date of the actual completion of the international search
27 September, 2006 (27.09.06)Date of mailing of the international search report
03 October, 2006 (03.10.06)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/315474

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	JP 10-309037 A (Kabushiki Kaisha Merikkusu), 17 November, 1998 (17.11.98), Full text (Family: none)	4-6

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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