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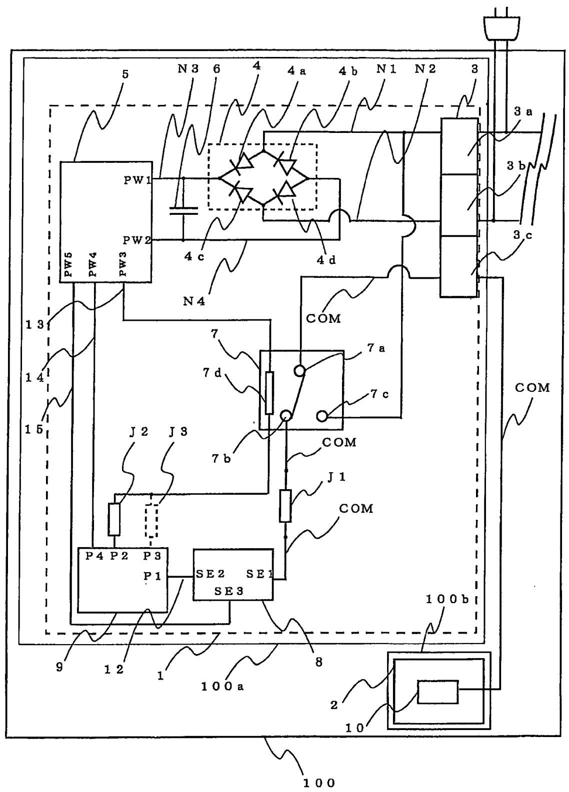
(54) **Air conditioner**

(57) An air conditioner (100) includes an indoor unit control board (1) and an outdoor unit controller (10) that controls a compressor. The indoor unit control board (1) has: a first power supply line (N1) and a second power supply line (N2) that supply AC power; a communication circuit (8); a single-pole double-throw relay (7) that has a first contact (7a) connected to a communication line COM, a second contact (7b) connected to the communication circuit (8), a third contact (7c) connected to the first power supply line (N1), and a coil (7d) for a switchover between a mutual connection of the first contact (7a) and the second contact (7b) and a mutual connection of the first contact (7a) and the third contact (7c), the communication circuit (8) communicating with the outdoor unit controller (10) via the communication line COM and the second contact (7b) and the first contact (7a) of the single-pole double-throw relay (7); and a microcomputer (9) that outputs communication information to the communication circuit (8) and controls the coil (7d).

FIG. 1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

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

2. Description of the Related Art

[0002] Air conditioners have an indoor unit and an outdoor unit. Various types of them having power supply lines that supply power to the indoor unit and the outdoor unit, and a transmission line used for communication between the indoor unit and the outdoor unit and used for power supply to the outdoor unit are proposed (see Patent Literature 1, for example). Such an air conditioner does not supply power to the outdoor unit in a standby state, and supplies power from the indoor unit to the outdoor unit in a state to start operation.

[0003] Specifically, the indoor unit of this type of an air conditioner includes a normally-open single-pole relay. The relay is controlled by a microcomputer so that the relay is open in the standby state. That is, in the standby state, the power supply lines and the transmission line are brought into non-conduction and thereby power is not supplied to the outdoor unit. In the operation state, the relay is closed by the microcomputer. That is, in the operation state, the power supply lines and transmission line are brought into conduction and thereby power is supplied to the outdoor unit and the outdoor unit is operated.

CITATION LIST

Patent Literature

[0004]

Patent Literature 1 Japanese Unexamined Patent Application Publication No. 2009-14225 (pages 5 and 6 and Fig. 1)

SUMMARY OF THE INVENTION

[0005] A conventional air conditioner as described in Patent Literature 1 has a normally-open single-pole relay in its control circuit. Accordingly, when the air conditioner shifts from the standby state to the operation state and the relay is closed, a power supply voltage is applied to a communication circuit, so the parts in the communication circuit need to have high dielectric strength or protective parts need to be mounted, increasing costs.

[0006] The present invention addresses the above problem with the object of providing an air conditioner that eliminates the need for expensive high dielectric strength parts or protective parts.

[0007] The air conditioner according to the present invention includes an indoor unit control board and an outdoor unit controller that controls a compressor. The indoor unit control board has: a first power supply line and a second power supply line that supply AC power; a communication circuit; a single-pole double-throw relay that has a first contact connected to a communication line, a second contact connected to the communication circuit, a third contact connected to the first power supply line, and a coil for a switchover between a mutual connection of the first contact and the second contact and a mutual connection of the first contact and the third contact, the communication circuit communicating with the outdoor unit controller via the communication line and the second contact and the first contact of the single-pole double-throw relay; and a microcomputer that outputs communication information to the communication circuit and controls the coil.

[0008] The air conditioner according to the present invention uses the single-pole double-throw relay to protect the communication circuit from a power supply voltage and thereby eliminates the need for expensive high dielectric strength parts or protective parts, suppressing an increase in costs.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Fig. 1 shows an exemplary circuit configuration of an indoor unit control board and an outdoor unit control board mounted in an air conditioner according to Embodiment 1 of the present invention.

[0010] Fig. 2 shows another exemplary circuit configuration of the indoor unit control board and the outdoor unit control board mounted in the air conditioner according to Embodiment 1 of the present invention.

[0011] Fig. 3 shows an exemplary circuit configuration of an indoor unit control board and an outdoor unit control board mounted in an air conditioner according to Embodiment 2 of the present invention.

[0012] Fig. 4 shows another exemplary circuit configuration of the indoor unit control board and the outdoor unit control board mounted in the air conditioner according to Embodiment 2 of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] Embodiments of the present invention will be described below with reference to the drawings.

Embodiment 1

[0014] Fig. 1 shows an exemplary circuit configuration of an indoor unit control board 1 and an outdoor unit control board 2 mounted in an air conditioner 100 according to Embodiment 1 of the present invention. In the example in Fig. 1, the air conditioner 100 can function as a low standby power air conditioner. In Fig. 1 and subsequent drawings, relationships in size between components may differ from actual relationships.

[0015] A first line J1, a second line J2, a third line J3, a fourth line J4, a fifth line J5, a sixth line J6, and a seventh line J7 in Fig. 1 and subsequent drawings are indicated as solid lines when they are brought into conduction and as dotted lines when they are brought into non-conduction. These lines may be jumper lines, jumper resistors, or any other lines for which their conduction and non-conduction can be controlled.

[0016] Low standby power air conditioners will be briefly described below. They can control the drive frequency of a compressor (not shown) and supply power to the compressor only during an operation (in an operation state). Low standby power air conditioners satisfy regulations in European countries and perform inverter control, which is widely demanded in Japan as well, to reduce power consumption during a standby operation (in a standby operation state).

[0017] As shown in Fig. 1, the air conditioner 100 according to Embodiment 1 includes an indoor unit 100a, in which at least the indoor unit control board 1 is disposed, and an outdoor unit 100b, in which at least the outdoor unit control board 2 is disposed. Although there is no limitation to a place at which the indoor unit control board 1 is disposed, it is assumed in Embodiment 1 that the indoor unit control board 1 is disposed in the indoor unit 100a.

[0018] The indoor unit control board 1 includes a terminal block 3, a diode bridge 4, a power supply circuit 5, an electrolytic capacitor 6, a single-pole double-throw relay 7, a communication circuit 8, and a microcomputer 9, which are electrically connected.

[0019] A first power supply line N1 and a second power supply line N2, which are connected to power supplies, and a communication line COM, which is connected to the outdoor unit control board 2, are led to the indoor unit control board 1.

[0020] The terminal block 3 includes a first power supply terminal 3a, a second power supply terminal 3b, and a communication terminal 3c that respectively bring the first power supply line N1, the second power supply line N2, and the communication line COM to the indoor unit control board 1. The terminal block 3 may be replaced with, for example, lines.

[0021] The diode bridge 4 is structured by connecting a first diode 4a, a second diode 4b, a third diode 4c, and a fourth diode 4d. Specifically, in the diode bridge 4, the anode of the first diode 4a is connected to the cathode of the second diode 4b in series, and the anode of the third diode 4c is connected to the cathode of the fourth diode 4d in series, and these two series connections are placed in parallel. The cathodes of the first diode 4a and third diode 4c are connected, and the anodes of the second diode 4b and fourth diode 4d are connected.

[0022] The anode of the first diode 4a and the cathode of the second diode 4b are connected to the first power supply terminal 3a of the terminal block 3 via the first power supply line N1. The anode of the third diode 4c and the cathode of the fourth diode 4d are connected to the second power supply terminal 3b of the terminal block 3 via the second power supply line N2. The function of the diode bridge 4 will be described later.

[0023] The power supply circuit 5 includes a first port PW1 and a second port PW2 that receive a DC voltage converted by the diode bridge 4 and electrolytic capacitor 6, and also includes a third port PW3, a fourth port PW4, and a fifth port PW5 that respectively supply an operation voltage to the single-pole double-throw relay 7, the communication circuit 8, and the microcomputer 9. The first port PW1 is connected to the cathode of the first diode 4a and the cathode of the third diode 4c through a first power supply circuit N3. The second port PW2 is connected to the anode of the second diode 4b and the anode of the fourth diode 4d through a second power supply circuit N4. The function of the power supply circuit 5 will be described later.

[0024] One electrode of the electrolytic capacitor 6 is connected to the first power supply circuit line N3 and the other electrode is connected to the second power supply circuit line N4. The function of the electrolytic capacitor 6 will be described later.

[0025] The single-pole double-throw relay 7, which can switch two contacts while its coil is energized, includes a first contact 7a connected to the communication line COM, a second contact 7b connected to the communication circuit 8, a third contact 7c connected to the first power supply line N1, and a coil 7d. The first line J1 is connected between the second contact 7b and the communication circuit 8.

[0026] The single-pole double-throw relay 7 can make a switchover to select conduction between the first contact 7a and the second contact 7b or conduction between the first contact 7a and the third contact 7c, in response to a control signal from the microcomputer. The coil 7d is connected to the third port PW3 in the power supply circuit 5 through a line 13 to receive an operation voltage (operation current). The coil 7d then functions as an electromagnet, enabling a metal connectable to the contacts to move.

[0027] The communication circuit 8 includes a second port SE2 communicating with the microcomputer 9, which will be described later, a first port SE1 communicating with an outdoor unit controller 10, and a third port SE3 receiving an operation voltage. The second port SE2 is connected to the microcomputer 9 through a line 12. The first port SE1 is connected to the communication line COM. The third port SE3 in the communication circuit 8 is connected to the fifth port PW5 in the power supply circuit 5 through a line 15 to receive an operation voltage. The function of the communication circuit 8 will be described later.

[0028] The microcomputer 9 includes a first port P1 for communicating with the communication circuit 8, a second port P2 and a third port P3 for sending control signals to the single-pole double-throw relay 7, and a fourth port P4 for receiving an operation voltage. The first port P1 is connected the second port SE2 in the communication circuit 8 through the line 12. The second port P2 and third port P3 are connected to the single-pole double-throw relay 7 through the second line J2 and third line J3, which will be described later, respectively. The fourth port P4 in the microcomputer 9 is connected to the fourth port PW4 in the power supply circuit 5 through a line 14, which will be described later, to receive an operation voltage. The function of the microcomputer 9 will be described later.

[0029] The outdoor unit control board 2 includes at least the outdoor unit controller 10. The outdoor unit controller 10 is connected to the communication circuit 8 on the indoor unit control board 1 through the communication line COM.

[0030] Next, the functions of the parts and circuits described above will be briefly described.
The diode bridge 4 converts supplied AC voltages to DC voltages, and supplies the DC voltages to the power supply circuit 5 behind the diode bridge 4. The electrolytic capacitor 6 is charged by receiving the DC voltages converted from the AC voltages by the diode bridge 4, and supplies stable DC voltages to the power supply circuit 5. The power supply circuit 5 receives the DC voltages from the diode bridge 4 and supplies operation voltages to at least the single-pole double-throw relay 7, the communication circuit 8, and the microcomputer 9.

[0031] The communication circuit 8 communicates with the outdoor unit controller 10. The microcomputer 9 sends a control signal to the single-pole double-throw relay 7 to switch the conduction state of the single-pole double-throw relay 7, and controls the communication circuit 8 through communication with it. The communication circuit 8 is controlled in response to a control signal from the microcomputer 9.

[0032] Operation of the indoor unit control board 1 will be described with reference to Fig. 1. As shown in Fig. 1, AC voltages supplied from the first power supply line N1 and second power supply line N2 are transferred to the indoor unit control board 1 through the first power supply terminal 3a and second power supply terminal 3b disposed on the terminal block 3, respectively.

[0033] First, a case in which a voltage is applied from the first power supply line N1 to the second power supply line N2 will be described. The voltage is transferred from the first power supply line N1 to the second power supply line N2 through the first diode 4a, first port PW1, second port PW2, and fourth diode 4d in that order.

[0034] When a voltage is applied from the second power supply line N2 to the first power supply line N1, the voltage is transferred from the second power supply line N2 to the first power supply line N1 through the third diode 4c, the first port PW1, the second port PW2, and the second diode 4b in that order. In the above process, the voltage is also supplied to the electrolytic capacitor 6, so that the electrolytic capacitor 6 is charged and thereby can supply a stable DC voltage to the power supply circuit 5 (the voltage is rectified by the diode bridge 4 and the electrolytic capacitor 6).

[0035] Upon receipt of the DC voltages, the power supply circuit 5 can supply drive voltages to the single-pole double-throw relay 7, the communication circuit 8, and the microcomputer 9. In addition, the power supply circuit 5 can supply predetermined operation voltages to circuits (not shown in Fig. 1) that are mounted on the indoor unit control board 1 and need these voltages.

[0036] When drive voltages are supplied as described above, the single-pole double-throw relay 7, the communication circuit 8, and the microcomputer 9 can operate as described below. When the outdoor unit controller 10 is in the standby state, the coil 7d conducts the first contact 7a and the second contact 7b of the single-pole double-throw relay 7 by a current (voltage) supplied from the third port PW3 of the power supply circuit 5, in response to a control signal from the second port P2 of the microcomputer 9. Then, the communication circuit 8 is connected to the outdoor unit controller 10 through the communication line COM, the second contact 7b, and the first contact 7a.

[0037] When the outdoor unit controller 10 shifts to the operation state, the coil 7d conducts the first contact 7a and the third contact 7c of the single-pole double-throw relay 7 by a current (voltage) supplied from the third port PW3 of the power supply circuit 5, in response to a control signal from the second port P2 of the microcomputer 9. Then, the first power supply line N1 is connected to the outdoor unit controller 10 through the third contact 7c and the first contact 7a.

[0038] When the outdoor unit controller 10 shifts from the standby state to the operation state (or from the operation state to the standby state) and while it is placed in the operation state (or in the standby state) as described above, the communication circuit 8 is left disconnected from the first power supply line N1, so a high voltage is not applied to the communication circuit 8.

[0039] Fig. 2 shows another exemplary circuit configuration of the indoor unit control board 1 and outdoor unit control board 2 mounted in the air conditioner 100 according to Embodiment 1 of the present invention. In Fig. 2, the indoor unit control board 1 in the air conditioner 100 is differently connected so that the air conditioner 100 functions as a constant-speed air conditioner. That is, when the connection of the indoor unit control board 1 in the air conditioner 100 is changed, the air conditioner 100 can also function as a constant-speed air conditioner. Specifically, the first line J1 and the second line J2 are brought into non-conduction, and the third port P3 of the microcomputer 9 and the single-pole double-throw relay 7 are conducted by the third line J3.

[0040] Now, constant-speed air conditioners will be briefly described. They do not control the drive frequency of the compressor. That is, they operate the compressor with a constant drive frequency in the operation state, and stop the compressor in the standby state.

[0041] With the low standby power air conditioner shown in Fig. 1, the communication line COM is connected to the outdoor unit controller 10. With the constant-speed air conditioner, however, the communication line COM is connected to a large relay 16 as shown in Fig. 2. Furthermore, to adapt to a compressor for a constant-speed air conditioner, the large relay 16 is disposed in the outdoor unit 100b, instead of the outdoor unit controller 10. In the case of a constant-speed air conditioner, the outdoor unit controller 10 may perform control the start and stop operation.

[0042] The communication line COM is connected to the large relay 16 so that power is supplied to the large relay 16 through the communication line COM. When power is supplied to the large relay 16, the compressor operates. While power is not supplied to the large relay 16, the compressor is left stopping.

[0043] Operation of the air conditioner 100 will be described. When the air conditioner 100 is in the standby state, the coil 7d conducts the first contact 7a and the second contact 7b of the single-pole double-throw relay 7 by a current (voltage) supplied from the third port PW3 of the power supply circuit 5, in response to a control signal from the third port P3 of the microcomputer 9. Then, the first power supply line N1 and the communication line COM are brought into non-conduction. Accordingly, power is not supplied to the large relay 16, so the compressor is left stopping.

[0044] When the air conditioner 100 shifts to the operation state, the coil 7d conducts the first contact 7a and third contact 7c of the single-pole double-throw relay 7 by a current (voltage) supplied from the third port PW3 of the power supply circuit 5, in response to a control signal from the third port P3 of the microcomputer 9. Then, the first power supply line N1 is connected to the large relay 16 through the third contact 7c and the first contact 7a. Since power is supplied to the large relay 16, therefore, the compressor operates.

[0045] Accordingly, when, on the indoor unit control board 1, the first line J1 and second line J2 are brought into non-conduction and the third line J3 is connected to the third port P3 of the microcomputer 9 and to the single-pole double-throw relay 7, the air conditioner 100 can also function as a constant-speed air conditioner.

[0046] As described above, when the air conditioner 100 shifts from the operation state to the standby state (or from the standby state to the operation state) and after the shift, the indoor unit control board 1 uses a single-pole double-throw relay to prevent a power supply voltage from being applied to the communication circuit 8. Therefore, the air conditioner 100 according to Embodiment 1 eliminates the need for expensive high dielectric strength parts or protective parts that protect the communication circuit 8 from a power supply voltage, which suppresses an increase in costs. Furthermore, the air conditioner 100 can selectively function as a low standby power air conditioner or constant-speed air conditioner by switching the first line J1, second line J2, and third line J3 between the conductive state and non-conductive state.

Embodiment 2

[0047] Fig. 3 shows an exemplary circuit configuration of an indoor unit control board 20 and an outdoor unit control board 21 mounted in an air conditioner 101, which includes at least an indoor unit 101a and an outdoor unit 101b, according to Embodiment 2 of the present invention. In the example in Fig. 3, the air conditioner 101 can function as a low standby power air conditioner. Fig. 4 shows another exemplary circuit configuration of the indoor unit control board 20 and the outdoor unit control board 21 mounted in the air conditioner 101 according to Embodiment 2 of the present invention. In Embodiment 2, the same parts as in Embodiment 1 are denoted by the same reference characters as in Embodiment 1, and differences from Embodiment 1 will be mainly described.

[0048] In Embodiment 1, the first power supply line N1, the second power supply line N2, and the communication line COM have been respectively led from the first power supply terminal 3a, the second power supply terminal 3b, and the communication terminal 3c to the indoor unit control board 1. In Embodiment 2, however, the first power supply line N1, the second power supply line N2, and the communication line COM are led to the indoor unit control board 20 with a different connection, depending on whether the air conditioner 101 functions as a low standby power air conditioner or a constant-speed air conditioner.

[0049] To be more specific, when the air conditioner 101 functions as the low standby power air conditioner, the first power supply line N1, the second power supply line N2, and the communication line COM are respectively led from the first power supply terminal 3a, the second power supply terminal 3b, and the communication terminal 3c to the indoor unit control board 20; when the air conditioner 101 functions as the constant-speed air conditioner, the first power supply line N1, the second power supply line N2, and the communication line COM are respectively led from the communication terminal 3c, the second power supply terminal 3b, and the first power supply terminal 3a to the indoor unit control board 20.

[0050] Accordingly, in addition to the first line J1, the second line J2, and the third line J3, Embodiment 2 uses a fourth line J4, a fifth line J5, a sixth line J6, and a seventh line J7 to electrically connect parts. Connections by the fourth line J4, the fifth line J5, the sixth line J6, and the seventh line J7 will be described below.

[0051] As shown in Fig. 3, the fourth line J4 interconnects the first power supply terminal 3a and the diode bridge 4. The fifth line J5 interconnects the communication line COM and one side of the fourth line J4 on which the diode bridge 4 is connected. The sixth line J6 interconnects the first contact 7a on the communication line COM and the other side of the fourth line J4, on which the first power supply terminal 3a is connected. The seventh line J7 interconnects the first contact 7a on the communication line COM and the communication terminal 3c on the fifth line J5.

[0052] In the case of the low standby power air conditioner, the first line J1, the second line J2, the fourth line J4, and the seventh line J7 are brought into conduction, as shown in Fig. 3. Operation of the indoor unit control board 20 in the low standby power air conditioner will be described below.

[0053] Alternating voltage supplied from the first power supply line N1 and the second power supply line N2 is transferred to the indoor unit control board 20 through the first power supply terminal 3a and second power supply terminal 3b disposed on the terminal block 3, respectively.

[0054] First, a case in which a voltage is applied from the first power supply line N1 to the second power supply line N2 will be described. The voltage is transferred from the first power supply line N1 to the second power supply line N2 through the first diode 4a, the first port PW1, the second port PW2, and the fourth diode 4d in that order.

[0055] When a voltage is applied from the second power supply line N2 to the first power supply line N1, the voltage is transferred from the second power supply line N2 to the first power supply line N1 through the third diode 4c, the first port PW1, the second port PW2, and the second diode 4b in that order. In the above processes, the voltage is also supplied to the electrolytic capacitor 6, so the electrolytic capacitor 6 is charged and thereby can supply a stable DC voltage to the power supply circuit 5.

[0056] Upon receipt of the DC voltages, the power supply circuit 5 can supply drive voltages to the single-pole double-throw relay 7, the communication circuit 8, and the microcomputer 9. In addition, the power supply circuit 5 can supply predetermined operation voltages to circuits (not shown in Fig. 3) that are mounted on the indoor unit control board 20 and need these voltages.

[0057] When drive voltages are supplied as described above, the single-pole double-throw relay 7, the communication circuit 8, and the microcomputer 9 can operate as described below. In the standby state, the first contact 7a and second contact 7b of the single-pole double-throw relay 7 are conducted by a voltage supplied from the third port PW3 of the power supply circuit 5, in response to a control signal from the second port P2 of the microcomputer 9. Then, the communication circuit 8 is connected to the outdoor unit controller 10 through the second contact 7b and first contact 7a.

[0058] In the operation state, the coil 7d conducts the first contact 7a and the third contact 7c of the single-pole double-throw relay 7 by a voltage supplied from the third port PW3 of the power supply circuit 5, in response to a control signal from the second port P2 of the microcomputer 9. Then, the first power supply line N1 is connected to the outdoor unit controller 10 through the third contact 7c and the first contact 7a.

[0059] At the shift from the standby state to the operation state (or from the operation state to the standby state) and in the operation state (or in the standby state) described above, the communication circuit 8 is left disconnected from the first power supply line N1, so a high voltage is not applied to the communication circuit 8.

[0060] In the case of a constant-speed air conditioner, the third line J3, the fifth line J5, and the sixth line J6 are brought into conduction, as shown in Fig. 4. For the low standby power air conditioner shown in Fig. 3, the communication line COM is connected to the outdoor unit controller 10. For the constant-speed air conditioner, however, the communication line COM (including the sixth line J6) is connected to the large relay 16, as shown in Fig. 4. Furthermore, to be adapted to a compressor for a constant-speed air conditioner, the large relay 16 is disposed in the outdoor unit 101b, instead of the outdoor unit controller 10. In the case as well in which the air conditioner is a constant-speed air conditioner, the outdoor unit controller 10 may perform control to start and stop operation. Operations of the indoor unit control board 20 in the constant-speed air conditioner will be described below.

[0061] When drive voltages are supplied as described above, the single-pole double-throw relay 7, the communication circuit 8, and the microcomputer 9 operate as described below. In the standby state, the first contact 7a and the second contact 7b of the single-pole double-throw relay 7 are conducted by a voltage supplied from the third port PW3 of the power supply circuit 5, in response to a control signal from the third port P3 of the microcomputer 9. Then, the first power supply line N1 and the communication line COM are brought into non-conduction. Accordingly, power is not supplied to the large relay 16, so the compressor is left stopping.

[0062] In the operation state, the coil 7d conducts the first contact 7a and the third contact 7c of the single-pole double-throw relay 7 by a voltage supplied from the third port PW3 of the power supply circuit 5, in response to a control signal from the third port P3 of the microcomputer 9. Then, the first power supply line N1 is connected to the large relay 16 through the third contact 7c and the first contact 7a.

[0063] Accordingly, the indoor unit control board 20 can also adapt to a constant-speed air conditioner by bringing the first line J1, the second line J2, the fourth line J4, and the seventh line J7 into non-conduction.

[0064] As described above, when the air conditioner 101 shifts from the operation state to the standby state (or from the standby state to the operation state) and in the standby state (or in the operation state), the indoor unit control board 20 uses a single-pole double-throw relay to prevent power supply a voltage from being applied to the communication circuit 8. Therefore, the air conditioner 101 according to Embodiment 2 eliminates the need for expensive high dielectric strength parts that protect the communication circuit 8 from a power supply voltage or for protective parts, which suppresses an increase in costs. Furthermore, the air conditioner 101 can selectively function as the low standby power air conditioner or the constant-speed air conditioner by switching the first line J1, the second line J2, the third line J3, the fourth line J4, the fifth line J5, the sixth line J6, and the seventh line J7 between the conductive state and non-conductive state.

[0065] In addition to connection patterns in Embodiments 1 and 2, respectively referred to as a first pattern and a second pattern, by which the first power supply line N1, the second power supply line N2, and the communication line COM are connected to the terminals of the terminal block 3, it is also possible to consider other four patterns described below.

[0066] An indoor unit control board 30 (not shown), an indoor unit control board 40 (not shown), an indoor unit control board 50 (not shown), and an indoor unit control board 60 (not shown), described below, are equivalent to the indoor unit control board 20, which can adapt to both the low standby power air conditioner and the constant-speed air conditioner by appropriately changing connections of lines (such as jumper lines, jumper resistors, or any other lines for which their conduction and non-conduction can be controlled).

[0067] In a third pattern, when the air conditioner functions as the low standby power air conditioner, the first power supply line N1, the second power supply line N2, and the communication line COM are respectively led from the first power supply terminal 3a, the second power supply terminal 3b, and the communication terminal 3c to the indoor unit control board 30. When the air conditioner functions as the constant-speed air conditioner, the first power supply line N1, the communication line COM, and the second power supply line N2 are respectively led from the communication terminal 3c, the second power supply terminal 3b, and the first power supply terminal 3a to the indoor unit control board 30.

[0068] In a fourth pattern, when the air conditioner functions as the low standby power air conditioner, the first power supply line N 1, the second power supply line N2, and the communication line COM are respectively led from the first power supply terminal 3a, the second power supply terminal 3b, and the communication terminal 3c to the indoor unit control board 40. When the air conditioner functions as the constant-speed air conditioner, the communication line COM, the second power supply line N2, and the first power supply line N1 are respectively led from the communication terminal 3c, the second power supply terminal 3b, and the first power supply terminal 3a to the indoor unit control board 40.

[0069] In a fifth pattern, when the air conditioner functions as the low standby power air conditioner, the first power supply line N1, the second power supply line N2, and the communication line COM are respectively led from the first power supply terminal 3a, the second power supply terminal 3b, and the communication terminal 3c to the indoor unit control board 50. When the air conditioner functions as the constant-speed air conditioner, the second power supply line N2, the first power supply line N1, and the communication line COM are respectively led from the communication terminal 3c, the second power supply terminal 3b, and the first power supply terminal 3a to the indoor unit control board 50.

[0070] In a sixth pattern, when the air conditioner functions as the low standby power air conditioner, the first power supply line N1, the second power supply line N2, and the communication line COM are respectively led from the first power supply terminal 3a, the second power supply terminal 3b, and the communication terminal 3c to the indoor unit control board 60. When the air conditioner functions as the constant-speed air conditioner, the second power supply line N2, the communication line COM, and the first power supply line N1 are respectively led from the communication terminal 3c, the second power supply terminal 3b, and the first power supply terminal 3a to the indoor unit control board 60.

[0071] The second port P2 and the third port P3 of the microcomputer 9 have been selectively used depending on whether the air conditioner functions as the low standby power air conditioner or the constant-speed air conditioner. However, it is also possible to select only either port by using a software program written in the microcomputer 9 or conforming to the product specifications.

Reference Signs List

[0072]

1	indoor unit control board;
N1	first power supply line;
N3	first power supply circuit;
COM	communication line;
3a	first power supply terminal; terminal;
3c	communication terminal;
4a	first diode;
4c	third diode;
5	power supply circuit;
PW2	second port;
PW4	fourth port;
6	electrolytic capacitor; relay;
8	communication circuit;
SE2	second port;
9	microcomputer;
P2	second port;

P4	fourth port;
12, 13, 14, 15	line;
20	indoor unit control board;
30	indoor unit control board;
2	outdoor unit control board;
N2	second power supply line;
N4	second power supply circuit;
3	terminal block ;
3b	second power supply
4	diode bridge;
4b	second diode;
4d	fourth diode;
PW1	first port;
PW3	third port;
PW5	fifth port;
7	single-pole double-throw
SE1	first port;
SE3	third port;
P1	first port;
P3	third port;
10	outdoor unit controller;
16	large relay;
21	outdoor unit control board;
40	indoor unit control board;
50	indoor unit control board;
100, 101	air conditioner;
100b, 101b	outdoor unit;
J2	second line;
J4	fourth line;
J6	sixth line;
60	indoor unit control board;
100a, 101a	indoor unit;
J1	first line;
J3	third line;
J5	fifth line;
J7	seventh line;

Claims

1. An air conditioner (100) comprising an outdoor unit controller (10) that controls a compressor and an indoor unit control board (1), wherein said indoor unit control board (1) including:

   a first power supply line (N1) and a second power supply line (N2) that supply AC power,
   a communication circuit (8),
   a single-pole double-throw relay (7) that has a first contact (7a) connected to a communication line (COM), a second contact (7b) connected to said communication circuit (8), a third contact (7c) connected to said first power supply line (N1), and a coil (7d) for a switchover between a mutual connection of said first contact (7a) and said second contact (7b) and a mutual connection of said first contact (7a) and said third (7c) contact, said communication circuit (8) communicating with said outdoor unit controller (10) via said communication line (COM) and said second contact (7b) and said first contact (7a) of said single-pole double-throw relay (7), and
   a microcomputer (9) that outputs communication information to said communication circuit (8) and controls said coil (7d).

2. The air conditioner (100) of Claim 1, further comprising:

   a rectifier that converts AC power from said first power supply line (N1) and said second power supply line (N2) to DC voltage; and
   a power supply circuit (5) that receives DC voltage from said rectifier and supplies an operation voltage for parts on said indoor unit control board (1).

3. The air conditioner (100) of Claim 1 or 2, wherein said single-pole double-throw relay (7) is controlled so that said first contact and said second contact are conducted when said outdoor unit controller (10) is

in a standby state and said first contact and said third contact are conducted when said outdoor unit controller (10) is in an operation state.

4. The air conditioner (100) of any one of Claims 1 to 3, wherein:

said microcomputer (9) has a first port (PW1) and a second port (PW2) used to control said coil (7d);
said communication circuit (8) and said second contact are connected by a first line (J1);
said first port (PW1) and said coil (7d) are connected by a second line (J2);
said second port (PW2) and said coil (7d) are connected by a third line (J3); and
said first line (J1) and said second line (J2) are brought into conduction and said third line (J3) is brought into non-conduction in a low standby power air conditioner in which an operation frequency of said compressor is controlled.

5. The air conditioner (100) of any one of Claims 1 to 3, wherein:

said microcomputer (9) has a first port (PW1) and a second port (PW2) used to control said coil (7d);
said communication circuit (8) and said second contact are connected by a first line (J1);
said first port (PW1) and said coil (7d) are connected by a second line (J2);
said second port (PW2) and said coil (7d) are connected by a third line (J3); and
said third line (J3) is brought into conduction and said first line (J1) and said second line (J2) are brought into non-conduction in a constant-speed air conditioner in which an operation frequency of said compressor is constant.

6. The air conditioner (100) of any one of Claims 1 to 3, wherein:

said microcomputer (9) has a first port (PW1) and a second port (PW2) used to control said coil (7d);
said communication circuit (8) and said second contact are mutually connected by a first line (J1);
said first port (PW1) and said coil (7d) are mutually connected by a second line (J2);
said second port (PW2) and said coil (7d) are mutually connected by a third line (J3);
a fourth line (J4) is connected to said first power supply line (N1) in series;
said communication line and one side of said fourth line (J4) with which said rectifier is connected are connected by a fifth line (J5);
the other side of said fourth line (J4) and the side of said communication line with which said first contact is connected are connected by a sixth line;
the side of said communication line with which said first contact is connected and the side of said fifth line (J5) with which said communication line is connected are connected by a seventh line; and
said first line (J1), said second line (J2), said fourth line (J4), and said seventh line are brought into conduction and said third line (J3), said fifth line (J5), and said sixth line are brought into non-conduction in a low standby power air conditioner in which an operation frequency of said compressor is controlled.

7. The air conditioner (100) of any one of Claims 1 to 3, wherein:

said microcomputer (9) has a first port (PW1) and a second port (PW2) used to control said coil (7d);
said communication circuit (8) and said second contact are mutually connected by a first line (J1);
said first port (PW1) and said coil (7d) are mutually connected by a second line (J2);
said second port (PW2) and said coil (7d) are mutually connected by a third line (J3);
a fourth line (J4) is connected to said first power supply line (N1) in series;
said communication line and one side of said fourth line (J4) with which said rectifier is connected are connected by a fifth line (J5);
the other side of said fourth line (J4) and the side of said communication line with which said first contact is connected are connected by a sixth line;
the side of said communication line with which said first contact is connected and the side of said fifth line (J5) with which said communication line is connected are connected by a seventh line; and
said third line (J3), said fifth line (J5), and said sixth line are brought into conduction and said first line (J1), said second line (J2), said fourth line (J4), and said seventh line are brought into non-conduction in a constant-speed air conditioner in which an operation frequency of said compressor is constant.

FIG. 1

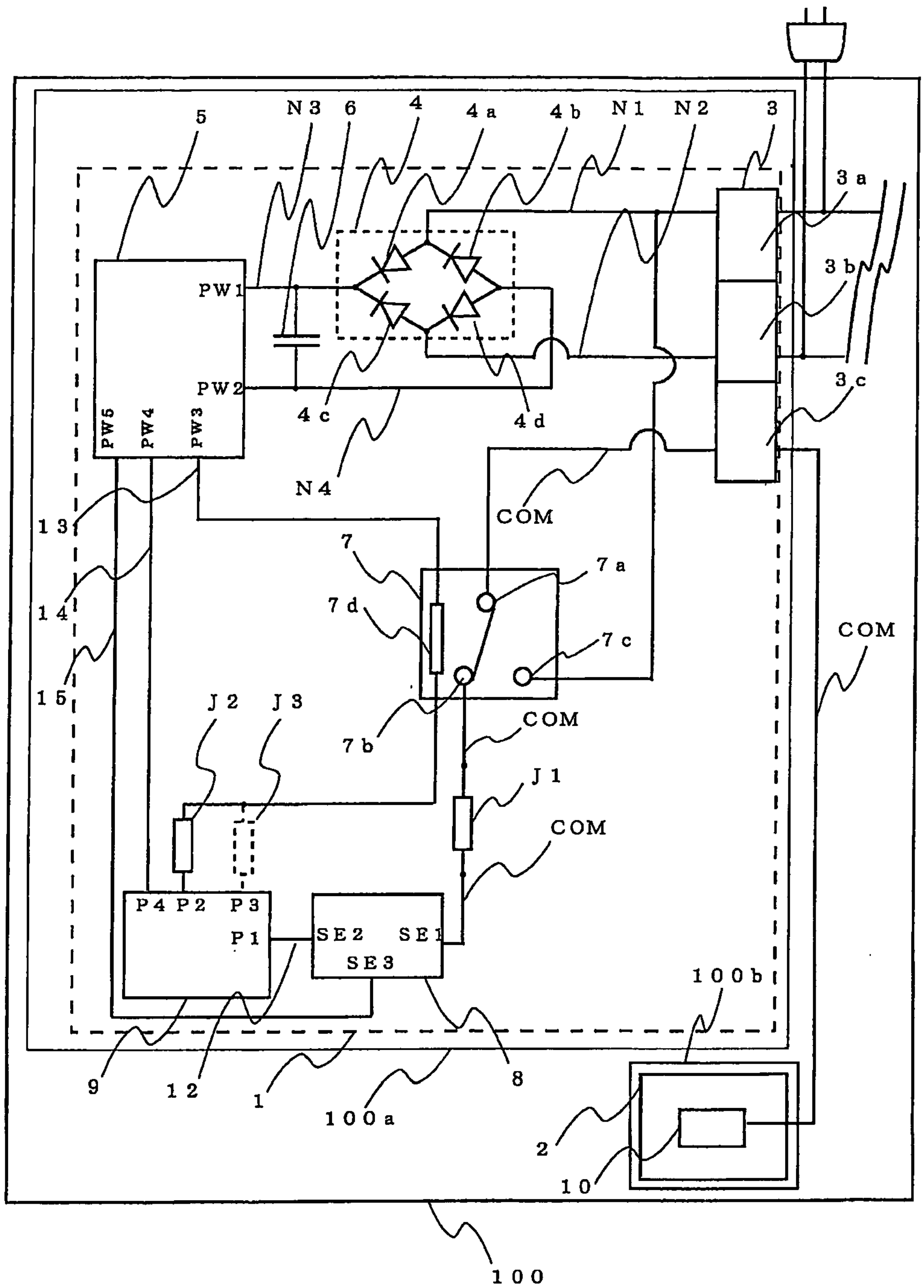
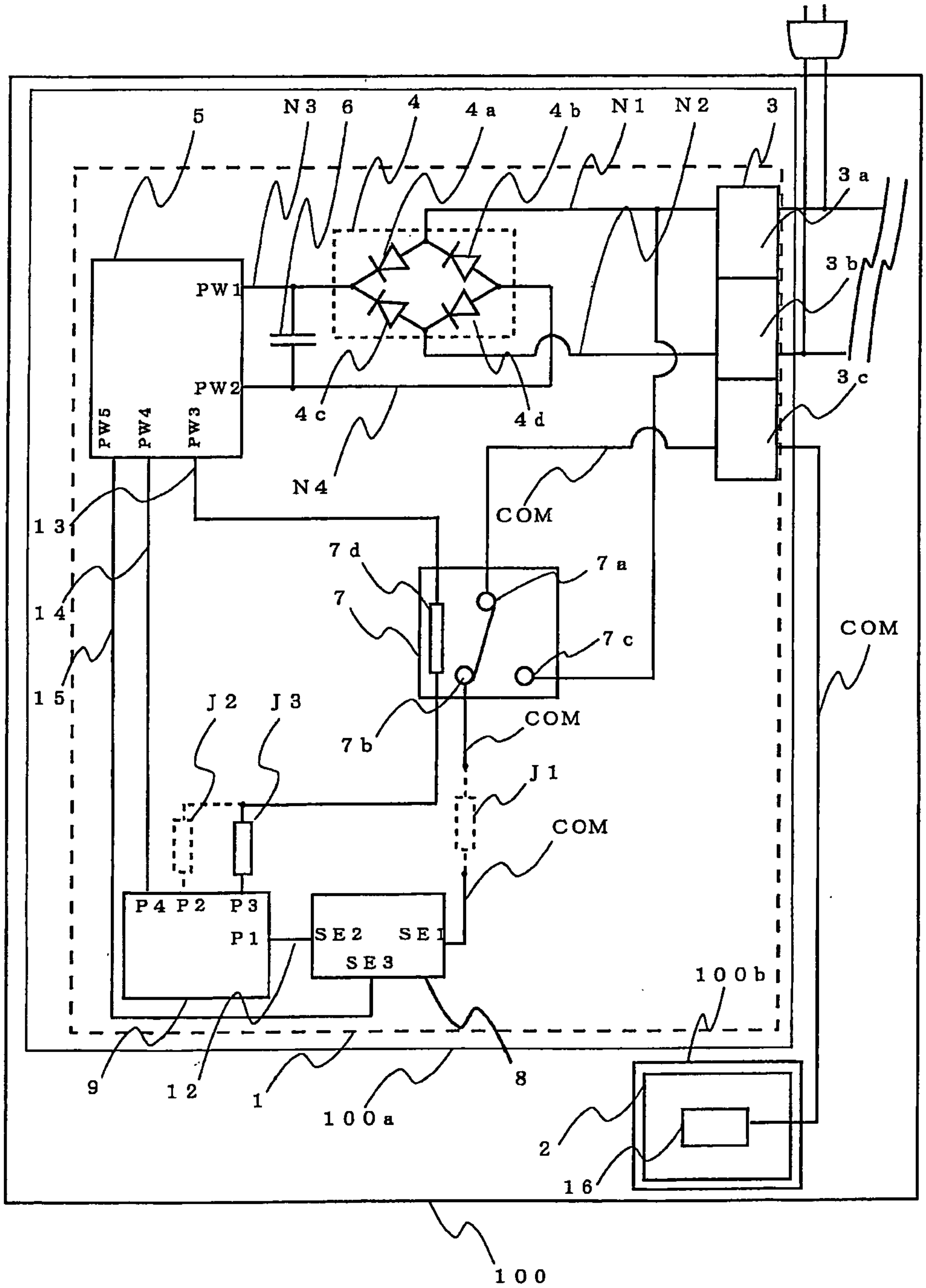

5
N3
6
4
4a
4b
N1
N2
3
3a
3b
3c
PW1
PW2
PW5
PW4
PW3
4c
4d
N4
COM
13
14
15
7
7a
7d
7c
7b
COM
J2
J3
J1
COM
P4 P2 P3
P1
SE2
SE1
SE3
COM
100b
9
12
1
100a
8
2
10
100

FIG. 2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N3
6
4
4a
4b
N1
N2
3
3a
3b
3c
PW1
PW2
PW5
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PW3
4c
4d
N4
COM
13
7d
7a
7
7c
14
15
J2
J3
7b
COM
J1
COM
P4 P2 P3
P1
SE2 SE1
SE3
100b
COM
9
12
1
100a
8
2
16
100

FIG. 3

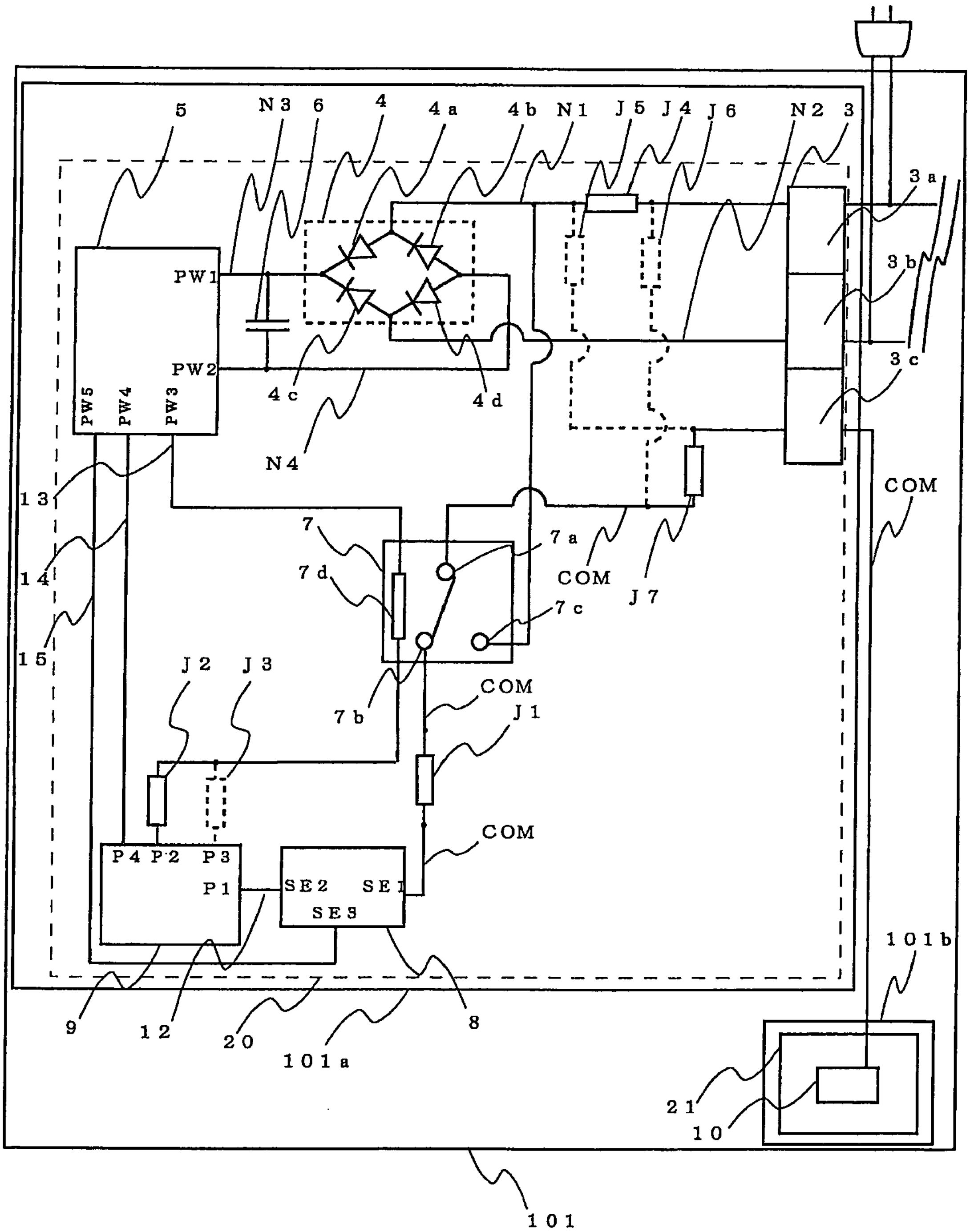
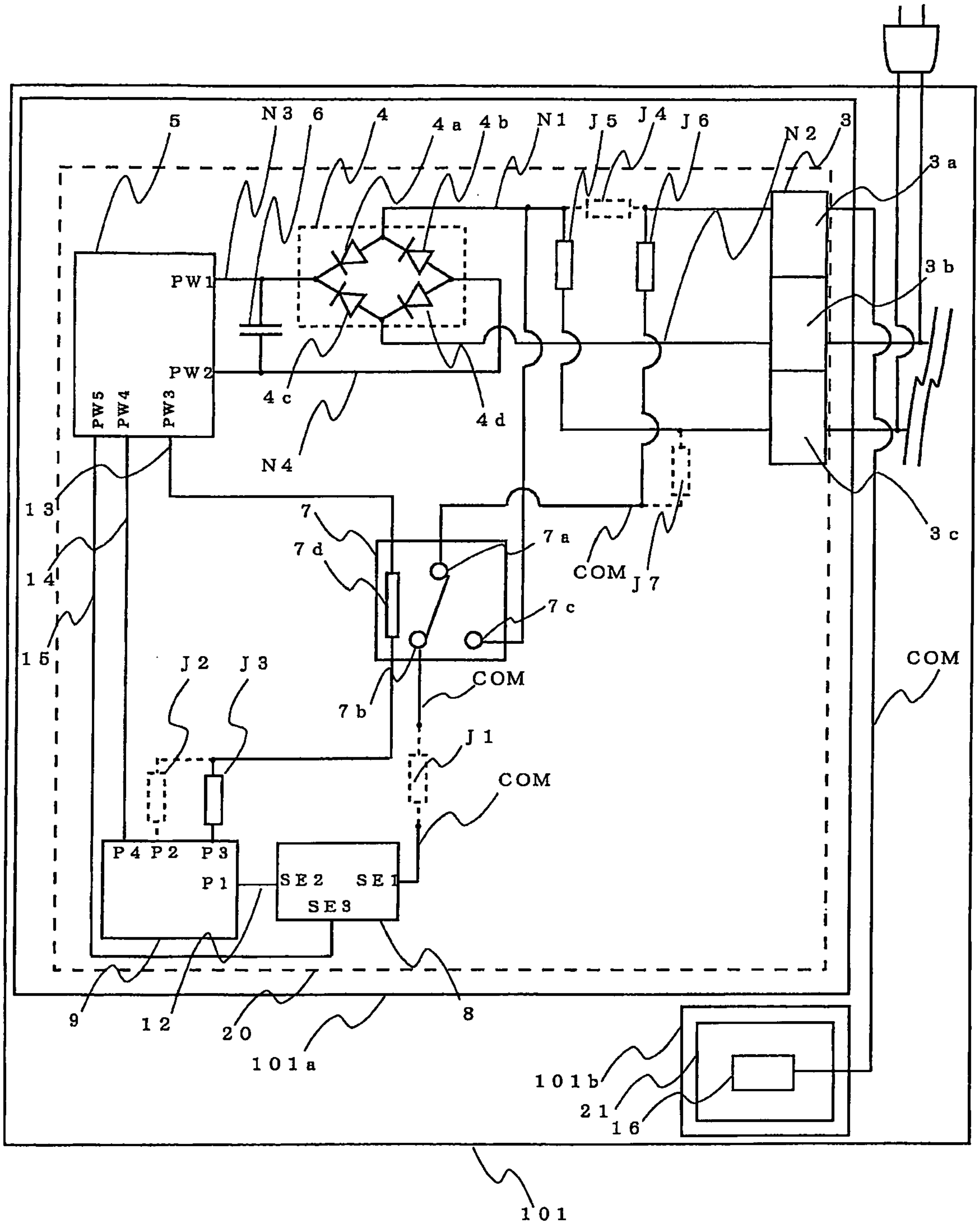

5
N3
6
4
4a
4b
N1
J5
J4
J6
N2
3
3a
3b
3c
PW1
PW2
PW5
PW4
PW3
4c
4d
N4
COM
13
14
15
7
7a
7d
7c
7b
J7
J2
J3
J1
P4
P2
P3
P1
SE2
SE1
SE3
101b
9
12
20
101a
8
21
10
101

FIG. 4



5
N3
6
4
4a
4b
N1
J5
J4
J6
N2
3
3a
3b
3c
PW1
PW2
PW5
PW4
PW3
4c
4d
N4
13
14
15
7
7d
7a
7c
7b
COM
J7
J2
J3
J1
P4
P2
P3
P1
SE2
SE1
SE3
9
12
20
8
101a
101b
21
16
101

REFERENCES CITED IN THE DESCRIPTION

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