POWER SUPPLY

The present invention relates to Power Supply in which a preset D.C.output voltage can be obtained from A.C.input voltage.

In general, Power Supply of such kind as Switching Power Supply is so structured that after obtaining D.C.input voltage by rectifying and smoothing A.C.power source supplied across a filter circuit, said D.C.input voltage is supplied to an inverter in order to optionally output stabilized D.C.voltage.

In recent years, power factor and harmonic correction circuit comprising boost-chopper type converter has come to be integrated into the Power Supply, to achieve better efficiency in energy consumption, and improve the power factor for the correction of electricity distortion and voltage drop of transmission voltage.

However, in the aforesaid prior art, on one board are mounted discrete parts such as resistors, capacitors, transistors, transformers, diodes, or the like, and integrated circuit (i.e.I.C.)for control of the inverter. Thus a user cannot newly design the once packaged Power Supply to obtain another input or output voltage and output power. As the result, such Power Supply lacks the flexibility in use a great deal.

Accordingly, it is an object of the present invention to provide a power supply which can realise optional design of the same, depending on its intended use.

According to the present invention, there is provided a power supply comprising:

a noise filter module for rejecting noise from an AC input voltage line;

one or more power factor and harmonic correction modules for bringing the current and voltage waveforms of the AC input voltage close to each other in order to output DC input voltage; and,

one or more power converter modules for converting said DC input voltage into preset DC output voltage;

the modules being optionally combined to obtain a desired power supply.

The power factor and harmonic correction modules may be replaced with a rectifying module for rectifying and smoothing the AC input voltage in order to output DC input voltage.

With the structure described above, each main part constituting the power supply can be divided into an independent module, and thus each module can be optionally combined to provide a desirable power supply in accordance with various specifications thereof.

A back-up power supply module may be provided for supplying DC input voltage to the power converter module or modules in case of abnormal stopping of the supply of said DC input voltage.

Other objects, features and advantages of the invention will be apparent to those skilled in the art from the following description of the preferred embodiments of the invention, wherein reference is made to the accompanying drawings, of which:

FIG.1 is a circuit diagram showing a first embodiment of a Power Supply of the present invention.
FIG.2 is a general front view showing a first embodiment of a Power Supply of the present invention.
FIG.3 is another general front view showing a first embodiment of a Power Supply of the present invention.
FIG.4 is a circuit diagram showing a second embodiment of a Power Supply of the present invention.

Hereinafter is explained a first embodiment of the invention with reference to FIGS.1 to 4.

FIGS.1 to 3 show a first embodiment of the invention. In FIG.1 showing a general circuit structure of the present Power Supply, reference numeral 1 designates A.C.power source, 2 and 2A designate fuses respectively, in which A.C.input voltage Vin1 from A.C.power source 1 is applied to each input terminal of noise filter module 3 across said fuses 2,2A.

Said noise filter module 3 integrates conventional noise filter circuit therein to suppress or cut-off the noise entering the line of A.C.input voltage Vin1. From the output terminals OUT of the noise filter module 3 is output D.C.input

voltage Vin1 from which are eliminated the noise within a preset frequency band. Reference numerals 4,4A designate power factor and harmonic correction modules serving asan A.C.front end of power converter modules or D.C./D.C.converters 5,5A,5B described hereinafter.

Said power factor and harmonic correction modules 4,4A are provided with rectifier circuit and boost-chopper type converter and the like therewithin respectively, which can bring the current and voltage waveforms of A.C.input voltage Vin1 applied to the input terminals AC close enough to each other, and correct the harmonic current from the A.C.input voltage Vin1 in order to output D.C.input voltage Vin2 from output terminals +V,-V.

Further, a plurality of power factor and harmonic correction modules 4,4A for various input or output voltages and output powers are provided in accordance with said A.C.input voltage Vin1 or the output power of D.C/D.C.converters 5,5A, whereby said power factor and harmonic correction modules are optionally used in a single or parallel connection thereof. Furthermore, said each power factor and harmonic correction modules 4,4A detects D.C.input voltage Vin2 so that detection signals can be supplied from detection terminals ENB when the voltage level reaches predetermined value thereof.

Each reference numeral 5,5A,5B is provided for D.C.back end, which is D.C./D.C.converter module having a plurality of kinds for various input or output voltages and output powers. To each input terminal +Vin,-Vin of said D.C./D.C. converters 5,5A.5B is supplied said D.C.input voltage Vin2 respectively, in which D.C.input voltage Vin2 is inverted

into D.C.output voltage Vout by inverter module (not shown) integrated threrewith, and then said D.C.output voltage Vout is supplied to common load 6 across output terminals +Vout,-Vout.

Besides a single operation of one D.C./D.C.converter module 5, where necessary, a parallel operation of a plurality of D.C./D.C.converters 5,5A,5B having the same output characteristics will be possible, as shown in FIG.1. Further, multi-outputs operation of D.C./D.C.converters 5,5A,5B having different output characteristics can be also possible, which is not shown herein.

Each D.C./D.C.converter 5,5A,5B is further provided with a control terminal CNT for remote on/off control of said D.C.output voltage Vout. Namely, when each control terminal CNT and input terminal -Vin is in an open state, said inverter will be forced to stop, so that the supply of D.C.output voltage Vout to load 6 can be shut down. Whereas, when each control terminal CNT and input terminal -Vin is in a short-circuit state, said inverter will be controlled so that stabilized D.C.output voltage Vout can be supplied.

On the other hand, reference numeral 7 is an optional unit for Power Supply, designating a back-up power supply module connected in parallel with said power factor and harmonic correction modules 4,4A. Said back-up power supply module 7 allows D.C.input voltage Vin2 to be supplied from output terminals +V,-V to each input terminal of each D.C./D.C.converter module 5,5A,5B when the supply of D.C.input voltage Vin2 is stopped because of some abnormal operation .

Reference numeral 8 designates a power supply monitoring module for simultaneously observing both the input

and output sides of Power Supply, which comprises a detection terminal AC1 connected to the line of A.C.input voltage Vin1 for detecting A.C.input voltage, another detection terminal DC1 connected to the line of D.C.input voltage Vin2 for detecting D.C.input, another detection terminal ENB connected to the detection terminals ENB of said power factor and harmonic correction modules 4,4A for suppressing secondary rush current, and eight detection terminals DCO1 to DCO8 connected to the line of D.C.output voltage Vout of each D.C./D.C.converter module 5,5A,5B.

Further, to the output terminals ION1 to ION8 of said power supply monitoring module 8 are connected control terminals CNT of D.C./D.C.converter modules 5,5A,5B, from which are supplied control signals which can perform on/off control of discrete D.C./D.C.converter modules 5,5A,5B. Whereas, to the power supply monitoring module 8 is connected control module 9 integrating a micro computer which comprises CPU, P-ROM, input/output interface, and the like, and said converter modules are controlled in a preset condition in accordance with programs pre-written on said control module 9, in which are further provided additional functions such as display function for indicating the channel of D.C./D.C.converters 5,5A,5B causing abnormal operation, D.C.output voltage Vout and D.C.currents variable function for each D.C./D.C.converter module 5,5A,5B.

Hereinafter is explained lay-out structure of the present Power supply with reference to FIGS.2 and 3.

FIG.2 shows a noise filter module 3, a power factor and harmonic correction module 4, D.C./D.C.converters 5,5A,5B,5C,5D laterally lined up in sequence.

In this case, multi-output power supply can be provided by combining power factor and harmonic correction module 4 of 1KW output power, D.C./D.C.converter 5 of 300W output power, D.C./D.C.converters 5A,5B of 150 W output power, D.C./D.C.converters 5C,5D of 75 W output power with one another. What is characteristic here is that each module 3,4,5,5A,5B,5C,5D is formed with a one-side portion 11 having the same length and height, while each of them is formed with another side portion 12 having various lengths depending upon output voltage or the like applied thereto. The bottom portion of each module 3,4,5,5A,5B,5C,5D is formed with a metal core board (not shown) on which various electronics components are to be mounted. Further, each module has a cover 13 for covering over the metal core board, a press-in nut 14 with a screw hole for mounting the same to chassis or the like, and a terminal portion 15 which enables the same to be connected externally thereof.

On the other hand, FIG.3 shows an approximately square-shaped Power Supply by suitably combining a noise filter module 3, a power factor and harmonic correction module 4, D.C./D.C.converters 5,5A. For this case, for example, a power factor and harmonic correction module 4 of 500W output power and D.C./D.C.converters 5,5A of 150 W output power are employed. Incidentally, although not shown in the drawings, back-up power supply module 7 or the like can be packaged into the same shape as each module 3,4,5,5A, whereby it can be layed out on the same plane along with other modules.

Again referring to FIG.1, during input of A.C.power source 1, detection signals will be supplied from detection

terminal ENB to power supply monitoring module 8 when D.C.input voltage Vin2 reaches a preset voltage level. At this time, said power supply monitoring module 8 forces each D.C./D.C.converter module 5,5A,5B to stop operating for preset time through control terminals CNT, suppressing the secondary rush current from power factor and harmonic correction modules 4,4A. Further, said power supply monitoring module 8 constantly monitors A.C.input voltage Vin1, D.C.input voltage Vin2, and D.C.output voltage Vout. Thus in case of abnormal operation, said power supply monitoring module 8 displays the channel of faulty D.C./D.C.converters 5,5A,5B, and where necessary, each D.C./D.C.converter is forced to stop operating.

As hereinabove described, according to the present embodiment, main parts constructing a Power Supply are divided into a noise filter module 3, power factor and harmonic correction module 4, D.C./D.C.converter module 5, and back-up power supply module 7 respectively, in order to be independently modularized. With the structure thus made, a user can optionally and easily combine each module to design Power Supply Systems with various specifications in accordance with the objects thereof. Further,each module 3,4,5,7 is formed with one-side portion 11 having the same length and height, thus there will be no stepped portion in both the lateral and vertical directions on lined-up modules 3,4,5,5A,5B,5C,5D shown in FIG.2 and square-shaped modules 3,4,5,5A shown in FIG.3. Accordingly, the present Power Supply is extremely easy to operate and use for users, and general configuration of Power Supply is free to change depending upon the housing space thereof. Furthermore,since power supply monitoring module 8 having control module 9 is connnected to the designed Power Supply, a user can promptly cope with discrete abnormal operations cased therewithin.

In FIG.4 showing a second embodiment of the present invention, the same portions as those of forgoing embodiment is designated as common reference numerals, and their repeated detail description will be omitted.

In the second embodiment, said power factor and harmonic correction modules 4, 4A are replaced with rectifying module 21 which rectifies and smoothes A.C.input voltage Vin1 applied to input terminals AC so that D.C.input voltage Vin2 will be output from output terminals +V,-V. Here, like aforesaid

embodiment, said rectifying module 21 is formed with one-side portion having the same length and height as another module, such as that of noise filter module 3, whereby the same effect and action as described in the first embodiment can be obtained.

Incidentally, the present invention should not be limited to the embodiments thus far described, it can be modified within a scope of the invention. For example, circuit structure within a D.C./D.C.converter module may be variously modified depending upon output power or the like.

CLAIMS

1. A power supply comprising:

a noise filter module (3) for rejecting noise from an AC input voltage line;

one or more power factor and harmonic correction modules (4,4A) for bringing the current and voltage waveforms of the AC input voltage close to each other in order to output DC input voltage; and,

one or more power converter modules (5,5A,5B) for converting said DC input voltage into preset DC output voltage;

the modules being optionally combined to obtain a desired power supply.

2. A power supply according to claim 1, wherein the power factor and harmonic correction modules are replaced with a rectifying module (21) for rectifying and smoothing the AC input voltage in order to output DC input voltage.

3. A power supply according to claim 1 or claim 2, further comprising a back-up power supply module (7) for supplying DC input voltage to the power converter module or modules (5,5A,5B) in case of abnormal stopping of the supply of said DC input voltage.

4. A power supply according to any of claims 1 to 3, wherein each module has an approximately square-shape or rectangular-shape configuration, each module having a side which is the same length and height as a side of another module.

5. A power supply according to any of claims 1 to 4, further comprising a power supply monitoring module (8) having a control module (9) for monitoring simultaneously the input and output side of each module.