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(71) Applicant: **AMETEK ITALIA S.r.l.**
20087 Robecco sul Naviglio (Milano) (IT)

(72) Inventor: **Carioni, Antonio Luigi**
26013 Crema (CR) (IT)

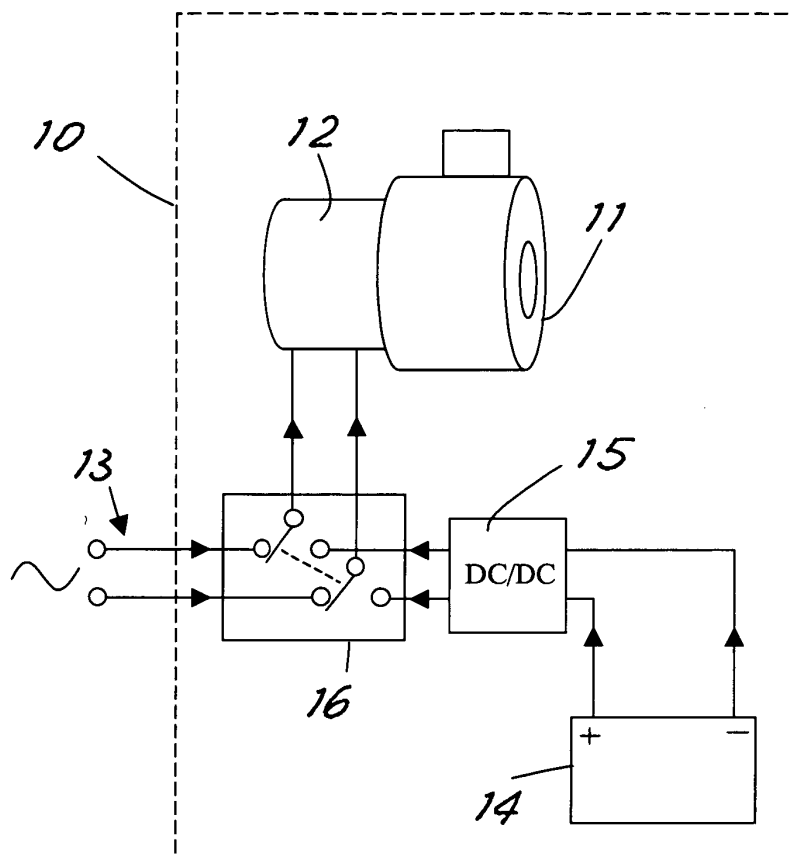
(74) Representative: **Faraggiana, Vittorio**
Ingg. Guzzi & Ravizza S.r.l.
Via Vincenzo Monti 8
I-20123 Milano (IT)

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(54) **Portable air-flow appliance with dual electrical power supply**

(57) A portable airflow appliance (10) with an impeller (11) rotated by a universal electric motor (12) is powered alternatively by the electrical mains (13) or by an internal battery (14). It includes a DC-DC electronic converter unit (15) which converts the direct low voltage of the bat-

teries (14) into a direct voltage intermediate between the battery voltage and the relatively high mains voltage and switching means (16) allowing sending to the motor (12) alternatively said intermediate voltage or said relatively high mains voltage.



Description

[0001] This invention relates to an innovative air-flow appliance (suction or blowing) powered alternatively by batteries or by mains voltage.

[0002] In the known art the practicality of appliances such as portable or battery-powered vacuum cleaners is known. On the other hand it is convenient to be able to use mains power when possible to increase the capability of continued use of the appliance.

[0003] Appliances have therefore been proposed which can be powered alternatively by battery or by mains voltage. To obtain this dual function in the known art, low power DC motors are usually proposed suited to the voltage supplied by the battery which, when necessary, are supplied by the mains over an appropriate AC-DC voltage reducer. This solution implies however having a low-power appliance in both of the uses.

[0004] It has also been proposed to use an AC mains voltage motor utilizing a DC to AC converter to raise the battery voltage to the mains voltage so as to power the motor in a manner substantially identical whether during mains or battery operation. But the solution is complicated and allows only a few minutes of autonomy in battery operation unless battery packs of absolutely unacceptable size and weight for portable use are used.

[0005] The general purpose of this invention is to remedy the above-mentioned shortcomings by making available an appliance operating alternatively on battery or mains voltage with power even higher in mains voltage operation, equal for example to normal professional appliances with only mains voltage and which at the same time in battery operation still allows good power and which allows anyway satisfactory utilization of the appliance with acceptable battery life and even with reduced weights and size.

[0006] In view of this purpose it was sought to provide in accordance with this invention a portable air-flow appliance with an impeller rotated by a universal electric motor powered alternatively by the electrical mains or by an internal battery and characterized in that it includes a DC-DC electronic converter unit which converts the direct low voltage of the batteries into a direct voltage intermediate between battery voltage and the relatively high mains voltage and switching means allowing sending to the motor alternatively said intermediate voltage or said relatively high mains voltage.

[0007] To clarify the explanation of the innovative principles of this invention and its advantages compared with the prior art there is described below with the aid of the single annexed drawing a possible embodiment thereof by way of non-limiting example applying said principles.

[0008] With reference to the figure, a portable air-flow appliance designated as a whole by reference number 10 is shown diagrammatically. This appliance including the impeller 11 rotated by a universal electric motor 12 can be a portable vacuum cleaner appliance or a portable blowing appliance as readily imaginable to one skilled in

the art.

[0009] The appliances includes a connection 13 (for example, a cord ending with a plug) to be powered by the mains and an internal battery 14 advantageously rechargeable.

[0010] The appliance also includes a DC-DC electronic converter unit 15 which converts the direct low voltage of the batteries into a direct voltage intermediate between the battery voltage and the relatively high mains voltage, and switching means 16 allowing sending to the motor said intermediate voltage or said relatively high mains voltage alternatively. The DC-DC converter unit 15 can be of known type readily imaginable to one skilled in the art.

[0011] Advantageously the batteries are rechargeable by connection of the appliance to the mains.

[0012] Preferably the intermediate voltage is chosen between 1/3 and 1/2 of the relatively high mains voltage. In particular, the converter takes the battery voltage to a direct voltage intermediate between 100V and 110V. A particularly interesting figure for the motor was found in an intermediate voltage around 106V DC. To have good efficiency and duration it was also found preferable that the batteries have a voltage around 24V.

[0013] Mains power can be 240V AC.

[0014] With the above values it was found that by giving the appliances a mains voltage one can have a motor power of, for example, 1000W while battery power remains around 300W which is still a more than interesting power for having a practically usable appliance.

[0015] It must also be considered that by using such a power reduction, battery life will still be acceptable without overloading the weight of the appliance and the relatively low current absorbed during battery operation ensures long life of the motor and avoids stress on the electronic components of the converter, which can be relatively small and occupy little space.

[0016] The solution in accordance with this invention is also suited to medium small appliances while not requiring special motors with windings dedicated to dual voltage or the like.

[0017] It is now clear that the preset purposes have been achieved by supplying the motor with alternating current when the maximum power supplied by the mains is available, and in direct current with reduced voltage (but in any case much higher than the battery voltage to still have satisfactory power without compromising the life of the batteries) when mains power is lacking.

[0018] The battery can be chosen on the basis of life at the desired weight and space occupied. However, it may be considered that with the system in accordance with this invention, during battery operation with 300W absorbed power and 106V intermediate voltage, the current absorbed by the battery at 24V is on the order of a few amperes and therefore even a battery of a few ampere-hours can ensure satisfactorily long life.

[0019] Naturally the above description of an embodiment applying the innovative principles of this invention

is given by way of non-limiting example of said principles within the scope of the exclusive right claimed here. For example, the form and function of the appliance can vary depending on the needs of practical realization. The switching means can be either automatic or even electronic or manual as readily imaginable to one skilled in the art. 5

Claims 10

1. Portable airflow appliance (10) with an impeller (11) rotated by a universal electric motor (12) powered alternatively by the electrical mains (13) or by an internal battery (14) and **characterized in that** it includes a DC-DC electronic converter unit (15) which converts the direct low voltage of the batteries (14) into a direct voltage intermediate between the battery voltage and the relatively high mains voltage and switching means (16) allowing sending to the motor (12) alternatively said intermediate voltage or said relatively high mains voltage. 15 20
2. Appliance in accordance with claim 1 **characterized in that** the intermediate voltage is chosen between 1/3 and 1/2 of the relatively high mains voltage. 25
3. Appliance in accordance with claim 1 **characterized in that** the intermediate direct voltage is between 100V and 110V and preferably around 106V DC. 30
4. Appliance in accordance with claim 1 **characterized in that** said low direct voltage supplied by the batteries is around 24V. 35
5. Appliance in accordance with claim 1 **characterized in that** the batteries are rechargeable by connection of the appliance to said mains voltage. 40
6. Appliance in accordance with claim 1 **characterized in that** it is a portable vacuum cleaner. 45

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