A power supply unit (10) that prolongs the operation of an electrical motor (11) without refuelling and is suitable for explosive or inflammable atmospheres is provided. An electrical storage device (12) supplies electrical power to the motor (11). The motor (11) drives a first electrical current generator (20) providing a source of electrical supply and a second electrical current generator (22) supplying a charging current to the electrical storage device (12) via a battery charger (25). Preferably, the electrical current generators (20, 22) are alternators. The electrical storage device (12) may be a pair of 12v batteries (12), or in the case of a power supply unit (40) fitted to a vehicle (41), the battery (43) of the vehicle (41). In the latter case, a pulley (50) on an axle (51) of the vehicle (41) drives the motor (45) when the vehicle (41) is moving.
POWER SUPPLY UNIT

This invention relates to power supply units, and in particular to electrical power supply units for use where a mains supply is not available.

Electrical power supply units are used extensively where a mains supply is not available. In such a situation, the electrical supply may be provided by means of one or more batteries or accumulators. However, both the voltage and the duration provided by such means are limited and are insufficient for many applications, in particular where an AC supply is required. To overcome the shortcomings of such power supplies, electrical supply units generally comprise petrol or diesel engines driving a generator. In some circumstances, the duration of the supply provided by such electrical power supply units without refuelling may be limited more than is desirable or convenient. Furthermore, such combined motor/generator power supply units are not suitable for use in certain situations, such as in explosive or inflammable atmospheres, e.g. in chemical works, petrol stations, sewers and the like. In such situations, it is usual to provide the motor/generator unit at a location remote from that at which the electrical supply is to be provided, requiring electrical cables between the two locations. This may be inconvenient and present difficulties, and may even not reduce the danger level sufficiently.

It is an object of the present invention to provide an electrical power supply unit that overcomes, at least to a significant extent, the disadvantages of the known power supply units.

The invention provides a power supply unit comprising an electrical motor, an electrical storage device operable to supply electrical power to the motor, first electrical current generator driven by the motor and operable to provide a source of electrical supply, a second electrical current generator driven by the motor and operable to supply a charging current to the electrical storage device.

The electrical storage device may comprise at least one battery, and may comprise two 12v batteries providing a power supply of substantially 24v DC. The power supply unit may comprise an inverter operable to convert the electrical power supplied by the electrical storage device and supplied to the motor. The inverter may provide a power supply of between 220v to 250v AC to the motor. The motor may be rated at between 1hp and 10hp, and may be rated at 4hp. The motor may have a cooling fan connected therewith. Alternatively, the power supply unit may be mounted in an enclosure adapted to isolate it from the surrounding atmosphere.
The electrical current generators may be alternators, and may be rated at between 4kw and 6kw. The first generator may provide a power supply source of between 220v and 250v AC. The second generator may provide a power supply of between 220v and 250v AC to a battery-charging device. The battery-charging device may provide a power supply of substantially 26v DC to the electrical storage device.

The power supply unit may comprise a drive arrangement between the motor and the electrical current generators. The drive arrangement may comprise pulleys mounted to the motor and the generators and at least one endless belt drivingly connecting the pulleys. The drive arrangement may comprise at least one clutch, which may be a centrifugal clutch. The motor pulley may have a clutch therein, or the generator pulleys may each have a clutch therein.

The power supply unit may be incorporated in a vehicle. In this case, the vehicle may have a pulley mounted on an axle thereof, and the axle pulley may have a centrifugal clutch therein. An endless belt may drivingly connect the axle pulley with generator pulleys. The power supply unit may comprise an isolating device operable to isolate the electrical storage device from the motor when the vehicle is moving. The isolating device may be relay. The vehicle may be a refrigerated vehicle, in which case the first generator may provide an electrical supply to a vehicle compartment-cooling fan.

The power supply unit may comprise a control panel, on which may be mounted an on/off switch. The control panel may also have at least one indicator lamp mounted thereon. A power-on indicator lamp, a power-up indicator lamp and/or a charging indicator lamp may be mounted on the control panel.

The invention will now be described with reference to the accompanying drawings in which

Fig. 1 illustrates one embodiment of power supply unit, and

Fig. 2 illustrates a second embodiment of power supply unit incorporated in a vehicle.

Referring now to Fig. 1, there is shown a power supply unit 10 having an electrical motor 11. Electrical power is supplied to the motor 11 from a pair of 12v batteries 12 via an inverter 13. The batteries 12 provide a 24v DC supply to the inverter 13, which in turn provides an AC supply at, for example 240v, to the motor 11. The motor is rated at, for example, 1hp or 4hp, and may have a cooling fan 14, shown in dashed lines, connected to it for cooling purposes. Preferably, a 4hp motor 11 is used, run at a relatively slow speed, to prolong the life of the batteries 12. Particularly in the event that the power supply unit 10 is to be used in explosive or inflammable atmospheres, the fan 14 is omitted and the power supply unit 10 is mounted in an
enclosure 15, also shown in dashed lines. In that case, the enclosure 15 isolates the power supply unit 10 from the surrounding atmosphere. Mounted to the motor 11 is a double pulley 16. Drive belts 17, 18 connect the double pulley 16 with pulley 19 of a first alternator 20 and pulley 21 of a second alternator 22. Within pulleys 19, 21 are centrifugal clutches 23, shown in dashed lines, although as an alternative, the double pulley 16 may be provided with a centrifugal clutch if preferred. The alternators 20, 22 are run at approximately 2600rpm, but this speed may be altered by changing the relative diameters of pulleys 16, 19 and 21.

The alternators 20, 22 are rated at between 4kw and 6kw. The first alternator 20 provides a power supply source 24 of between 220v and 250v AC for whatever purpose such supply is required. If the supply 24 is inputted to a transformer (not shown) an alternative power supply may be available, as required. The second alternator 22 provides a power supply of between 220v and 250v AC to a battery-charging device 25. In turn, the battery charging device 25 provides a power supply of approximately 26v DC to trickle charge the batteries 12.

The power supply unit 10 has a control panel 26, on which is mounted an on/off switch 27. Also mounted on the control panel 26 are a power-on indicator lamp 28, a power-up indicator lamp 29 and a charging indicator lamp 30. The red power-on lamp 28 indicates that the unit 10 is switched on. The yellow power-up lamp 29 indicates that the motor 11 is running up to its operational speed, and the green charging lamp indicates that current is flowing into the batteries 12 from the charging device 25.

After initial charging, the power in the batteries 12 is used to energise the motor 11. The motor 11 drives the alternators 20, 22 to provide the power supply 24 and at the same time to charge the batteries 12. Without this charging of the batteries 12, the period for which the batteries will energise the motor 11 to provide the power supply 24 is in the region of one hour. However, by means of the above described charging arrangement, the batteries 12 will energise the motor 11 to provide the power supply 24 for approximately 3 hours. In addition to this important advantage over known power supply arrangements, the power supply unit 10 has further advantages. The power supply unit 10 is considerably less noisy than known arrangements, there are no CO₂ or other harmful emissions, and there are no resulting oil or fuel spillages such as are common with petrol or diesel engined power supplies. In consequence, the power supply unit 10 is suited for use in hospitals, marquees and other situations, for example for providing power for cleaning appliances in such locations. The power supply unit 10 is also useful for powering wheelchairs and other electric vehicles.
Referring now to Fig. 2, there is shown a power supply unit 40 fitted to a vehicle 41 (shown in dashed lines). The vehicle 41 is a refrigerated vehicle, having a fan 42 that is operational to maintain the contents of the vehicle 41 in a cold condition. The power supply unit 40 may have its own batteries as described above, or may utilise the battery 43 of the vehicle 41. When the vehicle 41 is stopped, an inverter 44, a motor 45 and two alternators 46, 47 are connected and operate as described above, utilising power from the battery 43. Alternator 46 provides a power supply for the fan 42 to cool the contents of the vehicle 41. Alternator 47 supplies current to a battery charging device 48 to trickle charge the battery 43. However, in this case, the pulley 49 mounted to the motor 45 is a triple pulley. A further pulley 50 is fitted to an axle 51 of the vehicle 41, and has a centrifugal clutch (not shown) incorporated therein. A further drive belt 52 connects the pulleys 49, 50. When the vehicle 41 is moving, rotation of the axle 51 drives pulley 50, drive belt 52 and pulley 49, in turn driving the motor 45. In consequence, power is not required from the battery 43 to energise the motor 45, and an isolator in the form of relay 53 isolates the battery 43 from the inverter 44. The relay isolator 53 restores the connection between the battery 43 and the inverter 44 when the vehicle 41 again stops.
CLAIMS

1. A power supply unit (10) comprising an electrical motor (11) and an electrical storage device (12) operable to supply electrical power to the motor (11), characterised by a first electrical current generator (20) driven by the motor (11) and operable to provide a source of electrical supply and a second electrical current generator (22) driven by the motor (11) and operable to supply a charging current to the electrical storage device (12).

2. A power supply unit according to claim 1, characterised in that the electrical storage device (12) comprises at least one battery (12).

3. A power supply unit according to claim 2, characterised in that the electrical storage device (12) comprises two 12v batteries (12) providing a power supply of substantially 24v DC.

4. A power supply unit according to claim 2 or claim 3, characterised in that the power supply unit (10) comprises an inverter (13) operable to convert the electrical power supplied by the electrical storage device (12) and supplied to the motor (11).

5. A power supply unit according to claim 4, characterised in that the inverter (13) provides a power supply of between 220v to 250v AC to the motor (11).

6. A power supply unit according to any one of claims 1 to 5, characterised in that the motor (11) is rated at between 1hp and 10hp.

7. A power supply unit according to claim 6, characterised in that the motor (11) is rated at 4hp.

8. A power supply unit according to any one of claims 1 to 7, characterised in that the motor (11) has a cooling fan (14) connected therewith.

9. A power supply unit according to any one of claims 1 to 7, characterised in that the power supply unit (10) is mounted in an enclosure (15) adapted to isolate it from the surrounding atmosphere.

10. A power supply unit according to any one of claims 1 to 9, characterised in that the electrical current generators (20, 22) are alternators (20, 22).
11. A power supply unit according to any one of claims 1 to 10, characterised in that the electrical current generators (20, 22) are rated at between 4kw and 6kw.

12. A power supply unit according to any one of claims 1 to 11, characterised in that the first generator (20) provides a power supply source of between 220v and 250v AC.

13. A power supply unit according to any one of claims 1 to 12, characterised in that the second generator (22) provides a power supply of between 220v and 250v AC to a battery-charging device (25).

14. A power supply unit according to claim 13, characterised in that the battery-charging device (25) provides a power supply of substantially 26v DC to the electrical storage device (12).

15. A power supply unit according to any one of claims 1 to 14, characterised by a drive arrangement (16, 17, 18, 19, 21) between the motor (11) and the electrical current generators (20, 22).

16. A power supply unit according to claim 15, characterised in that the drive arrangement comprises pulleys (16, 19, 21) mounted to the motor (11) and the generators (20, 22) and at least one endless belt (17, 18) drivingly connecting the pulleys (16, 19, 21).

17. A power supply unit according to claim 16, characterised in that the drive arrangement (16, 17, 18, 19, 21) comprises at least one clutch (23).

18. A power supply unit according to claim 17, characterised in that the clutch (23) is a centrifugal clutch (23).

19. A power supply unit according to claim 17 or claim 18, characterised in that the motor pulley (16) has a clutch therein.

20. A power supply unit according to claim 17 or claim 18, characterised in that the generator pulleys (19, 21) each have a clutch (23) therein.

21. A power supply unit according to any one of claims 1 to 20, characterised in that the power supply unit (40) is incorporated in a vehicle (41).
22. A power supply unit according to claim 21, characterised in that the vehicle (41) has a pulley (50) mounted on an axle (51) thereof.

23. A power supply unit according to claim 22, characterised in that the axle pulley (51) has a centrifugal clutch therein.

24. A power supply unit according to claim 22 or claim 23, characterised in that an endless belt (52) drivingly connects the axle pulley (50) with generator pulleys.

25. A power supply unit according to any one of claims 21 to 24, characterised by an isolating device (53) operable to isolate the electrical storage device (43) from the motor (45) when the vehicle (41) is moving.

26. A power supply unit according to claim 25, characterised in that the isolating device (53) is a relay (53).

27. A power supply unit according to any one of claims 21 to 26, characterised in that the vehicle (41) is a refrigerated vehicle.

28. A power supply unit according to claim 27, characterised in that the first generator (46) provides an electrical supply to a vehicle compartment-cooling fan (42).

29. A power supply unit according to any one of claims 1 to 28, characterised by a control panel (26).

30. A power supply unit according to claim 29, characterised in that an on/off switch (27) is mounted on the control panel (26).

31. A power supply unit according to claim 29 or claim 30, characterised in that the control panel (26) has at least one indicator lamp (28) mounted thereon.

32. A power supply unit according to claim 31, characterised in that a power-on indicator lamp (28), a power-up indicator lamp (29) and/or a charging indicator lamp (30) are mounted on the control panel (26).

33. A power supply unit substantially as hereinbefore described with reference to and as illustrated in the accompanying drawing.