CLAIMS

1. Method of controlling an uninterrupted power supply with the help of a system (10) for uninterrupted power supply, wherein the system (10) comprises

- a first connection terminal (101) which can be connected with an alternating current source;
- a second connection terminal (102) which can be connected with an alternating current load;
- a switch (11) comprising
  - a first switch terminal (111) connected with the first connection terminal (101);
  - a second switch terminal (112) connected with the second connection terminal (102);
  - first thyristor (113) connected between the switch terminals (111, 112); and
  - a second thyristor (114) connected between the switch terminals (111, 112) anti-parallel to the first thyristor (113);
- an energy store (12); and
- an inverter (13) connected with the second connection terminal (102) and the energy store (12);

wherein

- a switch current flowing through the switch (11) is detected;
- a first potential present at the first connection terminal (101) is detected; and
- in a first fault case in which an amount of the first potential drops so that an instantaneous value of the first potential infringes a first predetermined permissibility rule and anamount of the switch current rises so that an instantaneous value of the switch current infringes a second predetermined permissibility rule:
  - a second potential present at the second switch terminal (102) is so set with the help of the inverter (13) that the switch current is driven to zero; and
  - after setting of the second potential the switch current is checked in that:
    - an amount of the switch current is detected up to a predetermined first checking instant lying after the setting of the second potential and is compared with a predetermined threshold value (SW2) and if this predetermined threshold value (SW2) is exceeded a first check result is evaluated as positive and otherwise as negative;

- in the case of a positive first check result the second potential is reversed;
- in the case of a negative first check result the switch current is detected at a predetermined second checking instant lying at or after the first checking instant and is compared with zero and if there is departure from zero the second check result is evaluated as positive and otherwise as negative; and
- in the case of a positive second check result the second potential is reversed.

2. Method according to claim 1, wherein

- in the first fault case
  - setting of the second potential is carried out in such a way that

$$\mathrm{sgn}(iS) \cdot v1 \leq \mathrm{sgn}(iS) \cdot v2 \text{ or } \mathrm{sgn}(iS) \cdot v1 < \mathrm{sgn}(iS) \cdot v2$$

$$\text{or } -v2/v1 \geq 1 \text{ or } -v2/v1 > 1,$$

wherein v1 is the instantaneous value of the first potential, v2 is an instantaneous value of the second potential and iS is the instantaneous value of the switch current.

3. Method according to claim 1 or according to the preceding claim, wherein

- the reversal is carried out in accordance with the following equation

$$v2(t2) = -A1 \cdot v2(t1) \text{ in which } A1 \geq 1 \text{ and } t2 > t1,$$

when the first check result or the second check result is positive.

wherein v2 is the instantaneous value of the second potential, t2 is an instant lying after the reversal, t1 is an instant lying in front of the reversal and A1 is a first proportioning factor.

4. Method according to claim 1 or according to one of the other preceding claims, wherein

- for the predetermined second check instant

$$PZ2 = T3 + A2 \cdot tq \text{ in which } A2 \geq 1,$$

wherein PZ2 is the second checking instant, T3 is an instant at which the second potential was set, A2 is a second proportioning factor and tq is a recovery time of the thyristors (113, 114).

5. Method according to claim 1 or according to any one of the other preceding

claims, wherein

- after the reversal when the first check result or the second check result is positive,

$$v2 = \mathrm{sgn}(iS) \cdot v0 \text{ in which } v0 > 0,$$

wherein v0 is a predetermined default potential, v2 is the instantaneous value of the second potential and iS is the instantaneous value of the switch current.

6. Method according to claim 5, wherein

- the default potential is selected at least for a time in such a way that

$$v0 = A3 \cdot VWR \text{ in which } 0 < A3 \leq 1,$$

wherein A3 is a third proportioning factor and VWR is the nominal potential of the inverter (13).

7. Method according to claim 5 or 6, wherein

- the default potential is selected at least for a time in such a way that

$$v0 = v(iS),$$

wherein v(iS) is a function dependent on the switch current.

8. Method according to claim 7, wherein

- the function is selected in such a way that

$$v(iS) = L \cdot d|iS|/dt,$$

wherein L is the inductivity of the alternating current source and of the section of the system (10) between the first connection terminal (101) and the second switch terminal (112) and d|iS|/dt is a time derivative of the amount of the switch current.

9. Method according claims 5-8, wherein

- the default potential is determined at least for a time by a regulation managed through the switch current.

10. Method according to any of claims 1-9, wherein

- monitoring is carried out as to whether the amount of the switch current after the reversal in case of positive first check has dropped to zero;
- waiting out a waiting time as soon as the amount of the switch current has dropped to zero, for which the waiting time is:

$$TW = A4 \cdot tq \text{ in which } A4 \geq 1,$$

wherein TW is the waiting time, A4 is a fourth proportioning factor and tq is the

recovery time of the thyristors (113, 114); and

- after expiry of the waiting time, the second potential is set with the help of the inverter (13) in such a way as is required for an uninterrupted power supply and/or with the help of the inverter an active power such as required for an uninterrupted power supply and/or a reactive power such as required for an uninterrupted power supply is or are generated.

11. Method according to any of claims 1-10, wherein

- in a second fault case in which the amount of the first potential drops and infringes a first predetermined permissibility rule and the amount of the switch current drops and/or

  in a fluctuation case in which the amount of the first potential rises so that the instantaneous value of the first potential does not infringe a predetermined third permissibility rule or drops so that the instantaneous value of the first potential does not infringe the predetermined first permissibility rule
  - then with the help of the inverter (13)
    - the second potential such as required for an uninterrupted power supply is set; and/or
    - an active power such as required for an uninterrupted power supply and/or a reactive power such as required for an uninterrupted power supply is or are generated.

12. Method according to any of claims 1-11, wherein

- the second potential is detected; and
- the inverter (13) is controlled in dependence on the second potential and/or in dependence on the second potential.

13. System (10) for uninterrupted power supply, wherein the system (10) comprises

- a first connection terminal (101) which can be connected with an alternating current source;
- a second connection terminal (102) which can be connected with an alternating current load;
- a switch (11) comprising
  - a first switch terminal (111) connected with the first connection terminal (101);

  - a second switch terminal (112) connected with the second connection terminal (102);
  - first thyristor (113) connected between the switch terminals (111, 112); and
  - a second thyristor (114) connected between the switch terminals (111, 112) anti-parallel to the first thyristor (113);
- an energy store (12);
- an inverter (13) connected with the second connection terminal (102) and the energy store (12);
- a current sensor (14) which can detect a switch current flowing through the switch (11);
- a first voltage sensor (15) which can detect a first potential present at the first connection terminal (102); and
- a control device (16) coupled to the switch (11), the inverter (13) and the sensors (14, 15);

wherein the control device (16) is constructed in such a way that it

- can evaluate the switch current and the first potential; and
- can recognise a first fault case, in which an amount of the first potential drops so that an instantaneous value of the first potential infringes a first predetermined permissibility rule and an amount of the switch current rises so that an instantaneous value of the switch current infringes a second predetermined permissibility rule, and in that case it
  - controls the inverter (13) in such a way that it generates a second potential which is present at the second switch terminal (102) and drives the switch current to zero; and
  - after setting of the second potential checks the switch current in that it
    - compares the amount of the switch current up to a predetermined first checking instant lying after the setting of the second potential with a predetermined threshold value (SW2) and if this threshold value (SW2) is exceeded evaluates a first check result as positive and otherwise as negative;
    - in the case of a positive first check result reverses the second potential;
    - in the case of a negative first check result compares the switch current at a predetermined second checking instant lying at or after the first checking instant with zero and if there is departure from zero

evaluates a second check result as positive and otherwise as negative; and

– in the case of a positive second check result reverses the second potential.

14. System (10) according to claim 13, wherein

- the control device (16) is so constructed that in the first fault case it
  – controls the inverter (13) in such a way that for the second potential

$$\text{sgn}(iS) \cdot v1 \leq \text{sgn}(iS) \cdot v2 \text{ or } \text{sgn}(iS) \cdot v1 < \text{sgn}(iS) \cdot v2$$

$$\text{or } -v2/v1 \geq 1 \text{ or } -v2/v1 > 1,$$

wherein v1 is the instantaneous value of the first potential, v2 is an instantaneous value of the second potential and iS is the instantaneous value of the switch current.

15. System (10) according to claim 13 or according to the preceding claim, comprising

- a coil (18) connected between the first connection terminal (101) and the first switch terminal (111) or between the second switch terminal (102) and the second connection terminal (112); and/or
- a capacitor (19) connected between the first connection terminal (101) and ground or between the first switch terminal (111) and ground or between the second switch terminal (112) and ground or between the second connection terminal (102) and ground; and/or
- a transformer (20) connected between the inverter (13) and the second switch terminal (112) or between the inverter (13) and the second connection terminal (102).