rechargeable battery voltage dropped across the second rechargeable battery connection, (v) a third short circuit switch, (vi) a third voltmeter that is arranged to measure a third rechargeable battery voltage dropped across the third rechargeable battery connection, and (ii) a control unit, (f) the control unit being designed to automatically carry out a method comprising the steps (i) for all voltmeters, detecting the respective rechargeable battery voltage, (ii) if the respective rechargeable battery voltages exceed a predetermined minimum voltage, connecting (and/or keeping connected) the corresponding rechargeable battery into a series circuit with at least one other rechargeable battery, particularly by means of the corresponding short circuit switch, and (iii) if the respective rechargeable battery voltages do not exceed the minimum voltage, removing the corresponding rechargeable battery from the series circuit, particularly by means of the corresponding short circuit switch.

According to a first aspect, there is provided a rechargeable battery discharge device for discharging rechargeable batteries for recycling with (a) a first rechargeable battery connection for connecting a first rechargeable battery, (b) a second rechargeable battery connection for connecting a second rechargeable battery, (c) at least a third rechargeable battery connection for connecting a third rechargeable battery (d) a load connection for a load for dissipating an electric output during discharging of the rechargeable batteries and, a discharge circuit comprising (i) a first voltmeter that is arranged to measure a first rechargeable battery voltage dropped across the first rechargeable battery connection, (ii) a second voltmeter that is arranged to measure a second rechargeable battery voltage dropped across the second rechargeable battery connection, (iii) a third voltmeter that is arranged to measure a third rechargeable battery voltage dropped across the third rechargeable battery connection, and, (iv) a control unit, wherein (f) the control unit being designed to automatically carry out a method comprising the steps (i) for all voltmeters, detecting the respective rechargeable battery voltage, (ii) when the respective rechargeable battery voltage exceeds a predetermined minimum voltage, connecting the corresponding rechargeable battery into a series circuit with at least one other rechargeable battery and (iii) when the respective rechargeable battery voltage does not exceed a minimum voltage, removing the corresponding rechargeable battery from the series circuit by means of the corresponding short circuit switch, (g) wherein

the minimum voltage is selected in such a way that a runaway of the rechargeable battery is avoided and, (h) wherein the discharge circuit comprises (i) a first short circuit switch, (ii) a second short circuit switch and (iii) a third short circuit switch and (iv) is set up to remove the respective rechargeable battery from the series circuit by means of the corresponding short circuit switch, (i) the short circuit switches each having a first switch element which are connected in such a way that the series connection is only closed when all the first switch elements are closed, and (j) at least one short circuit switch has a second switch element, which is connected in such a way that for each second switch element it applies that, irrespective of the switch state of the first switch element, the battery connected to the corresponding battery connection can only be discharged when the second switch element is closed.

According to a second aspect, there is provided a method for discharging a plurality of rechargeable batteries with the following automatically conducted steps: (a) continually measuring a rechargeable battery voltage of a plurality of rechargeable batteries, (b) connecting the rechargeable batteries whose rechargeable battery voltages do not fall below a predetermined minimum voltage into a series circuit, so that the rechargeable batteries are discharged, and (c) disconnecting a rechargeable battery whose rechargeable battery voltage falls below the predetermined minimum voltage, so that it is not longer connected in series, and (d) short-circuiting of at least one rechargeable battery connection to which a battery is connected and/or wherein the minimum voltage is 0 Volt, (e) wherein the disconnection of a battery whose battery voltage falls below the predetermined minimum voltage, so that it is no longer connected in series, comprises closing a first switch element of the short circuit switch, (f) wherein the method further comprises the step of closing or keeping closed a second switch element of the short circuit switch of the battery connection, the second switch element being connected in such a way that, irrespective of the switch state of the first switch element, the battery connected to the corresponding battery connection can only be discharged when the second switch element is closed.

The advantage of the invention is that the rechargeable batteries can be automatically discharged. It may only be necessary to manually connect the rechargeable batteries to one rechargeable battery at a time.

It is also advantageous that only a small number of loads have to be supplied. It is possible to use multiple loads, but it is not necessary. In particular, it is possible to reuse the energy still stored in the rechargeable batteries as useful energy. In other words, it is possible, but not necessary, for the electrical energy stored as heat in the rechargeable batteries to be dissipated. In particular, it can be supplied to a consumer as electrical energy.

Patent claims:

1. A rechargeable battery discharge device for discharging rechargeable batteries for recycling with

(a) a first rechargeable battery connection for connecting a first rechargeable battery,

(b) a second rechargeable battery connection for connecting a second rechargeable battery,

(c) at least a third rechargeable battery connection for connecting a third rechargeable battery

(d) a load connection for a load for dissipating an electric output during discharging of the rechargeable batteries and,

(e) a discharge circuit comprising

(i) a first voltmeter that is arranged to measure a first rechargeable battery voltage dropped across the first rechargeable battery connection,

(ii) a second voltmeter that is arranged to measure a second rechargeable battery voltage dropped across the second rechargeable battery connection,

(iii) a third voltmeter that is arranged to measure a third rechargeable battery voltage dropped across the third rechargeable battery connection, and

(iv) a control unit,

(f) the control unit being designed to automatically carry out a method comprising the steps:

(i) for all voltmeters, detecting the respective rechargeable battery voltage,

(ii) when the respective rechargeable battery voltage exceeds a predetermined minimum voltage, connecting the corresponding rechargeable battery into a series circuit with at least one other rechargeable battery and

(iii) when the respective rechargeable battery voltage does not exceed a minimum voltage, removing the corresponding rechargeable battery

from the series circuit by means of the corresponding short circuit switch

(g) wherein the minimum voltage is selected in such a way that a runaway of the rechargeable battery is avoided and

(h) wherein the discharge circuit comprises

(i) a first short circuit switch,

(ii) a second short circuit switch and

(iii) a third short circuit switch and

(iv) is set up to remove the respective rechargeable battery from the series circuit by means of the corresponding short circuit switch,

(i) the short circuit switches each having a first switch element which are connected in such a way that the series connection is only closed when all the first switch elements are closed, and

(j) at least one short circuit switch has a second switch element, which is connected in such a way that for each second switch element it applies that, irrespective of the switch state of the first switch element, the battery connected to the corresponding battery connection can only be discharged when the second switch element is closed.

2. The rechargeable battery discharge device according to claim 1, wherein the load connected to the load connection is

(a) an inverter for generating an AC voltage of a predetermined frequency and voltage and/or

(b) a DC voltage converter for generating a DC voltage of a predetermined voltage from a DC voltage acting on the load connection.

3. The rechargeable battery discharge device according to one of the preceding claims, wherein

a display for displaying the rechargeable batteries whose respective rechargeable battery voltage falls below the minimum voltage and/or the rechargeable battery connections whose connection contacts are short-circuited.

4. The rechargeable battery discharge device according to one of the preceding claims, wherein a polarity reversal protection circuit for automatically
   (i) detecting a rechargeable battery connected with the incorrect polarity and emitting a polarity reversal warning and/or
   (ii) connecting the incorrectly connected rechargeable battery with the right polarity.

5. The rechargeable battery discharge device according to one of the preceding claims, wherein the control unit is configured to automatically carry out a method comprising the steps:
   (i) determining changes in rechargeable battery voltages over time and
   (ii) bridging the corresponding rechargeable battery by means of the corresponding short circuit switch and/or emitting a voltage disconnection warning when the change in rechargeable battery voltage over time lies outside of a predetermined tolerance interval.

6. The rechargeable battery discharge device according to one of the preceding claims, wherein the control unit is configured to automatically carry out a method comprising the step:
   connecting some of the rechargeable batteries into the series circuit, so that a sum of the rechargeable battery voltages lies within a predetermined target voltage interval, wherein the combination with the largest number of rechargeable battery voltages is selected when two or more combinations of rechargeable battery voltages lie within the target voltage interval.

7. The rechargeable battery discharge device according to one of the preceding claims, wherein
   at least one heat sensor, in particular a thermal imaging camera, that is arranged to detect a temperature of at least one of the rechargeable batteries.

8. The rechargeable battery discharge device according to one of the preceding claims, wherein the control unit is configured to automatically carry out a method comprising the steps:
   (a) detecting a rechargeable battery that is connected to a rechargeable battery connection and does not exceed the minimum voltage,
   (b) closing a first switch element, especially a short circuit relay, of the short circuit switch of the rechargeable battery connection, or keeping said element closed,
   (c) closing a second switch element, especially a connecting relay, of the short circuit switch of the rechargeable battery connection, or keeping said element closed,
   (d) emitting a signal that encodes that the rechargeable battery can be removed,
   (e) detecting that no rechargeable battery is connected to the rechargeable battery connection,
   (f) opening the second switch element or keeping it open, then
   (g) opening the first switch element or keeping it open, and then
   (h) closing the second switch element.

9. The rechargeable battery discharge device according to claim 2, wherein
   (a) the inverter is connected to a power grid to which electrical consumers are connected,
   (b) the control unit is designed to automatically carry out a method featuring the steps:
      (i) detecting a target power output of the rechargeable battery discharge device and
      (ii) reducing a discharge output of the rechargeable batteries when an actual power output exceeds the target power output.

10. The rechargeable battery discharge device according to claim 9, wherein
    (a) an electrical buffer store,
    (b) the control unit being designed to automatically carry out a method comprising the steps:
        (i) detecting the target power output of the rechargeable battery discharge device and
        (ii) loading the buffer store so that the actual power output does not exceed the target power output.

11. A method for discharging a plurality of rechargeable batteries comprising the following automatically performed steps:
    (a) continuously measuring a rechargeable battery voltage of a plurality of rechargeable batteries,
    (b) connecting the rechargeable batteries whose rechargeable battery voltages do not fall below a predetermined minimum voltage into a series circuit, so that the rechargeable batteries are discharged, and
    (c) disconnecting a rechargeable battery whose rechargeable battery voltage falls below the predetermined minimum voltage, so that it is no longer connected in series, and
    (d) short-circuiting of at least one rechargeable battery connection to which a battery is connected and/or wherein the minimum voltage is 0 Volt,
    (e) wherein the disconnection of a battery whose battery voltage falls below the predetermined minimum voltage, so that it is no longer connected in series, comprises closing a first switch element of the short circuit switch,
    (f) wherein the method further comprises the step of closing or keeping closed a second switch element of the short circuit switch of the battery connection, the second switch element being connected in such a way that, irrespective of the switch state of the first switch element, the battery connected to the corresponding battery connection can only be discharged when the second switch element is closed.

12. The method according to claim 11, further comprising the step of:
emitting a notification that encodes the rechargeable batteries whose respective rechargeable battery voltage falls below the minimum voltage and/or the rechargeable battery connections whose connection contacts are short-circuited.

13. The method according to claim 11 or 12, further comprising the steps of:
(i) detecting a rechargeable battery connected with the incorrect polarity and emitting a polarity reversal warning and/or
(ii) connecting the incorrectly connected rechargeable battery with the right polarity.