POWER CHARGING DEVICE WITH CHARGE SATURATION DISCONNECTOR THROUGH ELECTROMAGNETIC FORCE RELEASE

BACKGROUND OF THE INVENTION

(a) Field of the invention

The present invention relates to a power charging device, wherein rechargeable device is placed within magnetic actuator conductive device of the power charging device which can control the rechargeable device to disconnect from the magnetic actuator conductive device when charge saturation.

(b) Description of the Prior Art

Typically, rechargeable device is placed within power charging device and keeps the placing situation even after charge saturation; which often leads to suspicion of overcharge.

SUMMARY OF THE INVENTION

A power charging device with charge saturation disconnector through electromagnetic force release is formed by charging power supply, charging control device, magnetic actuator conductive device, power excitation windings, rechargeable discharge device, and various detection devices optioned as need for detection the charge situation of the rechargeable discharge device.

When rechargeable discharge device (104) is placed by polarity within magnetic actuator conductive device (110) of the power charging device with charge saturation disconnector through electromagnetic force release, the rechargeable discharge device (104) is clamped by conductive device (112) of the magnetic actuator conductive device (110), and is input charge power.

When the rechargeable discharge device (104) is charged saturation, 1)

power excitation windings (103) can be directly controlled by charge saturation detection device to be conductive or disconnect to make magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112) of the magnetic actuator conductive device (110); and/or 2) a signal of charge saturation detection device (107) is transmitted to charging control device (102) to control the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112) of the magnetic actuator conductive device (110); and/or 3) the charging control device (102) performs trickling charge to the rechargeable discharge device (104) for the set time delay, and then the conductive device (112) is driven to control the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112) of the magnetic actuator conductive device (110); and/or 4) the signal of the charge saturation detection device (107) is transmitted to the charging control device (102) to reduce the charge current to the rechargeable discharge device (104) for waiting the detection charge saturation signal of the charge saturation detection device (107) further driving the charging control device (102) to control the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112) of the magnetic actuator conductive device (110) to implement two-stage charging; and/or 5) the detection charge saturation signal of the charging state detection device (107) repeatedly controls the charging control device (102) to gradually reduce the charge current to the rechargeable discharge device (104), and

finally the charging control device (102) is controlled to drive the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112) of the magnetic actuator conductive device (110), and then by means of one driving force of the followings including gravity, or the force from installed prestressing device with magnetic force, current force, or mechanic force, such as elastic force from a prestressing spring, or the thrust of electromagnetic driving transposition mechanism (115), at least one electrode side of the rechargeable discharge device (104) disconnects from the magnetic actuator conductive device (110) to stop charging.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a structural drawing showing the main components of the present invention;

FIG. 2 is a structural drawing showing an embodiment of FIG. 1 applied to the rechargeable discharge device (104) with conductive structure installed on one side;

FIG. 3 is a structural drawing showing an embodiment, wherein the magnetic actuator conductive device (110) is powered excitation, and then at least one electrode side of the rechargeable discharge device (104) disconnects from the magnetic actuator conductive device (110) to stop charging, according to the present invention;

FIG. 4 is a structural drawing showing an embodiment of FIG. 3 applied to the rechargeable discharge device (104) with conductive structure installed on one side;

FIG. 5 is a structural drawing showing an embodiment of the power excitation windings (103) driving the magnetic actuator conductive device (110) with the functionalities of prestressing release and magnetic clamping, according to the present invention;

FIG. 6 is a structural drawing showing an embodiment of FIG. 5 applied to the rechargeable discharge device (104) with conductive structure installed on one side;

FIG. 7 is a structural drawing showing an embodiment of the power excitation windings (103), wherein the power excitation windings (103) is powered to drive the conductive device (112) of the magnetic actuator conductive device (110), which simulatneously has the functionality of being driven by power excitation like that of the magnetic driving structure (111), for releasing the rechargeable discharge device (104) to stop charging when charge saturation, according to the present invention;

FIG. 8 is a structural drawing showing an embodiment of FIG. 7 applied to the rechargeable discharge device (104) with conductive structure installed on one side;

FIG. 9 is a structural drawing showing an embodiment of the power excitation windings (103), wherein the power excitation windings (103) drives the conductive device (112) of the magnetic actuator conductive device (110), which simultaneously has the functionality of being driven by power excitation like that of the magnetic driving structure (111), to clamp the rechargeable discharge device (104) for charging; on the other hand, the powering excitation to the power excitation windings (103) terminates for releasing the rechargeable discharge device (104) from the conductive device (112) to stop charging when charge saturation, according to the present invention;

FIG. 10 is a structural drawing showing an embodiment of FIG. 9 applied to the rechargeable discharge device (104) with conductive structure installed on one side;

FIG. 11 is a structural drawing showing an embodiment of the power excitation windings (103) driving prestressing pushed electromagnetic driving suction device (114), according to the present invention;

FIG. 12 is a structural drawing showing an embodiment of FIG. 11

equipped with reed contact (126) as a synchronous power switch;

FIG. 13 is a structural drawing showing an embodiment of FIG. 11 equipped with touch switch (limit switch) (117) as a synchronous power switch;

FIG. 14 is a structural drawing showing an embodiment of FIG. 11 applied to the rechargeable discharge device (104) with conductive structure installed on one side;

FIG. 15 is a structural drawing showing an embodiment of FIG. 12 applied to the rechargeable discharge device (104) with conductive structure installed on one side;

FIG. 16 is a structural drawing showing an embodiment of FIG. 13 equipped with the touch switch (limit switch) (117) as a synchronous power switch;

FIG. 17 is a structural drawing showing an embodiment of the power excitation windings (103) with charge current passing througe for driving the magnetic actuator conductive device (110) with the functionalities of prestressing release and magnetic clamping, according to the present invention;

FIG. 18 is a structural drawing showing an embodiment of the magnetic actuator conductive device (110) of FIG. 17 equipped with prestressing spring (106);

FIG. 19 is a structural drawing showing an embodiment of installing press type boot structure (231) for activating charging function, according to the present invention;

FIG. 20 is a structural drawing showing an embodiment of FIG. 17 applied to the rechargeable discharge device (104) with conductive structure installed on one side;

FIG. 21 is a structural drawing showing an embodiment of FIG. 18 applied to the rechargeable discharge device (104) with conductive structure installed on one side;

FIG. 22 is a structural drawing showing an embodiment of FIG. 19 applied to the rechargeable discharge device (104) with conductive structure installed on one side;

FIG. 23 is a schematic view showing disconnective state among the rechargeable discharge device (104), the prestressing reed (108), and the conductive device (112) in the embodiment of FIG. 22;

FIG. 24 is a schematic view showing conductive state among the rechargeable discharge device (104), the prestressing reed (108), and the conductive device (112) in the embodiment of FIG. 22;

FIG. 25 is a structural drawing showing an embodiment of the power excitation windings (103) driving the magnetic actuator conductive device (110) of electromagnetic driving transposition mechanism, according to the present invention;

FIG. 26 is a structural drawing showing an embodiment of FIG. 25 equipped with the reed contact (126) as a synchronous power switch;

FIG. 27 is a structural drawing showing an embodiment of FIG. 25 equipped with the touch switch (limit switch) (117) as a synchronous power switch;

FIG. 28 is a structural drawing showing an embodiment of FIG. 25 applied to the rechargeable discharge device (104) with conductive structure installed on one side;

FIG. 29 is a structural drawing showing an embodiment of FIG. 26 applied to the rechargeable discharge device (104) with conductive structure installed on one side; and

FIG. 30 is a structural drawing showing an embodiment of FIG. 27 applied to the rechargeable discharge device (104) with conductive structure installed on one side.

DESCRIPTION OF MAIN COMPONENT SYMBOLS

101 : Charging power supply

102 : Charging control device

103 : Power excitation windings

104 : Rechargeable discharge device

105 : Positioning ring structure

106 : Prestressing spring

107 : Charging state detection device

108 : Prestressing reed

110 : Magnetic actuator conductive device

111 : Magnetic driving structure

112 : Conductive device

114 : Prestressing pushed electromagnetic driving suction device

115 : Electromagnetic driving transposition mechanism

116 : Prestressing homing spring

117 : Touch switch

120 : Parallel shunt circuit device

124 : Electromagnetic actuator

126 : Reed contact

127 : Magnetic circuit with iron-core

229 : Clamping structure

231 : Press type boot structure

1060 : Released structural unit for rechargeable discharge device (104)

1081 : Relay conductive structure

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A power charging device with charge saturation disconnector through electromagnetic force release is formed by charging power supply, charging control device, magnetic actuator conductive device, power excitation windings, rechargeable discharge device, and various detection devices optioned as need for detection the charge situation of the rechargeable discharge device.

FIG. 1 is a structural drawing showing the main components of the present invention.

As showed in FIG. 1, the power charging device with charge saturation disconnector through electromagnetic force release uses power energy of charging power supply (101) to transmit to charging control device (102), and then under the control of the charging control device (102) to transmit the power energy to magnetic actuator conductive device (110) for charging rechargeable discharge device (104) clamped by conductive device (112) installed within the magnetic actuator conductive device (110). The main components include:

---Charging control device (102): formed by electromechanical or solid state electronic elements, including microprocessor and necessary softwares, for receiving input of the charging power supply (101) to output and control the charge voltage and current over the rechargeable discharge device (104), and receiving a signal of charging state detection device (107) from the rechargeable discharge device (104) to control the power timing to the power excitation windings (103); in which the charging control device (102) can be single circuit device or combine with the power supply (101) to be integrated structure;

---Power excitation windings (103): formed by elements or device which can transfer input power energy to magnetic energy, installed within the magnetic actuator conductive device (110), or placed at the position where the power excitation windings (103) can interact with the magnetic actuator conductive device (110); in which the power excitation windings (103) is directly controlled by the charging state detection device (107) or by the charging control device (102) to be conductive excitation state or disconnect to make magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112) of the magnetic actuator conductive device (110), and then the rechargeable discharge device (104)

further disconnects through released structural unit (1060) for rechargeable discharge device (104); and the released structural unit (1060) for rechargeable discharge device (104) is formed by structural space caused by gravity displacement, or formed by prestressing device with magnetic force, current force, or mechanic force, or prestressing spring, or formed by electromagnetic driving transposition mechanism; by means of at least one acting force of the followings including gravity, and/or the elastic force from the prestressing spring, and/or the thrust of the electromagnetic driving transposition mechanism, at least one electrode side of the rechargeable discharge device (104) disconnects from the conductive device (112) to stop charging;

---Rechargeable discharge device (104) and Cconductive device (112) of the magnetic actuator conductive device (110): related to their relative position relationship and operational functions, in which the rechargeable discharge device (104) is clamped by the conductive device (112) when the rechargeable discharge device (104) is installed in, and both of them present conductive state with same polarity for receiving transmitted charging energy; and

---Charging state detection device (107): related to the installation, in which one or more charging state detection device (107) can be installed at one or more positions as followings, including 1) installed within the rechargeable discharge device (104); and/or 2) installed within the near rechargeable discharge device (104) ; and/or 3) installed for linking the electrode side of the rechargeable discharge device (104) ; and/or 4) installed for linking the output side of the charging power supply of the charging control device (102) to transmit the detection signal of charging state, especially the detection signal of charge saturation;

The constitution types for the charging state detection device (107) of the rechargeable discharge device (104) are given examples as followings, but not to limit:

1) formed by terminal voltage detection device on charging, which is the charging state detection device (107) performing terminal voltage detection, installed at positive and negative electrodes of the charging control device (102), in which the positive and negative electrodes output charging energy, or installed at positive and negative electrodes of the rechargeable discharge device (104), wherein the above two installation ways can detect terminal voltage signal, when the rechargeable discharge device (104) is charged, for determining charge saturation state for the rechargeable discharge device (104); and /or

2) formed by detection circuit with sudden decreased charge saturation voltage, which adopts terminal voltage detection device as the charging state detection device (107), wherein when the rechargeable discharge device (104) is charge saturated, the terminal voltage decreases suddenly; the terminal voltage detection device can be installed at positive and negative electrodes of the charging control device (102), in which the positive and negative electrodes output charging energy, or installed at positive and negative electrodes of the rechargeable discharge device (104), and the above two installation ways can detect power signal of sudden decreased terminal voltage, when the rechargeable discharge device (104) is charge saturated; and /or

3) formed by charge current detection circuit, which provides a signal of current value when charge current decreases in charge saturation; and/or

4) formed by thermal switch device, which occurs response of switch function when the temperature of the rechargeable discharge device (104) in charge saturation raises to the set value; and/or

5) formed by the element with the coefficient of resistance related to positive or negative temperature, which occurs change of relative resistance value when the temperature of the rechargeable discharge device (104) in charge saturation raises to the set value; and/or

6) formed by internal resistance measurement circuit, which detects a signal of relative resistance value when internal resistance of the rechargeable discharge device (104) in charge saturation occurs relative change; and/or

7) formed by the other typical methods and devices which can detect the rechargeable discharge device (104) in charge saturation.

Through the above devices, when the rechargeable discharge device (104) is placed within the conductive device (112), depending on the polarity, the rechargeable discharge device (104) is clamped and input charging energy by the conductive device (112).

When the rechargeable discharge device (104) is charge saturated, there are one or more operations to be performed through the detection by the charging state detection device (107) of the rechargeable discharge device (104), including:

1) when the rechargeable discharge device (104) is charge saturated, the power excitation windings (103) can be directly controlled by the charge saturation detection device to be conductive or disconnect to make the magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112); and/or

2) when the rechargeable discharge device (104) is charge saturated, a signal of the charge saturation detection device (107) is transmitted to the charging control device (102) to control the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112); and/or

3) when the rechargeable discharge device (104) is charge saturated, the signal of the charge saturation detection device (107) is transmitted to the charging control device (102), and the charging control device (102) performs trickling charge to the rechargeable discharge device (104) for

the set time delay, and then the charging control device (102) is driven to control the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112); and/or

4) when the rechargeable discharge device (104) is charge saturated, the signal of the charge saturation detection device (107) is transmitted to the charging control device (102) to reduce the charge current to the rechargeable discharge device (104) for waiting the detection charge saturation signal of the charge saturation detection device (107) further driving the charging control device (102) to control the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112) to implement two-stage charging; and/or

5) when the rechargeable discharge device (104) is charge saturated, the detection charge saturation signal of the charging state detection device (107) repeatedly controls the charging control device (102) to gradually reduce the charge current to the rechargeable discharge device (104), and finally the charging control device (102) is controlled to drive the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112).

When the power charging device with charge saturation disconnector through electromagnetic force release is charge saturated, there are one or more different types of releasing the rechargeable discharge device (104) by the conductive device (112) of the magnetic actuator conductive device (110), depending on the different structures, including:

1) when the state of the magnetic actuator conductive device (110)

changes from clamping to releasing, at least one electrode side of the rechargeable discharge device (104) disconnects from the conductive device (112) of the magnetic actuator conductive device (110) through gravity to stop charging; and/or

2) by means of installing prestressing device with magnetic force, current force, or mechanic force, such as installing the prestressing spring (106), the rechargeable discharge device (104) is pushed to disconnect along gravity direction, anti-gravity direction, or the other directions; if the prestressing spring (106) is installed, the prestressing spring (106) is pressurized to be prestressed state when the rechargeable discharge device (104) is placed in, and when the rechargeable discharge device (104) is charge saturated, the conductive device (112) of the magnetic actuator conductive device (110) releases the rechargeable discharge device (104) through the prestressing of the prestressing spring (106) to facilitate at least one electrode side of the rechargeable discharge device (104) pushed away from the conductive device (112) of the magnetic actuator conductive device (110) along the direction of the prestressing of the prestressing spring (106) to stop charging; in which the pushed direction can be along the gravity direction of the rechargeable discharge device (104) itself, the anti-gravity direction of the rechargeable discharge device (104) itself, or the other directions; and/or

3) when the rechargeable discharge device (104) is charge saturated, at least one electrode side of the rechargeable discharge device (104) is pushed to disconnect from the conductive device (112) of the magnetic actuator conductive device (110) through the thrust of the electromagnetic driving transposition mechanism (115) along the gravity direction of the rechargeable discharge device (104) itself, the anti-gravity direction of the rechargeable discharge device (104) itself, or the other directions.

FIG. 2 is a structural drawing showing an embodiment of FIG. 1 applied to the rechargeable discharge device (104) with conductive

structure installed on one side. As shown in FIG. 2, the conductive device (112) is installed for coupling with the conductive structure installed on one side of the rechargeable discharge device (104), and clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in; the remaining structures and operations are same as those of the embodiment in FIG. 1.

FIG. 3 is a structural drawing showing an embodiment of FIG. 1, wherein the magnetic actuator conductive device (110) is powered excitation, and then at least one electrode side of the rechargeable discharge device (104) disconnects from the magnetic actuator conductive device (110) to stop charging, according to the present invention.

As shown in FIG. 3, the charging power supply (101) is formed by power supply device with direct current (DC), DC transferred from alternating current (AC), or DC transferred from DC for charging the rechargeable discharge device (104) via the charging control device (102). The main components include:

---Charging control device (102): formed by electromechanical or solid state electronic elements, including microprocessor and necessary softwares, for receiving input of the charging power supply (101) to output and control the charge voltage and current over the rechargeable discharge device (104), and receiving a signal of charging state detection device (107) from the rechargeable discharge device (104) to control the power timing to the power excitation windings (103); in which the charging control device (102) can be single circuit device or combine with the power supply (101) to be integrated structure;

---Power excitation windings (103): formed by elements or device which can transfer input power energy to magnetic energy, installed within the magnetic actuator conductive device (110), or placed at the

position where the power excitation windings (103) can interact with the magnetic actuator conductive device (110); in which the power excitation windings (103) is directly controlled by the charging state detection device (107) or by the charging control device (102), and when the rechargeable discharge device (104) is charge saturated, the control modes are one or more as followings, including:

1) power excitation windings (103) can be directly controlled by charge saturation detection device to be conductive or disconnect to make magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112) of the magnetic actuator conductive device (110); and/or

2) a signal of charge saturation detection device (107) is transmitted to charging control device (102) to control the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112) of the magnetic actuator conductive device (110); and/or

3) the charging control device (102) performs trickling charge to the rechargeable discharge device (104) for the set time delay, and then the charging control device (102) is driven to control the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112) of the magnetic actuator conductive device (110); and/or

4) the signal of the charge saturation detection device (107) is transmitted to the charging control device (102) to reduce the charge current to the rechargeable discharge device (104) for waiting the detection charge saturation signal of the charge saturation detection device (107) further driving the charging control device (102) to control the power excitation windings (103) to be conductive or disconnect to make

the magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112) of the magnetic actuator conductive device (110) to implement two-stage charging; and/or

5) the detection charge saturation signal of the charging state detection device (107) repeatedly controls the charging control device (102) to gradually reduce the charge current to the rechargeable discharge device (104), and finally the charging control device (102) is controlled to drive the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112) of the magnetic actuator conductive device (110), and then by means of gravity and/or the elastic force from the prestressing spring (106), at least one electrode side of the rechargeable discharge device (104) disconnects from the magnetic actuator conductive device (110) to stop charging.

---Rechargeable discharge device (104): formed by rechargeable alkaline battery, or various rechargeable discharge battery, ultracapacitor, or capacitor, and installed within the conductive device (112) of the magnetic actuator conductive device (110) to be clamped and rechargeable state, in which when the magnetic actuator conductive device (110) is driven by power excitation, depending on the relative position relationship between the rechargeable discharge device (104) and the magnetic actuator conductive device (110), the conductive device (112) releases the clamped rechargeable discharge device (104), and then by means of gravity and/or the elastic force from the prestressing spring (106), at least one electrode side of the rechargeable discharge device (104) disconnects from the magnetic actuator conductive device (110) to stop charging;

---Charging state detection device (107): formed by one or more

charging state detection devices for detecting the charge saturation state for the rechargeable discharge device (104), in which when the rechargeable discharge device (104) is charge saturated, the rechargeable discharge device (104) can be released to stop charging through one or more ways as followings, including:

1) power excitation windings (103) can be directly controlled by the charge saturation detection device (107) to be conductive or disconnect to make magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112) of the magnetic actuator conductive device (110); and/or

2) a signal of charge saturation detection device (107) is transmitted to charging control device (102) to control the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112) of the magnetic actuator conductive device (110); and/or

3) the charging control device (102) performs trickling charge to the rechargeable discharge device (104) for the set time delay, and then the charging control device (102) is driven to control the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112) of the magnetic actuator conductive device (110); and/or

4) the signal of the charge saturation detection device (107) is transmitted to the charging control device (102) to reduce the charge current to the rechargeable discharge device (104) for waiting the detection charge saturation signal of the charge saturation detection device (107) further driving the charging control device (102) to control the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement for releasing the

rechargeable discharge device (104) clamped by the conductive device (112) of the magnetic actuator conductive device (110) to implement two-stage charging; and/or

5) the detection charge saturation signal of the charging state detection device (107) repeatedly controls the charging control device (102) to gradually reduce the charge current to the rechargeable discharge device (104), and finally the charging control device (102) is controlled to drive the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement for releasing the rechargeable discharge device (104) clamped by the conductive device (112) of the magnetic actuator conductive device (110), and then by means of gravity and/or the elastic force from the prestressing spring (106), at least one electrode side of the rechargeable discharge device (104) disconnects from the magnetic actuator conductive device (110) to stop charging.

As shown in FIG. 3, the operation of the magnetic actuator conductive device (110) of the power charging device with charge saturation disconnector through electromagnetic force release is as followings:

The magnetic actuator conductive device (110) includes the conductive devices (112) respectively conducting with the positive and negative electrodes of the rechargeable discharge device (104), and the magnetic driving structure (111), in which the conductive device (112) and the magnetic driving structure (111) institute the magnetic actuator conductive device (110) by combination or individual. When the rechargeable discharge device (104) is installed within the conductive device (112), the prestressing spring (106) is prestressed by the rechargeable discharge device (104), and the rechargeable discharge device (104) is charged through the prestressing and conductive characteristics of the conductive device (112). When the rechargeable discharge device (104) installed within the conductive device (112) is

charge saturated, the power excitation windings (103) is powered excitation to drive the magnetic driving structure (111), and then by means of gravity and/or the elastic force from the prestressing spring (106), at least one electrode side of the rechargeable discharge device (104) disconnects from the magnetic actuator conductive device (110) to stop charging.

The embodiment as shown in FIG. 3 can further apply to the rechargeable discharge device (104) with conductive structure installed on one side.

FIG. 4 is a structural drawing showing an embodiment of FIG. 3 applied to the rechargeable discharge device (104) with conductive structure installed on one side. As shown in FIG. 4, the conductive device (112) is installed for coupling with the conductive structure installed on one side of the rechargeable discharge device (104), and the clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in; the remaining structures and operations are same as those of the embodiment in FIG. 3.

FIG. 5 is a structural drawing showing an embodiment of the power excitation windings (103) driving the magnetic actuator conductive device (110) with the functionalities of prestressing release and magnetic clamping, according to the present invention.

As shown in FIG. 5, in which: the rechargeable discharge device (104) is clamped by the following one or more pressurized clamping force when the rechargeable discharge device (104) is placed in; the operational functions are that the charging control device (102) senses to output charge current to the rechargeable discharge device (104), the charging control device (102) powers excitation to the power excitation windings (103) to suck the magnetic driving structure (111) to make the conductive

device (112) to pressurize for clamping the rechargeable discharge device (104) to prevent releasing from the conductive device (112), and the conductive device (112) pressurizes to clamp the rechargeable discharge device (104), and transmits charging energy to the rechargeable discharge device (104); when the rechargeable discharge device (104) is charge saturated, the charging state detection device (107) detects and directly or through the charging control device (102) controls to cut off the current passing through the power excitation windings (103) to make the conductive device (112) to release the clamping force on the rechargeable discharge device (104), and then the rechargeable discharge device (104) disconnects from the conductive device (112) to stop charging; and the above disconnection is implemented by making use of gravity and/or the thrust of the prestressing spring (106).

The embodiment as shown in FIG. 5 can further apply to the rechargeable discharge device (104) with conductive structure installed on one side.

FIG. 6 is a structural drawing showing an embodiment of FIG. 5 applied to the rechargeable discharge device (104) with conductive structure installed on one side. As shown in FIG. 6, the conductive device (112) is installed for coupling with the conductive structure installed on one side of the rechargeable discharge device (104), and the clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in; the remaining structures and operations are same as those of the embodiment in FIG. 5.

The power charging device with charge saturation disconnector through electromagnetic force release can further make the conductive device (112) of the magnetic actuator conductive device (110) to simultaneously have the function of being driven by power excitation like

that of the magnetic driving structure (111), and makes use of the prestressing of the conductive device (112) to clamp and charge the rechargeable discharge device (104). The conductive device (112) is driven by the power excitation windings (103) of the magnetic actuator conductive device (110) to release clamping to the rechargeable discharge device (104) to stop charging when charge saturation.

FIG. 7 is a structural drawing showing an embodiment of the power excitation windings (103), wherein the power excitation windings (103) is powered to drive the conductive device (112) of the magnetic actuator conductive device (110), which simultaneously has the functionality of being driven by power excitation like that of the magnetic driving structure (111), for releasing the rechargeable discharge device (104) to stop charging when charge saturation, according to the present invention.

As shown in FIG. 7, when the rechargeable discharge device (104) is placed in, the conductive device (112) clamps and transmits charging energy to the rechargeable discharge device (104) through the prestressing thereof; and the power excitation windings (103) is powered excitation to drive the conductive device (112) of the magnetic actuator conductive device (110), which simulatneously has the functionality of being driven by power excitation like that of the magnetic driving structure (111), for releasing the rechargeable discharge device (104) to stop charging when charge saturation, wherein the operational functions are same as those of FIG.3.

The embodiment as shown in FIG. 7 can further apply to the rechargeable discharge device (104) with conductive structure installed on one side.

FIG. 8 is a structural drawing showing an embodiment of FIG. 7 applied to the rechargeable discharge device (104) with conductive structure installed on one side. As shown in FIG. 8, the conductive device (112) is installed for coupling with the conductive structure

installed on one side of the rechargeable discharge device (104), and the clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in; the remaining structures and operations are same as those of the embodiment in FIG. 7.

The power charging device with charge saturation disconnector through electromagnetic force release can further make the conductive device (112) of the magnetic actuator conductive device (110) to simultaneously have the function of being driven by power excitation like that of the magnetic driving structure (111), and makes use of the excitation current passing through the power excitation windings (103) to drive the conductive device (112) to clamp and charge the rechargeable discharge device (104). The power excitation to the power excitation windings (103) is terminated to make the conductive device (112) to release clamping to the rechargeable discharge device (104) to stop charging when charge saturation.

FIG. 9 is a structural drawing showing an embodiment of the power excitation windings (103), wherein the power excitation windings (103) drives the conductive device (112) of the magnetic actuator conductive device (110), which simultaneously has the functionality of being driven by power excitation like that of the magnetic driving structure (111), to clamp the rechargeable discharge device (104) for charging; on the other hand, the powering excitation to the power excitation windings (103) terminates for releasing the rechargeable discharge device (104) from the conductive device (112) to stop charging when charge saturation, according to the present invention.

As shown in FIG. 9, when the rechargeable discharge device (104) is placed in, by means of the power excitation windings (103) being powered excitation to drive the conductive device (112), which

simultaneously has the functionality of being driven by power excitation, the conductive device (112) clamps and transmits charging energy to the rechargeable discharge device (104); and the powering excitation to the power excitation windings (103) terminates for releasing the rechargeable discharge device (104) from the conductive device (112) to stop charging when charge saturation, wherein the operational functions are same as those of FIG.5.

The embodiment as shown in FIG. 9 can further apply to the rechargeable discharge device (104) with conductive structure installed on one side.

FIG. 10 is a structural drawing showing an embodiment of FIG. 9 applied to the rechargeable discharge device (104) with conductive structure installed on one side. As shown in FIG. 10, the conductive device (112) is installed for coupling with the conductive structure installed on one side of the rechargeable discharge device (104), and clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in; the remaining structures and operations are same as those of the embodiment in FIG. 9.

The power charging device with charge saturation disconnector through electromagnetic force release can further install prestressing pushed electromagnetic driving suction device (114), which will get displacement because of being actuated through the charging control device (102) controlling the power excitation current passing through the power excitation windings (103) when the rechargeable discharge device (104) is charged, and the space vacated by the displacement is used for installing the rechargeable discharge device (104); when the rechargeable discharge device (104) is charge saturated, the charging state detection device (107) detects and directly or through the charging control device

(102) controls to cut off the power excitation current passing through the power excitation windings (103), and the prestressing spring (106) is driven to make the prestressing pushed electromagnetic driving suction device (114) to push the rechargeable discharge device (104) away from the conductive device (112) to stop charging.

FIG. 11 is a structural drawing showing an embodiment of the power excitation windings (103) driving the prestressing pushed electromagnetic driving suction device (114), according to the present invention.

As shown in FIG. 11, the main components include:

---Charging control device (102): formed by electromechanical or solid state electronic elements, including microprocessor and softwares, for receiving input of the charging power supply (101) to output and control the charge voltage and current over the rechargeable discharge device (104), and receiving a signal of the charging state detection device (107) from the rechargeable discharge device (104) to control the power timing to the power excitation windings (103); in which the charging control device (102) can be single circuit device or combine with the power supply (101) to be integrated structure;

---Magnetic actuator conductive device (110): equipped with the conductive device (112) connecting with the charging control device (102), and installed the prestressing pushed electromagnetic driving suction device (114) at the space for installing the rechargeable discharge device (104);

---Prestressing pushed electromagnetic driving suction device (114): equipped with the power excitation windings (103) and the prestressing spring (106), and formed of electromagnetic force dirving and spring force reversion mechanism; in which when power interruption, by means of the prestressing of the prestressing spring (106), the moving mechanism of the prestressing pushed electromagnetic driving suction device (114) can push the rechargeable discharge device (104) away from

the position of the conductive device (112); and when the power excitation windings (103) is powered excitation, the moving mechanism of the prestressing pushed electromagnetic driving suction device (114) can be sucked to move to provide space for placing the rechargeable discharge device (104) to receive charge from the conductive device (112); and

---Charging state detection device (107): formed by one or more charging state detection devices for detecting the charge saturation state for the rechargeable discharge device (104).

The constitution types for the charging state detection device (107) of the rechargeable discharge device (104) are given examples as followings, but not to limit:

1) formed by terminal voltage detection device on charging, which is the charging state detection device (107) performing terminal voltage detection, installed at positive and negative electrodes of the charging control device (102), in which the positive and negative electrodes output charging energy, or installed at positive and negative electrodes of the rechargeable discharge device (104), wherein the above two installation ways can detect terminal voltage signal, when the rechargeable discharge device (104) is charged, for determining charge saturation state for the rechargeable discharge device (104); and /or

2) formed by detection device with sudden decreased charge saturation voltage, which adopts terminal voltage detection device as the charging state detection device (107), wherein when the rechargeable discharge device (104) is charge saturated, the terminal voltage decreases suddenly; the terminal voltage detection device can be installed at positive and negative electrodes of the charging control device (102), in which the positive and negative electrodes output charging energy, or installed at positive and negative electrodes of the rechargeable discharge device (104), and the above two installation ways can detect power signal of

sudden decreased terminal voltage, when the rechargeable discharge device (104) is charge saturated; and /or

3) formed by charge current detection circuit, which provides a signal of current value when charge current decreases in charge saturation; and/or

4) formed by thermal switch device, which occurs response of switch function when the temperature of the rechargeable discharge device (104) in charge saturation raises to the set value; and/or

5) formed by the element with the coefficient of resistance related to positive or negative temperature, which occurs change of relative resistance value when the temperature of the rechargeable discharge device (104) in charge saturation raises to the set value; and/or

6) formed by internal resistance measurement circuit, which detects a signal of relative resistance value when internal resistance of the rechargeable discharge device (104) in charge saturation occurs relative change; and/or

7) formed by the other typical methods and devices which can detect the rechargeable discharge device (104) in charge saturation.

There are one or more functionalities involved in the above operations performed by the charging state detection device (107), including:

1) the charging state detection device (107) of the rechargeable discharge device (104) can directly terminate power excitation to the power excitation windings (103);

2) the detection signal of the charging state detection device (107) is transmitted to the charging control device (102), and then the charging control device (102) cuts off power energy to the power excitation windings (103); and

3) the detection signal of the charging state detection device (107) is transmitted to the charging control device (102), and then the charging control device (102) performs trickling charge to the rechargeable

discharge device (104) for the set time delay, or again through the detection signal of the charging state detection device (107), the charging control device (102) cuts off power energy to the power excitation windings (103) to stop excitation.

As mentioned above, the charging state detection device (107) controls the charging control device (102) to cut off power energy to the power excitation windings (103), by means of the prestressing of the prestressing spring (106), the prestressing pushed electromagnetic driving suction device (114) is pushed, and then the rechargeable discharge device (104) is pushed away from the conductive device (112) to stop charging.

The rechargeable discharge device (104) is formed by rechargeable alkaline battery, or various rechargeable discharge battery, ultracapacitor, or capacitor, and installed within the conductive device (112) of the magnetic actuator conductive device (110) to be clamped and rechargeable state. When the excitation to the power excitation windings (103) of the prestressing pushed electromagnetic driving suction device (114) is terminated, or the power excitation current decreases to the threshold limit value that the prestressing spring (106) of the prestressing pushed electromagnetic driving suction device (114) occurs push, at least one electrode side of the rechargeable discharge device (104) disconnects from the magnetic actuator conductive device (110) to stop charging.

As shown in FIG.11, the power charging device with charge saturation disconnector through electromagnetic force release can further tack synchronous power switch function, in which synchronous power switch is installed at a position for interacting with the magnetic actuator conductive device (110); when the rechargeable discharge device (104) is placed in and the magnetic actuator conductive device (110) is forced to move to deform, the synchronous power switch is touched simultaneously to make power supply to power the rechargeable discharge device (104) for charging; and the synchronous power switch is formed by

electromechanical or solid state switches for the following one or more switch functional operations, including:

the trigger by mechanical displacement, photoelectric operation, pressure operation, acoustic operation, static electricity operation, manipulation of magnetic induction, operation of electromagnetic induction, and capacitive sensor operation, the above operational types are used for switch functional operations of power supply and which are given embodiments as below.

FIG. 12 is a structural drawing showing an embodiment of FIG. 11 equipped with reed contact (126) as a synchronous power switch.

As shown in FIG. 12, the power charging device with charge saturation disconnector through electromagnetic force release shown in FIG. 11 can further install the reed contact (126) for forming synchronous operation switch with the conductive device (112) to simultaneously start power when the rechargeable discharge device (104) is placed in, and to simultaneously cut off power when the rechargeable discharge device (104) disconnects from the conductive device (112).

FIG. 13 is a structural drawing showing an embodiment of FIG. 11 equipped with touch switch (limit switch) (117) as a synchronous power switch.

As shown in FIG. 13, the power charging device with charge saturation disconnector through electromagnetic force release shown in FIG. 11 can further install the touch switch (limit switch) (117) for forming synchronous operation switch with the conductive device (112) to simultaneously start power when the rechargeable discharge device (104) is placed in, and to simultaneously cut off power when the rechargeable discharge device (104) disconnects from the conductive device (112).

The embodiments as shown in FIG. 11 to FIG. 13 can further apply to the rechargeable discharge device (104) with conductive structure installed on one side.

FIG. 14 is a structural drawing showing an embodiment of FIG. 11 applied to the rechargeable discharge device (104) with conductive structure installed on one side. As shown in FIG. 14, the conductive device (112) is installed for coupling with the conductive structure installed on one side of the rechargeable discharge device (104), and the clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in; the remaining structures and operations are same as those of the embodiment in FIG. 11.

FIG. 15 is a structural drawing showing an embodiment of FIG. 12 applied to the rechargeable discharge device (104) with conductive structure installed on one side. As shown in FIG. 15, the conductive device (112) is installed for coupling with the conductive structure installed on one side of the rechargeable discharge device (104), and the clamping structure (229) controlled by the magnetic actuator conductive device (110), and further the reed contact (126) installed for forming synchronous operation switch with the conductive device (112), are installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in; the remaining structures and operations are same as those of the embodiment in FIG. 12.

FIG. 16 is a structural drawing showing an embodiment of FIG. 13 equipped with the touch switch (limit switch) (117) as a synchronous power switch. As shown in FIG. 16, the conductive device (112) is installed for coupling with the conductive structure installed on one side of the rechargeable discharge device (104), and the clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in; the remaining structures and operations are same as those of the embodiment in FIG. 13.

The power charging device with charge saturation disconnector through electromagnetic force release can further drive magnetic circuit with iron-core (127) of the magnetic actuator conductive device (110) by means of charge current passing through the power excitation windings (103), and then the conductive device (112) clamps and charges the rechargeable discharge device (104); and the charge current terminates or decreases when charge saturation, and then the magnetic actuator conductive device (110) and the conductive device (112) release the clamped rechargeable discharge device (104) for disconnecting from the conductive device (112) to stop charging.

FIG. 17 is a structural drawing showing an embodiment of the power excitation windings (103) with charge current passing througe for driving the magnetic actuator conductive device (110) with the functionalities of prestressing release and magnetic clamping, according to the present invention.

As shown in FIG. 17, the main components include:

---Charging power supply (101): related to DC charging power supply composed of various DC power supply or DC transferred from AC power supply;

---Charging control device (102): related to device which can perform the following one or more operations to the rechargeable discharge device (104), the operations including: 1) manipulating charge time; and/or 2) manipulating charge voltage; and/or 3) manipulating charge current;

---Magnetic actuator conductive device (110): equipped with the conductive device (112) connecting with the charging control device (102), and installed the electromagnetic actuator (124) at the space for installing the rechargeable discharge device (104); in which the electromagnetic actuator (124) includes the power excitation windings (103), the magnetic circuit with iron-core (127), the magnetic driving structure (111), the magnetic circuit with iron-core (127), the conductive

device (112), and the prestressing homing spring (116), for sucking the magnetic driving structure (111) when the power excitation windings (103) is powered, to make the conductive device (112) which is in total structure with the magnetic driving structure (111) to clamp the rechargeable discharge device (104), and to charge the rechargeable discharge device (104); and when the current passing through the power excitation windings (103) decreases or terminates, the magnetic driving structure (111) returns to the original position through the prestressing of the prestressing homing spring (116), and then the conductive device (112) releases the clamped rechargeable discharge device (104); and

---Parallel shunt circuit device (120): formed by electromechanical or electronic circuit elements, or solid state power components, and parallel to two sides of the power excitation windings (103), for controlling the value of the current passing through the power excitation windings (103), and further controlling the disconnecting timing for the magnetic actuator conductive device (110); in which if all charge current is adopted to be the power excitation current to the magnetic actuator conductive device (110), the parallel shunt circuit device (120) may not be installed.

The above power energy of the charging power supply (101) can directly or through the charging control device (102) pass through the power excitation windings (103), and then all or part of the current passing through the power excitation windings (103) passes through the rechargeable discharge device (104) via the conductive device (112) to charge the rechargeable discharge device (104).

When the rechargeable discharge device (104) is placed in to make charge current to pass through the power excitation windings (103), the electromagnetic actuator (124) is sucked by excitation to drive the magnetic driving structure (111) of the magnetic actuator conductive device (110) and the conductive device (112) which is in total structure with the magnetic driving structure (111) to produce the clamping force

and conductive functionality to the rechargeable discharge device (104).

When the rechargeable discharge device (104) is charged, the voltage thereof gradually raises, and then the charge current decreases and further makes the current passing through the power excitation windings (103) to decrease, or when the current passing through the power excitation windings (103) terminates through the control of the charging control device (102), the excitation to the electromagnetic actuator (124) is terminated, and by means of the prestressing of the prestressing homing spring (116), the magnetic driving structure (111) and the conductive device (112) which is in total structure with the magnetic driving structure (111) release the clamped rechargeable discharge device (104).

The embodiment as shown in FIG.17 can further install the prestressing spring (106), when the current passing through the power excitation windings (103) decreases to the threshold limit value or terminates, the magnetic driving structure (111) and the conductive device (112) which is in total structure with the magnetic driving structure (111) can release the clamped rechargeable discharge device (104), and coerce to push the rechargeable discharge device (104) away from the conductive device (112) to stop charging.

FIG. 18 is a structural drawing showing an embodiment of the magnetic actuator conductive device (110) of FIG. 17 equipped with prestressing spring (106).

As shown in FIG.18, the main components are same as those in FIG.17, and the further characteristics is that the prestressing spring (106) is installed at the space within the conductive device (112) for installing the rechargeable discharge device (104). When the current passing through the power excitation windings (103) decreases to the threshold limit value or terminates, the magnetic driving structure (111) and the conductive device (112) which is in total structure with the magnetic driving structure (111) can release the clamped rechargeable discharge

device (104), and the prestressing spring (106) pushs the rechargeable discharge device (104) to disconnect from the conductive device (112).

As shown in FIG. 17 and 18, the power charging device with charge saturation disconnector through electromagnetic force release can further adopt the pitch status between the two conductive devices (112) as the positive and negative electrodes, in which the above pitch is more than the pitch between two electrodes of the rechargeable discharge device (104) before charging, but after the rechargeable discharge device (104) is placed in, the two conductive devices (112) as the positive and negative electrodes are pushed close through the start structure driven by external force to contact with the positive and negative electrodes of the rechargeable discharge device (104), and then the rechargeable discharge device (104) is charged by the charging power supply via the two conductive devices (112) as the positive and negative electrodes. The power excitation windings (103) is powered excitation simultaneously through the charge current to suck the magnetic driving structure (111), and then the conductive device (112) which is in total structure with the magnetic driving structure (111) clamps and charges to the rechargeable discharge device (104) continuously.

FIG. 19 is a structural drawing showing an embodiment of installing press type boot structure (231) for activating charging function, according to the present invention.

As shown in FIG. 19, the main components include:

---Charging power supply (101): related to DC charging power supply composed of various DC power supply or DC transferred from AC power supply;

---Charging control device (102): related to device which can perform the following one or more operations to the rechargeable discharge device (104), the operations including: 1) manipulating charge time; and/or 2) manipulating charge voltage; and/or 3) manipulating charge current; and

---Magnetic actuator conductive device (110): equipped with the conductive device (112) connecting with the charging control device (102), in which the conductive device (112) and the magnetic driving structure (111) are in total structure, and the pitch between the two conductive devices (112) as the positive and negative electrodes is more than the pitch between two electrodes of the rechargeable discharge device (104); after positioning ring structure (105) is placed in the rechargeable discharge device (104), press type boot structure (231) is driven by external force, and the two conductive devices (112) as the positive and negative electrodes are pushed close to conduct with the positive and negative electrodes of the rechargeable discharge device (104), and then the charging power supply power to the rechargeable discharge device (104) via the two conductive devices (112) as the positive and negative electrodes, and the power excitation windings (103) is powered excitation simultaneously, so that the electromagnetic actuator (124) has an effect to suck the magnetic driving structure (111), and the conductive device (112) which is in total structure with the magnetic driving structure (111) is forced to clamp the rechargeable discharge device (104) continuously, and to charge the rechargeable discharge device (104); when the current passing through the power excitation windings (103) decreases to the threshold limit value or terminates, by means of the prestressing of the prestressing homing spring (116), the magnetic driving structure (111) and the conductive device (112) which is in total structure with the magnetic driving structure (111) can release the clamped rechargeable discharge device (104) and stop charging.

As shown in FIG. 17 to FIG. 19, if the conductive device and the clamping structure are separate structures installed at different positions, such as conductive device (112) and clamping structure (229), in which the conductive device (112) for transmitting the charge power energy is installed against the direction for installing the conductive device (112),

and the clamping structure (229) is the same structure to only have the clamping functionality for clamping the side of the rechargeable discharge device (104), when the rechargeable discharge device (104) is place in, the charging power supply can power the rechargeable discharge device (104), and the power excitation windings (103) is powered excitation to make the electromagnetic actuator (124) to clamp the rechargeable discharge device (104); and when the current passing through the power excitation windings (103) decreases or terminates, by means of the prestressing of the prestressing homing spring (116), the magnetic driving structure (111) and the conductive device (112) which is in total structure with the magnetic driving structure (111) release the clamped rechargeable discharge device (104).

The embodiments as shown in FIG. 17 to FIG. 19 can further apply to the rechargeable discharge device (104) with conductive structure installed on one side.

FIG. 20 is a structural drawing showing an embodiment of FIG. 17 applied to the rechargeable discharge device (104) with conductive structure installed on one side. As shown in FIG. 20, the conductive device (112) is installed for coupling with the conductive structure installed on one side of the rechargeable discharge device (104), and the clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in; the remaining structures and operations are same as those of the embodiment in FIG. 17.

FIG. 21 is a structural drawing showing an embodiment of FIG. 18 applied to the rechargeable discharge device (104) with conductive structure installed on one side. As shown in FIG. 21, the conductive device (112) is installed for coupling with the conductive structure installed on one side of the rechargeable discharge device (104), the

clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in, and the prestressing spring (106) is installed for pushing the rechargeable discharge device (104), after the clamping structure (229) releases the clamped rechargeable discharge device (104) when charge saturation, the rechargeable discharge device (104) is pushed to disconnect from the conductive device (112) through the prestressing spring (106), the remaining structures and operations are same as those of the embodiment in FIG. 18.

FIG. 22 is a structural drawing showing an embodiment of FIG. 19 applied to the rechargeable discharge device (104) with conductive structure installed on one side. As shown in FIG. 22, the conductive device (112) is installed for coupling with the conductive structure installed on one side of the rechargeable discharge device (104), and prestressing reed (108) is installed between the conductive device (112) and the rechargeable discharge device (104), in which the prestressing reed (108) is elastic structure with prestressing, and the prestressing, which is normally along the direction for pushing the rechargeable discharge device (104) away to stop charging, is less than the clamping force of the clamping structure (229), but more than the weight of the rechargeable discharge device (104); the prestressing reed (108) is equipped with relay conductive structure (1081) for transmitting the power energy of the positive and negative electrodes of the conductive device (112) to the positive and negative electrodes of the rechargeable discharge device (104), if the prestressing reed (108) is made of insulative material, than the relay conductive structure (1081) can be directly installed on the prestressing reed (108), and if the prestressing reed (108) is made of conductive material, than there is necessary additional insulator existing between the relay conductive structure (1081) and the

prestressing reed (108); when the rechargeable discharge device (104) is placed in, through the operation to the press type boot structure (231), the clamping structure (229) controlled by the magnetic actuator conductive device (110) can clamp the rechargeable discharge device (104), and force the prestressing reed (108) to move, and then the power energy of the conductive device (112) and be transmitted to the rechargeable discharge device (104) for charging via the relay conductive structure (1081) installed on the prestressing reed (108), and because the power excitation windings (103) is powered excitation, the clamping structure (229) clamps the rechargeable discharge device (104) continuously; and when charge saturation, the clamping structure (229) disconnects and releases the clamped rechargeable discharge device (104), by means of the prestressing of the prestressing reed (108), the rechargeable discharge device (104) disconnects from the conductive device (112) to stop charging; the remaining structures and operations are same as those of the embodiment in FIG. 19.

FIG. 23 is a schematic view showing disconnective state among the rechargeable discharge device (104), the prestressing reed (108), and the conductive device (112) in the embodiment of FIG. 22.

FIG. 24 is a schematic view showing conductive state among the rechargeable discharge device (104), the prestressing reed (108), and the conductive device (112) in the embodiment of FIG. 22.

The power charging device with charge saturation disconnector through electromagnetic force release further can install electromagnetic driving transposition mechanism (115) within the magnetic actuator conductive device (110), and the electromagnetic driving transposition mechanism (115) is installed for pushing the rechargeable discharge device (104) away from the position of the magnetic actuator conductive device (110); when the rechargeable discharge device (104) is charge saturated, the power excitation windings (103) drives the electromagnetic

driving transposition mechanism (115) for pushing the rechargeable discharge device (104) away from the magnetic actuator conductive device (110).

FIG. 25 is a structural drawing showing an embodiment of the power excitation windings (103) driving the magnetic actuator conductive device (110) of electromagnetic driving transposition mechanism, according to the present invention.

As shown in FIG. 25, the operational functionality of the power charging device with charge saturation disconnector through electromagnetic force release is that when the rechargeable discharge device (104) is installed within the magnetic actuator conductive device (110), the rechargeable discharge device (104) is clamped and charged by the conductive device (112), and when the rechargeable discharge device (104) is charge saturated, the charging state detection device (107) used for detecting the charging state for the rechargeable discharge device (104) can perform the following one or more operational functions, including:

1) the power excitation windings (103) can be directly controlled by the charge saturation detection device (107) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement, and the electromagnetic driving transposition mechanism (115) is driven simultaneously to push the rechargeable discharge device (104), and then the conductive device (112) of the magnetic actuator conductive device (110) releases the clamped rechargeable discharge device (104);

2) a signal of the charge saturation detection device (107) is transmitted to the charging control device (102) to control the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement, and the electromagnetic driving transposition mechanism (115) is driven simultaneously to push the rechargeable discharge device (104), and then

the conductive device (112) of the magnetic actuator conductive device (110) releases the clamped rechargeable discharge device (104);

3) the charging control device (102) performs trickling charge to the rechargeable discharge device (104) for the set time delay, and then the charging control device (102) is driven to control the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement, and the electromagnetic driving transposition mechanism (115) is driven simultaneously to push the rechargeable discharge device (104), and then the conductive device (112) of the magnetic actuator conductive device (110) releases the clamped rechargeable discharge device (104);

4) the signal of the charge saturation detection device (107) is transmitted to the charging control device (102) to reduce the charge current to the rechargeable discharge device (104) for waiting the detection charge saturation signal of the charge saturation detection device (107) further driving the charging control device (102) to control the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement, and the electromagnetic driving transposition mechanism (115) is driven simultaneously to push the rechargeable discharge device (104), and then the conductive device (112) of the magnetic actuator conductive device (110) releases the clamped rechargeable discharge device (104) to implement two-stage charging; and

5) the detection charge saturation signal of the charging state detection device (107) repeatedly controls the charging control device (102) to gradually reduce the charge current to the rechargeable discharge device (104), and finally the charging control device (102) is controlled to drive the power excitation windings (103) to be conductive or disconnect to make the magnetic driving structure (111) to get displacement for pushing the conductive device (112), and when the power excitation windings

(103) is powered excitation, the electromagnetic driving transposition mechanism (115) is driven simultaneously to push the rechargeable discharge device (104), and then at least one electrode side of the rechargeable discharge device (104) disconnects from the conductive device (112) to stop charging.

As shown in FIG. 25, the power charging device with charge saturation disconnector through electromagnetic force release can further tack synchronous power switch function, in which synchronous power switch is installed at a position for interacting with the magnetic actuator conductive device (110); when the rechargeable discharge device (104) is placed in and the magnetic actuator conductive device (110) is forced to move to deform, the synchronous power switch is touched simultaneously to make power supply to power the rechargeable discharge device (104) for charging; and the synchronous power switch is formed by electromechanical or solid state switches for the following one or more switch functional operations, including:

the trigger by mechanical displacement, photoelectric operation, pressure operation, acoustic operation, static electricity operation, manipulation of magnetic induction, operation of electromagnetic induction, and capacitive sensor operation, the above operational types are used for switch functional operations of power supply.

FIG. 26 is a structural drawing showing an embodiment of FIG. 25 equipped with the reed contact (126) as a synchronous power switch.

As shown in FIG. 26, the reed contact (126) is installed for forming the conductive contact of the synchronous operational switch with the conductive device (112), and the installed position thereof is at a position when the rechargeable discharge device (104) is placed in, by means of the installation of the rechargeable discharge device (104), or the displacement of the reed of the magnetic actuator conductive device (110), the charging power supply can be driven to transfer disconnection (off) to

powering (on).

FIG. 27 is a structural drawing showing an embodiment of FIG. 25 equipped with the touch switch (limit switch) (117) as a synchronous power switch.

As shown in FIG. 27, the synchronous power switch is formed by the touch switch (limit switch) (117), which is installed at a position when the rechargeable discharge device (104) is placed in, by means of the installation of the rechargeable discharge device (104), or the displacement of the reed of the magnetic actuator conductive device (110), the charging power supply can be driven to transfer disconnection (off) to powering (on).

The embodiments as shown in FIG. 25 to FIG. 27 can further apply to the rechargeable discharge device (104) with conductive structure installed on one side.

FIG. 28 is a structural drawing showing an embodiment of FIG. 25 applied to the rechargeable discharge device (104) with conductive structure installed on one side. As shown in FIG. 28, the conductive device (112) is installed for coupling with the conductive structure installed on one side of the rechargeable discharge device (104), and the clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in; the remaining structures and operations are same as those of the embodiment in FIG. 25.

FIG. 29 is a structural drawing showing an embodiment of FIG. 26 applied to the rechargeable discharge device (104) with conductive structure installed on one side. As shown in FIG. 29, the conductive device (112) is installed for coupling with the conductive structure installed on one side of the rechargeable discharge device (104), and the clamping structure (229) controlled by the magnetic actuator conductive

device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in; the remaining structures and operations are same as those of the embodiment in FIG. 26.

FIG. 30 is a structural drawing showing an embodiment of FIG. 27 applied to the rechargeable discharge device (104) with conductive structure installed on one side. As shown in FIG. 30, the conductive device (112) is installed for coupling with the conductive structure installed on one side of the rechargeable discharge device (104), and the clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in; the remaining structures and operations are same as those of the embodiment in FIG. 27.

CLAIMS

1. A power charging device with a charge saturation disconnector utilizing electromagnetic force release, which is formed by a charging power supply, a charging control device, a magnetic actuator conductive device, power excitation windings, a rechargeable discharge device, and a charge state detection device for detection of the charge situation of the rechargeable discharge device; in which the power charging device with charge saturation disconnector utilising electromagnetic force release supplies power from the charging power supply (101) to the charging control device (102), and then under the control of the charging control device (102) transmits the power to the magnetic actuator conductive device (110) for charging the rechargeable discharge device (104), which has been clamped by a conductive device (112) installed within the magnetic actuator conductive device (110); wherein:

the charging control device (102) is formed by electromechanical or solid state electronic elements including a microprocessor and software, for receiving power input from the charging power supply (101) to output and control a charging voltage and current supplied to the rechargeable discharge device (104), and receiving a signal from the charging state detection device (107) to control the excitation timing of the power excitation windings (103); wherein the charging control device (102) is a single circuit device or combines with the power supply (101) to be an integrated structure;

the power excitation windings (103) are formed by elements or a device which converts input power energy to magnetic energy, and installed within the magnetic actuator conductive device (110), or placed at a position where the power excitation windings (103) interact with the magnetic actuator conductive device (110); wherein the power excitation windings (103) are directly controlled by the charging state detection device (107) or by the charging control device (102) to be in a conductive excitation state or

to disconnect to displace a magnetic driving structure (111) for releasing the rechargeable discharge device (104) clamped by the conductive device (112) of the magnetic actuator conductive device (110), the rechargeable discharge device (104) being further disconnected by at least one disconnection force provided by a release structural unit (1060), by gravity displacement, by a prestressing device operable by magnetic force, current force, or mechanical force, by a prestressing spring, or by an electromagnetic driving transposition mechanism; wherein by means of said at least one disconnection force, at least one electrode side of the rechargeable discharge device (104) is disconnected from the conductive device (112) to stop the charging;

the rechargeable discharge device (104) and conductive device (112) of the magnetic actuator conductive device (110) have a relative position relationship such that the rechargeable discharge device (104) is clamped by the conductive device (112) when the rechargeable discharge device (104) is installed in the conductive device, and both the rechargeable discharge device and conductive device present a conductive state with a same polarity for receiving charging energy; and

the charging state detection device (107) is installed in at least one of the following positions: within the rechargeable discharge device (104); within the near rechargeable discharge device (104); in a position linking the electrode side of the rechargeable discharge device (104); and in a position linking the output side of the charging power supply of the charging control device (102) to transmit the charging state detection signal;

wherein the charging state detection device (107) of the rechargeable discharge device (104) includes at least one of the following detection devices:

a terminal voltage detection device installed at positive and negative electrodes of the charging control device (102) or at positive and negative

electrodes of the rechargeable discharge device (104), so as to detect a terminal voltage signal of the rechargeable discharge device when the rechargeable discharge device (104) is charged, for determining the charge saturation state of the rechargeable discharge device (104);

a detection circuit for detecting a suddenly decreased charge saturation voltage that occurs when the rechargeable discharge device (104) is charge saturated and the terminal voltage decreases suddenly; the detection circuit being installed at positive and negative electrodes of the charging control device (102) or at positive and negative electrodes of the rechargeable discharge device (104);

a charge current detection circuit, which provides a signal of current value when the charge current decreases at charge saturation;

a thermal switch device operable to perform a switching function when the temperature of the rechargeable discharge device (104) in charge saturation rises to a set value;

an element with a coefficient of resistance related to positive or negative temperature, which undergoes a change in relative resistance value when the temperature of the rechargeable discharge device (104) in charge saturation rises to a set value;

an internal resistance measurement circuit, which detects a relative resistance value when an internal resistance of the rechargeable discharge device (104) in charge saturation undergoes a relative change; and

other methods and devices which detect that the rechargeable discharge device (104) is in charge saturation;

wherein when the rechargeable discharge device (104) is charge saturated, at least one of the following operations is performed:

a) the power excitation windings (103) are directly controlled by the charge saturation detection device to be conductive or disconnected to cause the magnetic driving structure (111) to be displaced for

releasing the rechargeable discharge device (104) clamped by the conductive device (112);

b) a signal is transmitted from the charge saturation detection device (107) to the charging control device (102) to control the power excitation windings (103) to be conductive or disconnected to cause displacement of the magnetic driving structure (111) for releasing the rechargeable discharge device (104) clamped by the conductive device (112);

c) a signal from the charge saturation detection device (107) is transmitted to the charging control device (102), and the charging control device (102) performs a trickling charge to the rechargeable discharge device (104) for a set time delay, and then the charging control device (102) is driven to control the power excitation windings (103) to be conductive or disconnected to cause the magnetic driving structure (111) to be displaced for releasing the rechargeable discharge device (104) clamped by the conductive device (112);

d) the signal of the charge saturation detection device (107) is transmitted to the charging control device (102) to reduce the charge current to the rechargeable discharge device (104) while waiting for the detection charge saturation signal of the charge saturation detection device (107), the charge saturation signal further driving the charging control device (102) to control the power excitation windings (103) to be conductive or disconnected to cause the magnetic driving structure (111) to be displaced for releasing the rechargeable discharge device (104) clamped by the conductive device (112) to implement two-stage charging; and

e) the detection charge saturation signal of the charging state detection device (107) repeatedly controls the charging control device (102) to

gradually reduce the charge current to the rechargeable discharge device (104), and finally the charging control device (102) is controlled to drive the power excitation windings (103) to be conductive or disconnected to cause the magnetic driving structure (111) to be displaced for releasing the rechargeable discharge device (104) clamped by the conductive device (112).

2. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 1, wherein when the power charging device with charge saturation disconnector through electromagnetic force release is charge saturated, release of the rechargeable discharge device and termination of charging by the conductive device of the magnetic actuator conductive device is accomplished in one or more than one of the following ways:

a) when the state of the magnetic actuator conductive device (110) changes from clamping to releasing, at least one electrode side of the rechargeable discharge device (104) disconnects from the conductive device (112) of the magnetic actuator conductive device (110) through gravity to stop charging;

b) a prestressing spring (106) is pressurized to be in a prestressed state when the rechargeable discharge device (104) is placed in the conductive device, and when the rechargeable discharge device (104) is charge saturated, the conductive device (112) of the magnetic actuator conductive device (110) releases the rechargeable discharge device (104) through the prestressing of the prestressing spring (106) to cause at least one electrode side of the rechargeable discharge device (104) to be pushed away from the conductive device (112) of the magnetic actuator conductive device (110) along the direction of the prestressing of the prestressing spring (106) to stop charging;

wherein the pushed direction is along the gravity direction of the rechargeable discharge device (104) itself, the anti-gravity direction of the rechargeable discharge device (104) itself, or another direction;

c) when the rechargeable discharge device (104) is charge saturated, at least one electrode side of the rechargeable discharge device (104) is pushed to disconnect from the conductive device (112) of the magnetic actuator conductive device (110) through the thrust of the electromagnetic driving transposition mechanism (115) along the gravity direction of the rechargeable discharge device (104) itself, the anti-gravity direction of the rechargeable discharge device (104) itself, or another direction.

3. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 1, wherein the conductive device (112) is installed on one side of the rechargeable discharge device (104), a clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in the clamping structure.

4. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 1, wherein the magnetic actuator conductive device (110) is powered by excitation to cause at least one electrode side of the rechargeable discharge device (104) to disconnect from the magnetic actuator conductive device (110) to stop charging; and

the rechargeable discharge device (104) is formed by a rechargeable alkaline battery, rechargeable discharge battery, ultracapacitor, or capacitor.

5. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 4, wherein the conductive device (112) is installed on one side of the rechargeable discharge device (104), a clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in the conductive device.

6. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 2, wherein the power excitation windings (103) drive the magnetic actuator conductive device (110) with the functionalities of prestressing release and magnetic clamping; the rechargeable discharge device (104) is clamped by a pressurized clamping force when the rechargeable discharge device (104) is placed in the conductive device; the charging control device (102) senses output of the charge current to the rechargeable discharge device (104), the charging control device (102) causes excitation of the power excitation windings (103) to attract the magnetic driving structure (111) and to cause the conductive device (112) to pressurize for clamping the rechargeable discharge device (104) to prevent release of the rechargeable discharge device from the conductive device (112), and the conductive device (112) transmits charging energy to the rechargeable discharge device (104); wherein when the rechargeable discharge device (104) is charge saturated, the charging state detection device (107) detects and directly or through the charging control device (102) cuts off the current passing through the power excitation windings (103) to cause the conductive device (112) to release the clamping force on the rechargeable discharge device (104), and then the rechargeable discharge device (104) disconnects from the conductive device (112) to stop charging; the disconnection being implemented by making use

of gravity or the thrust of the prestressing spring (106).

7. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 6, wherein the conductive device (112) is installed on one side of the rechargeable discharge device (104), a clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in the conductive device.

8. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 1, wherein the conductive device (112) of the magnetic actuator conductive device (110) is simultaneously driven by power excitation to cause prestressing of the conductive device (112) and to charge the rechargeable discharge device (104); the conductive device (112) being driven by the power excitation windings (103) of the magnetic actuator conductive device (110) to release clamping to the rechargeable discharge device (104) to stop charging when charge saturation occurs.

9. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 8, wherein the conductive device (112) is installed on one side of the rechargeable discharge device (104), a clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in the conductive device.

10. The power charging device with charge saturation disconnector

through electromagnetic force release as claimed in Claim 1, wherein the conductive device (112) of the magnetic actuator conductive device (110) is driven by power excitation to make use of the excitation current passing through the power excitation windings (103) to drive the conductive device (112) to clamp and charge the rechargeable discharge device (104); and the power excitation to the power excitation windings (103) is terminated to cause the conductive device (112) to release clamping of the rechargeable discharge device (104) to stop charging when charge saturation occurs.

11. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 10, wherein the conductive device (112) is installed on one side of the rechargeable discharge device (104), a clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in the conductive device.

12. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 2, further comprising an electromagnetic driving suction device (114) which is displaced upon being actuated through the charging control device (102) controlling the power excitation current passing through the power excitation windings (103) when the rechargeable discharge device (104) is charged, a space vacated by the displacement being used for installing the rechargeable discharge device (104); wherein when the rechargeable discharge device (104) is charge saturated, the charging state detection device (107) detects and directly or through the charging control device (102) cuts off the power excitation current passing through the power excitation windings (103), and the prestressing spring (106) is driven to cause the electromagnetic driving

suction device (114) to push the rechargeable discharge device (104) away from the conductive device (112) to stop charging;

wherein the electromagnetic driving suction device (114) is equipped with the power excitation windings (103) and the prestressing spring (106) to form an electromagnetic force driving and spring force reversion mechanism.

13. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 1, wherein the power charging device with charge saturation disconnector through electromagnetic force release is further arranged to provide a synchronous power switch function, in which a synchronous power switch is installed at a position for interacting with the magnetic actuator conductive device (110); and wherein when the rechargeable discharge device (104) is placed in the conductive device and the magnetic actuator conductive device (110) is forced to move to deform, the synchronous power switch is activated simultaneously to supply power to the rechargeable discharge device (104) for charging; the synchronous power switch being formed by electromechanical or solid state switches is characterised by at least one of the following:

the synchronous power switch is triggered by mechanical displacement, photoelectric operation, pressure operation, acoustic operation, static electricity operation, manipulation of magnetic induction, operation of electromagnetic induction, and capacitive sensor operation, and

a reed contact (126) is installed with the conductive device (112), or a touch switch (117) is installed for simultaneously starting power when the rechargeable discharge device (104) is placed in the conductive device, and to simultaneously cut off power when the rechargeable discharge device (104) disconnects from the conductive device (112).

14. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 12, wherein the conductive device (112) is installed on one side of the rechargeable discharge device (104), a clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in the conductive device; and further a reed contact (126) is installed for forming a synchronous operation switch with the conductive device (112) for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in the conductive device; or the conductive device (112) is installed for coupling with the conductive structure installed on one side of the rechargeable discharge device (104), and the clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in the conductive device.

15. A power charging device with charge saturation disconnector through electromagnetic force release, wherein a magnetic circuit with iron-core (127) of the magnetic actuator conductive device (110) is driven by means of a charge current passing through some power excitation windings (103), and then a conductive device (112) clamps and charges a rechargeable discharge device (104) placed in the conductive device; and wherein the charge current terminates or decreases when charge saturation occurs, and then the magnetic actuator conductive device (110) and the conductive device (112) release the clamped rechargeable discharge device (104) for disconnecting from the conductive device (112) to stop charging;

wherein the magnetic actuator conductive device (110) is equipped with the conductive device (112) connected with the charging control device

(102) and an electromagnetic actuator (124) installed in the space for installing the rechargeable discharge device (104); wherein the electromagnetic actuator (124) includes the power excitation windings (103), the magnetic circuit with iron-core (127), and a magnetic driving structure (111), wherein the magnetic circuit with iron-core (127), the conductive device (112), and a prestressing homing spring (116) for attracting the magnetic driving structure (111) when the power excitation windings (103) is powered, cause the conductive device (112) which is integrated with the magnetic driving structure (111) to clamp and charge the rechargeable discharge device (104), and when the current passing through the power excitation windings (103) decreases or terminates, the magnetic driving structure (111) returns to the original position through the prestressing of the prestressing homing spring (116), and then the conductive device (112) releases the clamped rechargeable discharge device (104);

wherein a parallel shunt circuit device (120) is installed if not all charge current is to be utilized as the power excitation current to the magnetic actuator device, the parallel shunt circuit device being formed by electromechanical or electronic circuit elements, or solid state power components, and parallel to two sides of the power excitation windings (103), for controlling the value of the current passing through the power excitation windings (103), and further controlling the disconnecting timing for the magnetic actuator conductive device (110);

wherein when the rechargeable discharge device (104) is placed in the conductive device to cause charge current to pass through the power excitation windings (103), the electromagnetic actuator (124) is attracted by excitation to drive the magnetic driving structure (111) of the magnetic actuator conductive device (110) and the conductive device (112) integrated with the magnetic driving structure (111) to produce the clamping force and charging current; and

wherein when the rechargeable discharge device (104) is charged, the voltage thereof gradually rises, and then the charge current decreases and further causes the current passing through the power excitation windings (103) to decrease, or when the current passing through the power excitation windings (103) terminates through the control of the charging control device (102), the excitation of the electromagnetic actuator (124) is terminated, and by means of the prestressing provided by the prestressing homing spring (116), the magnetic driving structure (111) and the conductive device (112) integrated with the magnetic driving structure (111) release the clamped rechargeable discharge device (104).

16. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 15, wherein the prestressing homing spring is installed at the space within the conductive device (112) for installing the rechargeable discharge device (104), wherein when the current passing through the power excitation windings (103) decreases to a threshold limit value or terminates, the magnetic driving structure (111) and the conductive device (112) integrated with the magnetic driving structure (111) release the clamped rechargeable discharge device (104), and the prestressing homing spring pushes the rechargeable discharge device (104) to disconnect from the conductive device (112).

17. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 15, wherein a pitch between two conductive devices (112) as the positive and negative electrodes is more than a pitch between two electrodes of the rechargeable discharge device (104) before charging, but after the rechargeable discharge device (104) is placed in between the two conductive devices, the two conductive devices (112) are pushed close to contact with the positive and

negative electrodes of the rechargeable discharge device (104), and then the rechargeable discharge device (104) is charged by the charging power supply via the two conductive devices (112), and the power excitation windings (103) are powered excitation simultaneously through the charge current to attract the magnetic driving structure (111), and then the conductive device (112) which is integrated with the magnetic driving structure (111) clamps and charges to the rechargeable discharge device (104) continuously;

wherein after a positioning ring structure (105) is placed in the rechargeable discharge device (104) and operation of a press type boot structure (231) is driven by an external force, the two conductive devices (112) are pushed close to conduct with the positive and negative electrodes of the rechargeable discharge device (104), and then the charging power is supplied to the rechargeable discharge device (104) via the two conductive devices (112), and the power excitation windings (103) are excited simultaneously, so that the electromagnetic actuator (124) has an effect to attract the magnetic driving structure (111), and the conductive device (112) is forced to clamp the rechargeable discharge device (104) continuously, and to charge the rechargeable discharge device (104); and wherein when the current passing through the power excitation windings (103) decreases to the threshold limit value or terminates, by means of the prestressing of the prestressing homing spring (116), the magnetic driving structure (111) and the conductive device (112) release the clamped rechargeable discharge device (104) and stop charging.

18. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 15, wherein the conductive device and a clamping structure (229) are separate structures installed at different positions, the conductive device (112) for transmitting

the charge power energy is installed against the direction for installing the conductive device (112), and the clamping structure (229) only has a clamping functionality for clamping the side of the rechargeable discharge device (104), and wherein when the rechargeable discharge device (104) is placed in the clamping structure (229), the charging power supply powers the rechargeable discharge device (104), and the power excitation windings (103) are excited to cause the electromagnetic actuator (124) to clamp the rechargeable discharge device (104); and when the current passing through the power excitation windings (103) decreases or terminates, by means of the prestressing of the prestressing homing spring (116), the magnetic driving structure (111) and the conductive device (112) release the clamped rechargeable discharge device (104).

19. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 15, wherein the conductive device (112) is installed on one side of the rechargeable discharge device (104), a clamping structure (229) controlled by the magnetic actuator conductive device (110) is installed for clamping the rechargeable discharge device (104) when the rechargeable discharge device (104) is placed in the conductive device.

20. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 19, wherein the conductive device (112) is installed on one side of the rechargeable discharge device (104), and a prestressing reed (108) is installed between the conductive device (112) and the rechargeable discharge device (104), in which the prestressing reed (108) is an elastic structure, and the prestressing, which is normally along a direction for pushing the rechargeable discharge device (104) away to stop charging, is less than a clamping force of the

clamping structure (229), but more than a weight of the rechargeable discharge device (104); the prestressing reed (108) being equipped with a relay conductive structure (1081) for transmitting the power energy of the positive and negative electrodes of the conductive device (112) to the positive and negative electrodes of the rechargeable discharge device (104), wherein when the prestressing reed (108) is made of insulative material, then the relay conductive structure (1081) is directly installed on the prestressing reed (108), and if the prestressing reed (108) is made of a conductive material, then an additional insulator is provided between the relay conductive structure (1081) and the prestressing reed (108); and wherein when the rechargeable discharge device (104) is placed in the conductive device, through the operation of a press type boot structure (231), the clamping structure (229) controlled by the magnetic actuator conductive device (110) clamps the rechargeable discharge device (104), and forces the prestressing reed (108) to move, and then the power energy of the conductive device (112) is transmitted to the rechargeable discharge device (104) for charging via the relay conductive structure (1081) installed on the prestressing reed (108), and because the power excitation windings (103) is powered excitation, the clamping structure (229) clamps the rechargeable discharge device (104) continuously; and when charge saturation occurs, the clamping structure (229) disconnects and releases the clamped rechargeable discharge device (104) by means of the prestressing of the prestressing reed (108) such that the rechargeable discharge device (104) disconnects from the conductive device (112) to stop charging.

21. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 15, wherein an electromagnetic driving transposition mechanism (115) is installed within the magnetic actuator conductive device (110) for pushing the rechargeable

discharge device (104) away from the position of the magnetic actuator conductive device (110) when the rechargeable discharge device (104) is charge saturated, wherein the power excitation windings (103) drive the electromagnetic driving transposition mechanism (115) for pushing the rechargeable discharge device (104) away from the magnetic actuator conductive device (110) in one of the following ways:

a) the power excitation windings (103) are directly controlled by the charge saturation detection device (107) to be conductive or disconnect to cause the magnetic driving structure (111) to be displaced, and the electromagnetic driving transposition mechanism (115) is driven simultaneously to push the rechargeable discharge device (104), and then the conductive device (112) of the magnetic actuator conductive device (110) releases the clamped rechargeable discharge device (104);

b) a signal of the charge saturation detection device (107) is transmitted to the charging control device (102) to control the power excitation windings (103) to be conductive or disconnect to cause the magnetic driving structure (111) to be displaced, and the electromagnetic driving transposition mechanism (115) is driven simultaneously to push the rechargeable discharge device (104), and then the conductive device (112) of the magnetic actuator conductive device (110) releases the clamped rechargeable discharge device (104);

c) the charging control device (102) performs trickling charge to the rechargeable discharge device (104) for a set time delay, and then the charging control device (102) is driven to control the power excitation windings (103) to be conductive or disconnect to cause the magnetic driving structure (111) to be displaced, and the electromagnetic driving transposition mechanism (115) is driven simultaneously to push the rechargeable discharge device (104), and

then the conductive device (112) of the magnetic actuator conductive device (110) releases the clamped rechargeable discharge device (104);

d) a signal from the charge saturation detection device (107) is transmitted to the charging control device (102) to reduce the charge current to the rechargeable discharge device (104) while waiting for the detection charge saturation signal of the charge saturation detection device (107) further driving the charging control device (102) to control the power excitation windings (103) to be conductive or disconnect to cause the magnetic driving structure (111) to be displaced, and the electromagnetic driving transposition mechanism (115) is driven simultaneously to push the rechargeable discharge device (104), and then the conductive device (112) of the magnetic actuator conductive device (110) releases the clamped rechargeable discharge device (104) to implement two-stage charging; and

e) the detection charge saturation signal of the charging state detection device (107) repeatedly controls the charging control device (102) to gradually reduce the charge current to the rechargeable discharge device (104), and finally the charging control device (102) is controlled to drive the power excitation windings (103) to be conductive or disconnect to cause the magnetic driving structure (111) to be displaced for pushing the conductive device (112), and when the power excitation windings (103) are excited, the electromagnetic driving transposition mechanism (115) is driven simultaneously to push the rechargeable discharge device (104), and then at least one electrode side of the rechargeable discharge device (104) disconnects from the conductive device (112) to stop charging.

22. The power charging device with charge saturation disconnector through electromagnetic force release as claimed in Claim 21, wherein the power charging device with charge saturation disconnector through electromagnetic force release is further arranged to provide a synchronous power switch function, in which a synchronous power switch is installed at a position for interacting with the magnetic actuator conductive device (110); wherein when the rechargeable discharge device (104) is placed in the conductive device and the magnetic actuator conductive device (110) is forced to move to deform, the synchronous power switch is activated simultaneously to supply power to the rechargeable discharge device (104) for charging; the synchronous power switch is formed by electromechanical or solid state switches is characterised by at least one of the following:

the synchronous power switch is triggered by mechanical displacement, photoelectric operation, pressure operation, acoustic operation, static electricity operation, manipulation of magnetic induction, operation of electromagnetic induction, and capacitive sensor operation, and

a reed contact (126) is installed with the conductive device (112), or a touch switch (117) is installed, for forming a conductive contact of the synchronous power switch, and the installed position of the synchronous power switch is at a position in which when the rechargeable discharge device (104) is placed in the conductive device, by means of the installation of the rechargeable discharge device (104), or the displacement of the reed of the magnetic actuator conductive device (110), the charging power supply is driven to power on.