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ONBOARD CHARGING APPARATUS OF BATTERY VEHICLE

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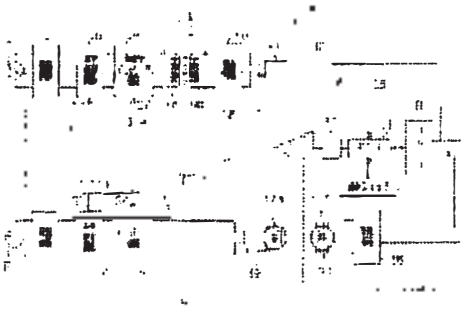
Abstract of JPH11252810 (A)

PROBLEM TO BE SOLVED: To provide a charging apparatus which can be manufactured at low cost and corresponds to both types apparatus of the stationary charging apparatus (manual system) which can be widely spread and the stationary charging apparatus (automatic system) which assures highly efficient charging work to realize the charging work from any type of apparatus. SOLUTION: An onboard charging apparatus corresponds to a first stationary charging apparatus 1 for intentionally coupling a first power transmitting coupler 11 to a power receiving coupler, and a second stationary charging apparatus 2 for automatically coupling the first power receiving coupler 12, which can be coupled with the first power transmitting coupler 11 and a second power transmitting coupler 19 to the power receiving coupler, and provides the second power receiving coupler 20 which may be coupled with the second power transmitting coupler 19. Moreover, a charging circuit is also provided for charging a



battery B with the charging power source supplied to the power transmitting side coupling part, when the first and second power receiving couplers 12, 20 are coupled with the corresponding power transmitting couplers, respectively.

Notice

DESCRIPTION JPH11252810

[0001]

BACKGROUND OF THE INVENTION The present invention, an electric vehicle or the like, in the battery vehicles and the power of the battery to drive source, out of the charging device for charging the battery, is related to vehicle-side charging device to be mounted on a vehicle.

[0002]

Conventionally, for example, charging device for charging an electric vehicle battery has been developed a variety of things. Among them, there is a charging device comprising an electrical structure such as the following. Namely, it is converted to an AC power source to charge DC power supply by the inverter circuit, and further applies the AC power to the transformer primary coil. Then, an induced voltage generated in the transformer secondary coil in the rectifying circuit is converted into a DC voltage, and charging the battery by applying the direct-current power source to the battery.

[0003]

Such charging device may be separated into a vehicle-side charging device provided in the stationary-side charger and the motor vehicle side to be installed on the ground or the like, when performing the charging operation and the transmission coupler provided on the stationary side charger vehicle It has been carried out by combining the power receiving coupler provided on the side charging device.

[0004]

In this case, the separation of the transmission coupler and the receiving coupler, bond, workers who perform the charging operation was going artificially. (Hereinafter, the work method of the charging operation manual method called.) In such a guide method in a charging device for charging operations, it is possible to inexpensively manufacture the stationary side charging apparatus was equipped with a feature that can be widely said stationary side charger.

[0005]

In contrast, in recent years, the tip of the arm extending from the stationary side charging device is provided with a transmission coupler, after parking the motor vehicle, automatic developed fully automatic charging system which is adapted to be coupled to the power receiving coupler automotive side the arm that has been. According to the charging system, and a separation of the transmission couplers and the receiving coupler by the operator, bonding becomes unnecessary, the characteristic of the convenience of the charging operations is increased. (Below, automatically that auto scheme work method of charging work to bond the coupler each other.)

[0006]

[Invention Problems to be Solved] However, the charging operation by the manual method and the automatic system had problems in each. That is, in the case of the manual system, since it must be performed by a worker. However it has the characteristics of easy penetration can be manufactured at low cost devices, separation of the coupler between when charged, the binding work, working me had a problem of complicated.

[0007]

In the case of the automatic mode, although it has the characteristic that the convenience of the charging operation increases, automatically separates the transmission coupler to the power receiving coupler complex for binding, and requires expensive stationary side charging device Become. Therefore, it can not be spread widely stationary side charging device, the stationary-side charger can only be installed in a limited charging work station. In other words, in order to perform the charging operation, it had a problem that will have to be every time [Demuka the charging operation for stations that do not exist only in a limited location points.

[0008]

The present invention is has been made to solve the above problems, a first object, it is possible to inexpensively manufacture, the stationary-side charging apparatus capable of widespread, convenience of charging operation In response to both devices and stationary-side charging apparatus can be increased sex, it is to provide a vehicle-side charging apparatus for a battery vehicle capable of performing a charging operation from either device.

[0009]

Second object, in addition to the first object, is to provide a vehicle-side charging apparatus for a battery vehicle capable of simplifying the electrical configuration of the apparatus. Third object, in addition to the first object, is to provide a vehicle-side charging apparatus for a battery vehicle capable of accurately executing the process operation for the charging operation to the battery.

[0010]

In order to solve the above problems means for solving the Problem] The invention of claim 1, provided with the receiving-side coupling portion capable of binding to the power transmission side coupling portion provided on the outside of the stationary-side charger A vehicle-side charging apparatus for a battery vehicle, artificially a first transmission-side coupling portion corresponds to the first stationary side charging device for coupling to a power receiving side coupling portion, the coupling and the first transmission-side coupling portion a first receiving-side coupling portion that can automatically corresponds to the second stationary side charging device for coupling the second transmission-side coupling portion to the power receiving side coupling portion, the coupling and the second transmission-side coupling portion a second power-receiving-side coupling part possible, the first is the one power-receiving-side joint or the second power-receiving-side coupling portion, when coupled with the corresponding power transmission side coupling portion, provided on the power transmission side coupling portion It has been the vehicle-side power reception device of a battery vehicle with a charging circuit for charging the battery by the charging power supply is set to its gist.

[0011]

The invention described in claim 2 is a vehicle-side charging apparatus for a battery vehicle in which a power receiving side bond portions capable of binding to the power transmission side coupling portion provided on the outside of the stationary-side charger, artificially first The power transmission coupling portion corresponding to the first stationary side charging device for coupling to a power receiving side connecting portion is capable of binding at its first transmission-side coupling portion and a non-contact state, the first power transmission side bonds upon binding a first receiving-side coupling portion which is disposed a secondary coil forming a transformer with the primary coils disposed on the parts, automatically the second coupling the second transmission-side coupling portion to the power receiving side connecting portion corresponds to the stationary side charging device, it is capable of binding at its second power transmission side coupling part and a non-contact state, two at the time of bonding to form a transformer with a second primary coil the power transmitting side coupling portion disposed on the primary a second power-receiving-side coupling portion which is disposed a coil, when one of the first power receiving side joint or the second power-receiving-side coupling portion is coupled with the corresponding power transmission side coupling portion, a power-transmitting-side binding By AC power supply for charging is applied to the part of the primary coil, with a rectifier circuit for rectifying an induced voltage generated in the secondary coil of the power receiving side coupling part, to a DC voltage for charging the battery the battery the vehicle-side charging apparatus of the car to its gist.

[0012]

The invention according to claim 3. the vehicle-side charging apparatus for a battery vehicle according to claim 1, coupled between the first power transmitting side connecting portion and the first power-receiving-side coupling portion, and the second power transmission side coupling part and the coupling between the second power-receiving-side coupling part, respectively, and its gist to be accomplished through a contact.

[0013]

The invention described in claim 4 is a vehicle-side charging apparatus for a battery vehicle in which a power receiving side bond portions capable of binding to the power transmission side coupling portion provided on the outside of the stationary-side charger, artificially first The power transmission side coupling portion corresponds to the first stationary side charging device for coupling to a power receiving side connecting portion, and the first power-receiving-side coupling portion capable of binding through its first power transmission side coupling part and the contact, automatically The second transmission-side coupling portion corresponding to the second stationary side charging device for coupling to a power receiving side coupling portion, it is capable of binding at its second power transmission side coupling part and a non-contact state, the coupling at the time to the second a second power-receiving-side coupling portion which together with the primary coils disposed on the power transmission side bonded portion is provided with two primary coils forming a transformer, the first power-receiving-side coupling part and the first transmission-side coupling portion When bound to a charging circuit for charging the battery at its first power-transmitting-side coupling portion for charging power supplied to the second power-receiving-side coupling portion is a second transmission-side coupling portion coupled When it is, by its second charging AC power supply to the primary coil of the power transmission side coupling part is applied, an induced voltage generated in the secondary coil of the second receiving-side coupling portion, in order to charge the battery the vehicle-side charging apparatus of the battery car with a of a rectifier circuit for rectifying a DC voltage I as its gist.

[0014]

The invention described in claim 5 is the vehicle-side charging apparatus for a battery vehicle according to claim 2 or 3, between the first power-receiving-side coupling portion battery, and the second power-receiving-side coupling portion and it is set to its gist that it shared the circuit with the same electrical configuration that exists between the battery.

[0015]

The invention described in claim 6, the vehicle-side charging apparatus for a battery vehicle according to claim 4, or carried out using a first stationary side charger when charging the battery, the second stationary side charge a first controller which is provided by or carried out using the apparatus is provided with selectable selection means, based on selection in the selection means, the first stationary side charging device a processing operation for performing a charging operation for the battery and it is set to its required to be provided a control means to run in between one and of the second controller provided on the second stationary side charger

[0016]

Thus, according to the invention described in claim 1, when charging the battery by a first stationary side charging device, the first transmission side coupling portion that is artificially bonded to the first power-receiving-side coupling portion . Moreover, when charging the battery by a second stationary side charger, the second transmission-side coupling portion that is automatically coupled to the second power-receiving-side coupling portion. Then, one of the first power receiving side joint or the second power-receiving-side coupling portion is, when it is combined with the corresponding power transmission side coupling portion, when the charging power is supplied to the power-transmitting-side coupling portion, the battery It is charged.

[0017]

According to the invention described in claim 2, when charging the battery by a first stationary side charging device, the first transmission-side coupling portion that is in the form of artificially non-contact with the first power-receiving-side coupling portion It is coupled. Moreover, when charging the battery by a second stationary side charger, the second transmission-side coupling portion that is coupled in a non-contact state automatically to the second power-receiving-side coupling portion. One of the first power receiving side joint or the second power-receiving-side coupling part has a corresponding and coupled with the power transmission side coupling portion, the power transmission side coupling portion and the primary coils disposed respectively on the power receiving side connecting portion and the secondary coil transformer is formed by the. When the charging AC power supply to the primary coil of the power transmission side coupling part is applied, the induced voltage is generated in the secondary coil of the power receiving side coupling part. DC voltage obtained by rectifying the induced voltage in the rectifying circuit is charged into the battery.

[0018]

According to the invention described in claim 3, the first transmission-side coupling portion coupled to the first power-receiving-side coupling portion, and the coupling between the second transmission-side coupling part and a second transmission-side coupling portion and it takes place via the contacts, respectively.

[0019]

According to the invention described in claim 4, when charging the battery by a first stationary side charging device, the first transmission-side coupling portion thereof through an artificially contacts the first receiving-side coupling portion coupled differentially. In this case, if the charging power is supplied to the first transmission-side coupling portion, the battery is charged. Moreover, when charging the battery by a second stationary side charger, the second transmission-side coupling portion that is coupled in a non-contact state automatically to the second power-receiving-side coupling portion. In this case, the transformer is formed by the second transmission-side coupling portion and the second power-receiving-side coupling part one coil disposed respectively in the secondary coil. When the charging AC power supply to the primary coil of the second transmission-side coupling portion is applied, the induced voltage is generated in the secondary coil of the second receiving-side coupling portion. DC voltage obtained by rectifying the induced voltage in the rectifying circuit is charged into the battery.

[0020]

According to the invention ot claim 5, between the first power-receiving-side coupling part and the battery, and when the circuit with the same electrical structure between the second power-receiving-side coupling part and the battery is present Because the circuit is shared, thereby simplifying the electrical configuration of the apparatus.

[0021]

According to the invention of claim 6, whether carried out using a first stationary side charger when charging the battery, and is either carried out using a second stationary side charger can be selected by selecting means ringing are. Based on this selection, the charging of the battery between the first controller and the one with the control means of the second controller provided on the second stationary side charging device provided in the first stationary side charger processing operation is carried out for the work.

[0022]

DETAILED DESCRIPTION OF THE INVENTION First Embodiment Hereinafter, a first embodiment in accordance with Figure 1.

[0023]

1, a first stationary-side charging apparatus 1 and the second stationary side charging device 2 is installed on the ground or the like, the electrical configuration of a charging system 4 comprising a vehicle-side charging device 3 which is mounted on an electric vehicle my shows.

[0024]

In the first stationary side charging device 1, the AC voltage E as the charging power source is connected to the rectifier circuit 5. Therefore, the commercial AC power supply E is rectified to a DC power supply by the rectifier circuit 5. The rectifier circuit 5 is connected to the power factor correction circuit 6, the DC power supply is supplied to the power factor improving circuit 6. The power factor improving circuit 6 is driven based on a drive signal S1 from the first controller 7, the DC power supply by the drive with its power factor is adjusted, it is boosted. The power factor improving circuit 6 is connected to a resonant type inverter circuit 8, a DC power source that is adjusted and the boost power factor is supplied to the resonance type inverter circuit 8. The resonant inverter circuit 8 is also driven based on a drive signal S2 from the first controller 7, the AC power supply of a high frequency is generated by the drive. Resonant inverter circuit 8 is connected to the primary coil 9a of the transformer 9, the AC power supply is supplied to the primary coil 9a of the transformer 9.

[0025]

The transformer 9 is provided with a primary coil 9a and the secondary coil 9b. Maki-hi the primary coil 9a and the secondary coil 9b is in this embodiment has to be one-to-one. Then, the AC power supplied to the primary coil 9a is output as the induced voltage in the power conversion at the transformer 9 from the secondary coil 9b. The secondary coil 9b is connected to the rectifier circuit 10, the induced voltage by the rectifier circuit 10 is rectified into a DC voltage.

[0026]

The in-vehicle side charging device 3 and the battery B is provided, the DC power is applied to the battery B, whereby battery B is charged. Between the rectifier circuit 10 connected to the transformer 9 and the battery B, separated from each other, the first power transmission coupler 11 as a first transmission-side coupling portion capable of binding to and as the first power-receiving-side coupling portion first and receiving coupler 12 is provided. The first power transmission coupler 11 is connected to the rectifier circuit 10, a first power receiving coupler 12 is connected to the battery B. In the state of being separated both couplers 11 and 12, the first power transmission coupler 11 is provided on the first stationary side charging apparatus 1, first the power receiving coupler 12 is provided on the vehicle-side charging device 3. Then, when coupling the two couplers 11 and 12,

a rectifier circuit 10 and the battery B are electrically connected through the contacts are provided on both the coupler 11. In this coupled state, if caused to drive the power factor improving circuit 6 and the resonant inverter circuit 8, the battery B is adapted to be charged. Therefore, the charging circuit when it binds the first power receiving coupler 12 and the first transmission coupler 11, and a connecting line connecting the a first power receiving coupler 12 battery B.

[0027]

Coupling system for such a coupler is called Conductive scheme. Then, the separation of the two couplers 11 and 12, the coupling is configured to be performed by the operator, with respect to the battery B of the vehicle-side charging device 3, the charging work is performed using a first stationary side charger 1 It has become a manual method.

[0028]

Meanwhile, the second to the stationary-side charging device 2, like the stationary side charging device 1 of the first rectifier circuit 13 is connected to a commercial AC power source E, a power factor correction circuit 14 to the rectifier circuit 13 It is connected. The power factor improving circuit 14 is driven based on the driving signal S3 from the second controller 15. The power factor improving circuit 14 and inverter circuit 16 is connected to a DC power supply for charging is adjusted and the boost power factor is supplied to the inverter circuit 16. The inverter circuit 16 is driven based on the driving signal S4 from the second controller 15, an AC power supply of a high frequency is generated by the drive. The inverter circuit 16 is connected to the primary coil 17a of the transformer 17, the high frequency AC power source is supplied to the primary coil 17a of the transformer 17.

[0029]

The transformer 17 includes a first similar to the transformer 9 of the stationary-side charging device 1, the winding ratio of 1: 1 and the sounding has a primary coil 17a and the secondary coil 17b. Then, the AC power supplied to the primary coil 17a is output as the induced voltage in the power converter in the transformer 17 from the secondary coil 17b.

[0030]

The in-vehicle side charging device 3 and the rectifier circuit 18 is provided and connected to the secondary coil 17b. Therefore, the induced voltage generated in the secondary coil 17b is supplied to the rectifier circuit 18 is rectified into a DC voltage. The rectifier circuit 18 is connected to the battery B, the DC power supply is the battery B is applied to the battery B is charged.

[0031]

The transformer 17, the separation and its primary coil 17a and the secondary coil 17b to each other, have become capable of binding structures. That is, the primary coil 17a of the transformer 17 is provided on the second power transmission coupler 19 as a second transmission-side coupling portion, the secondary coil 17b is provided on the second power receiving coupler 20 as a second receiving-side coupling portion It is. In a state where the two couplers 19 and 20 are separated, the second power transmission coupler 19 is provided on the second stationary side charger 2, a second power receiving coupler 20 is provided on the vehicle-side charging device 3. Then, when coupling the two couplers 19 and 20 in non-contact state, the transformer 17 is formed by the primary coil 17a and a secondary coil 17b which are provided to the coupler 19. In this coupled state, if caused to drive the power factor improvement circuit 14 and the inverter circuit 16, the battery B is adapted to be charged. Therefore, the charging circuit upon binding a second power receiving coupler 20 and the second power transmission coupler 19, connecting lines for connecting the secondary coil 17b and the rectifying circuit 18, rectifying circuit 18 and the rectifier circuit 18 and the battery B and a connecting line for connecting the door.

[0032]

Coupling system for such a coupler is called an inductive method. Then, the separation of the two couplers 19 and 20, coupled automatically is configured to be performed with respect to the battery B of the vehicle-side charging device 3, the charging work is performed using the second stationary side charger 2 It has become the auto method.

[0033]

In addition, ECU31 is provided on the vehicle-side charging device 3. The ECU31, the battery is connected to B, the temperature of battery B, various data such as remaining capacity is adapted to be detected by the ECU31. Moreover, ECU31 is connected to the first power receiving coupler 12 through a signal line L1. The signal line L1, when the said first of the power receiving coupler 12 first transmission coupler 11 is coupled, is connected to the signal line L2 connected between the transmission coupler 11 and the first controller 7 that. Therefore, when the first transmission coupler 11 and the first power receiving coupler 12 are coupled, data communication via the signal line L1, L2 which are connected to each other between the

ECU31 and the first controller 7 is performed . Then, ECU31, in order battery B for driving said power factor correction circuit 6 and the resonant inverter circuit 8 to be charged in an optimal state, the control through the signal line L1, L2 to the first controller 7 It outputs a signal S5.

[0034]

Furthermore, the ECU31 is connected communications circuits 32 are provided a receiving circuit 33 can receive a signal transmitted from the communication circuit 32 to the second controller 15. Then, ECU31 performs a known data communication for automatically coupled to the second power transmission coupler 19 and a second power receiving coupler 20 with the second controller 15 via the communication circuits 32 and 33 . When the second power transmission coupler 19 and the second power receiving coupler 20 are coupled, ECU31 the battery B to drive the power factor improvement circuit 14 and the inverter circuit 16 to be charged in an optimal state so, it wants to send a control signal S6 from the communication circuit 32 to the second controller 15.

[0035]

The ECU31 is connected to the operation switch 34 as a selecting means provided at the driver's seat or the like. Operation switch 34 uses the stationary side charging device 1 of the first manual mode or to charge the battery B, and using a second stationary side charger 2 of the automatic type to charge the battery B and a switch to select whether performed.

[0036]

ECU31, when charging operation using a first stationary side charging device 1 of the manual mode by the operation switch 34 is selected, battery B between a first die 1 of the controller of the stationary-side charger 1 to perform the processing operation for charging work on. Moreover, ECU31 is between the charging operation with the second stationary side charger 2 of the automatic type at the operation switch 34 is selected, the second of the second controller 15 of the stationary-side charger 2 to perform the processing operation for the charging operation for the battery B.

[0037]

Then, we will describe the operation of this charging system 4. First, when charging a battery B, that is, the manual method to perform the charging operation will be described with reference to the first stationary side charging device 1.

[0038]

The first transmission coupler 11 provided worker on the first stationary side charging device 1, and I is coupled to a first power roooiving coupler 12 provided on the vehicle-side charging device 3. This makes it possible to perform data communication with the first controller 7 via the ECU31 signal lines L1, L2. Here. selecting a charging operation using a first stationary side charging device 1 of the manual mode by the operation switch 34, ECU31 via a signal line L1, L2 so that battery B is charged in an optimal state It outputs a control signal S5 to the first controller 7. The first controller 7 outputs a drive signal S1, S2 to the power factor improving circuit 6 and the resonant inverter circuit 8 based on the input of the control signal 35.

[0039]

Then, the power factor improving circuit 6, as well as adjusting the power factor of the DC power supply obtained by rectifying a commercial alternating-current power supply E by the rectifier circuit 5 boosts. The resonant inverter circuit 8 converts the DC power into AC power and supplies it to the primary coil 9a of the transformer 9. Trans 9 to the power converting AC power supplied to the primary coil 9a, the induced voltage is generated in the secondary coil 9b. The induced voltage is rectified by the rectifier circuit 10 becomes a direct current power source. Its DC power supply are applied to the battery B is the battery B is charged.

[0040]

In the case of charging the battery B, that is, the automatic mode to perform a charging operation will be described with reference to the second stationary side charger 2. Selecting the charging operation with the second stationary side charger 2 of the automatic type with the operation switch 34, the second transmission coupler 19 provided on the second stationary side charging device 2, the vehicle-mounted side charging device 3 automatically coupled to the second power receiving coupler 20 provided on the. Then, both the coupler 19 and 20 to form a transformer 17. Then, ECU31 outputs a control signal S6 to the second controller 15 via the communication circuits 32 and 33 so that battery B is charged in an optimal state. The second controller 15 outputs a drive signal S3, S4 to the power factor improving circuit 14 and the inverter circuit 16 based on the reception of the control signal S6

[0041]

Then, the power factor improvement circuit 14, as well as adjusting the power factor of the DC power supply obtained by rectifying a commercial alternating-current power supply E by the rectifier circuit 13 steps up. Then, the inverter circuit 16 converts the DC power into AC power, and supplies the primary coil 17a of the transformer 17. Transformer 17 is the secondary coil 17b by the power converting AC power supplied to the primary coil 17a induced voltage is generated. The induced voltage is rectified by the rectifier circuit 18 becomes a direct current power source. Its DC power supply are applied to the battery B is the battery B is charged.

[0042]

Below, we describe the characteristic effects in the first embodiment. (1) The vehicle-side charging apparatus 3 of the first embodiment corresponds to the first stationary side charging device 1 for coupling the transmission coupler for receiving the coupler by manual mode, first transmission coupler provided in the apparatus and a first power receiving coupler 12 capable of binding by 11 and Conductive scheme. In addition, corresponding to the second stationary side charger 2 for coupling the transmission coupler for receiving the coupler by the auto mode, the second receiving coupler capable of binding by the second power transmission coupler 19 and inductive type provided in the device It has a 20. Therefore, the vehicle-side charging device 3, since the coupling the transmission coupler for receiving the coupler manually manner, it is possible to inexpensively manufacture, the first stationary side charging apparatus 1 which can be widespread in the auto mode Since coupling the transmission coupler for receiving the coupler, it is possible to correspond to both devices and the second stationary side charging device 2 can increase the convenience of the charging operations. In other words, the battery B of the vehicle-side charging apparatus 3, and can be charged even from the both devices.

[0043]

(2) In the first embodiment, to perform the charging of the battery B, whether performed by using a stationary-side charging device 1 of the first manual mode and the second stationary side charging device of the automatic type 2 The operation switch 34 that can select whether performed using connected to the ECU31. ECU31, based on the selection in this connection switch 34 executes a process operation for the charging operation to the battery B with the first controller 7 or the second controller 15. Therefore, it is possible to carry out the execution of the processing operation accurately.

[0044]

Second Embodiment Hereinafter, a second embodiment according to Figure 2. Note that above for the first embodiment and the same members are denoted by the same reference numerals and description thereof is omitted. Therefore, the following description mainly the points different from the first embodiment.

[0045]

As shown in Figure 2, in this embodiment, unlike the electric configuration of a first stationary side charging device 41 of the manual method in the first embodiment, similar to the second stationary side charger 2 and it is configured. That is, the first stationary side charging device 41, a rectifier circuit 42 connected to a commercial AC power source E, a power factor improving circuit 43, a first transmission coupler 47 to the primary coil 46a of the inverter circuit 45 and transformer 46 are provided It has a. The power factor improving circuit 43 and the inverter circuit 45 is driven based on the drive signals S3, S4 respectively outputted from the first controller 44.

[0046]

The first receiving coupler 49 provided on the vehicle-side charger 48 in this embodiment has the same electrical structure as the second power receiving coupler 20. That is, the secondary coil 46b of the transformer 46 is provided. Also, the vehicle-side charging device 48, common rectifier circuit 50 for rectifying the secondary coil 46b provided in the first and second receiving coupler 49,20, an induced voltage generated in 17b before applying to the battery B that has been. Therefore, both of the secondary coil 46b, the induced voltage is rectified by the same rectifier circuit 50 also occurs 20b. Therefore, the charging circuit of this embodiment, first and second receiving coupler 49,20 of the secondary coil 46b, 17b and the connecting line for connecting the rectifier circuit 50, rectifying circuit 50 and the rectifier circuit 50 and the battery B and a connecting line for connecting the door.

[0047]

When the first transmission coupler 47 and the first power receiving coupler 49 are coupled, via a communication circuit 32, 33 between the first controller 44 provided in the ECU31 in the first stationary side charger 41 the data communication is performed.

[0048]

Therefore, when charging the battery B using a first stationary side charging device 41, the operator first transmission coupler 47, is coupled to the first power receiving coupler 49. Then, both the coupler 47 and 49 to form a transformer 46. Here, selecting a charging operation using a first stationary side charging device 41 of the manual mode by the operation switch 34, ECU31 through a communication circuit 32, 33 as battery B is charged in an optimal state It outputs a control signal S6 to the first controller 44. Thus, the induced voltage generated in the secondary coil 46b of the transformer 46 via the circuit from the commercial alternating-current power source E is a direct current power source is rectified by the rectifier circuit 50 which is common. Its DC power supply are applied to the battery B is the battery B is charged.

[0049]

Moreover, even when charging the battery B using the second stationary side charger 2, the induction voltage generated in the secondary coil 17b of the transformer 17, DC for charging by being rectified by the rectifier circuit 50 which is common battery B is charged by a DC power supply is a power supply.

[0050]

Thus, vehicle-side charging device 48 of the second embodiment corresponds to the first stationary side charging device 41 for coupling the transmission coupler for receiving the coupler by manual mode, first power transmission provided in the device and a first receiving coupler 49 can be coupled by the coupler 47 and the inductive type. In addition, corresponding to the second stationary side charger 2 for coupling the transmission coupler for receiving the coupler by the auto mode, the second receiving coupler capable of binding by the second power transmission coupler 19 and inductive type provided in the device It has a 20. Therefore, it is possible to obtain the same effects as are operational effects of the first embodiment (1).

[0051]

Furthermore, in this embodiment, the secondary coil 46b provided in the first and second receiving coupler 49,20, an induced voltage generated in 17b, the rectifier circuit 50 which rectifies the DC voltage is shared. Therefore, it is possible to simplify the electrical configuration of a vehicle-side charging device 48.

[0052]

Third Embodiment Hereinafter, a third embodiment according to Fig. Note that above for the first embodiment and the same members are denoted by the same reference numerals and description thereof is omitted. Therefore, the following description mainly the points different from the first embodiment

[0063]

As shown in Figure 3, in this embodiment, the electrical configuration of the second stationary side charging device 51 of the automatic method is different from the case of the first embodiment, similar to the first stationary side charger 1 and it is configured. That is, the second stationary side charging device 51 includes a rectifier circuit 52 connected to a commercial AC power source, the power factor improving circuit 53, a resonance type inverter circuit 55, a rectifying circuit 57 connected to the transformer 56 and the transformer 56 It has. The power factor improving circuit 43 and the resonance type inverter circuit 55 is driven based on the drive signals S1, S2 each of which is outputted from the second controller 54.

[0064]

The vehicle-side charging device 59, the second power receiving coupler 60 which is coupled via a second transmission coupler 58 and contacts connected to the rectifier circuit 57 is provided. The second receiving coupler 60 is connected to the battery B. Therefore, the charging circuit of this embodiment is constituted by the connection line connecting the first and second receiving coupler 12 and 60 and the battery B.

[0055]

Moreover, ECU31 is connected to the second power receiving coupler 60 through a signal line L3. The signal line L3, when the second power receiving coupler 60 and the second power transmission coupler 58 is coupled and connected to the signal line L4 connected between the same power transmission coupler 58 second controller 54 . Then, ECU31 is automatic and a second power receiving coupler 60 and the second power transmission coupler 58 between the second controller 54 via the communication apparatus (not shown) provided respectively on the ECU31 and the second controller 54 and it perfoms well-known data communication in order to bind. When both couplers 58 and 60 are coupled, ECU31 outputs a control signal S5 to the second controller 54 via the signal line L3, L4.

[0056]

Therefore, when performing the charging operation by using the second stationary side charging device 51, selects the charging operation with the second stationary side charging device 51 of the automatic mode by operating the switch 34. Then, the second power transmission coupler 58 is automatically coupled to the second power receiving coupler 60. Then, ECU31 the battery B and outputs a control signal S5 to the second controller 54 via the signal line L3, L4 to be charged in an optimal state. Accordingly, a DC power supply that is generated through the circuits from the commercial AC power supply E is the applied to the battery B is charged to battery B.

[0057]

Thus, the vehicle-side charging apparatus 59 of the third embodiment corresponds to the first stationary side charging device 1 for coupling the transmission coupler for receiving the coupler by manual mode, the first power transmission coupler 11 provided to the device and a first power receiving coupler 12 can be coupled by a Conductive scheme. In addition, corresponding to the second stationary side charging device 51 to couple the power transmission coupler to the power receiving coupler by the auto mode, the second power transmission coupler 58 and the Conductive system second to receiving coupler capable of binding by which is provided to the device It has a 60. Therefore, it is possible to obtain the same effects as are operational effects of the first embodiment (1).

[0058]

Each of the above embodiments, for example, can also be modified as follows. ○ In the above-described first embodiment is connected to the first power transmission coupler 11 to the rectifier circuit 10 connected to the transformer 9, the first transmission coupler 11 may be configured to connect to a commercial AC power supply E . That is, it may be provided between the first power transmission coupler 11 and the first power receiving coupler 12 and the rectifier circuit 5 connected to the power source E and the commercial alternating-current power supply E and. In this case, the first stationary side charging device 1 is provided with a first power transmission coupler only 11, other configurations that follow it are provided for all vehicle-side charging device 3. Then, it is possible to commonality of a rectifier circuit 18 connected to a rectifier circuit 10 connected to the transformer 9 second receiving coupler 20.

[0059]

○ In the third embodiment, in both the apparatus of the first stationary side charging apparatus 1 and the second stationary side charging device 51, the first and the rectifier circuit 10,57 connected to the transformer 9,56 Although connecting the two power transmission couplers 11,58 may be configured such that each well with both transmission coupler 11,58 connected to a commercial AC power source E

[0060]

That is, as shown in Figure 4, may be a second power transmission coupler 58 configured to connect to a commercial AC power source E. In other words, it may be provided between the second power transmission coupler 58 and the second power receiving coupler 60 and the rectifier circuit 52 connected to the power source E and the commercial AC power source E a. In this case, the second stationary side charging device 51 is only the second power transmission coupler 58 is provided, other configurations that follow it are provided for all vehicle-side charging device 59. Incidentally, it may be configured to connect the first transmission coupler 11 instead of the second power transmission coupler 58 to a commercial AC power source E.

[0061]

As shown in Fig. 5 may be configured to connect the first and second power transmission couplers 11,58 in both a commercial AC power source E. In this case, only the respective power transmission coupler to the first and second stationary side charging devices 1 and 51 are provided, are provided other configurations subsequent all be shared by the vehicle-side charging device 59.

[0062]

○ The first, in the third embodiment, in the case of bonding the coupler 11,12,58,60 in Conductive scheme, resonant inverter circuit 8 as an electrical arrangement for generating a direct current power source to be applied to the battery B , it was used 55, etc., a configuration may be other configurations.

[0063]

For example, a commercial AC power source E is supplied through the circuit breaker to the leakage transformer, the direct current voltage generated by rectifying an induced voltage generated by may be applied to the battery B. With this configuration, normally, the control of the required becomes current by the capacity of the battery B is changed albeit rough and automatically. For this reason, no longer need but providing the ECU31.

[0064]

Also, it may be a structure using an SCR that replaced diode of the rectifier circuit 10,57 connected to the transformer 9,56 thyristor. According to this configuration, it is possible to control the more precise current than the configuration using the leakage transformer.

[0065]

c. In the first embodiment, the work of charging the battery B using a first stationary side charging device 1 is set to the manual mode, but the operation using the second stationary side charging device 2 and the auto mode This task scheme may be reversed. In other words, the case of the first stationary side charging device 1 and auto method, may be the case of the second stationary side charging device 2 as a manual mothod.

[0066]

c. The first, in the third embodiment, when bonding the coupler 11,12,58,60 in Conductive manner to control the first and second controllers 7,54 via the signal line L1~L4 from ECU31 Although outputs a signal S5. it may transmit a control signal S5 via the communication circuit. In this case, the first and second controllers 7,54, it is necessary to provide a receiving unit for receiving the transmitted control signal S5.

[0067]

c. In the above embodiments have been described by taking an electric vehicle as an example of a battery vehicle, not only the electric vehicle as a battery vehicle, if the vehicle power supply battery for driving source, for example buses, trucks, industrial It may be a vehicle or the like

[0068]

Next, the technical concept other than the claims that can be grasped from the above embodiments will be described along with the effects described below. (1) and the first power-receiving-side connecting portion where the first transmission-side coupling portion which is provided in the charging power source is artificially bound, is connected to the first power-receiving-side coupling part, both coupling portion is coupled when it, and a battery that is charged by the charging power source, further, to the battery, a second power receiving side in which the second transmission-side coupling portion which is provided in the charging power supply is automatically coupled vehicle-side charging apparatus of a battery car was connected to the coupling portion.

[0069]

With this configuration, when the first transmission-side coupling portion is coupled to the first power-receiving-side coupling portion artificially, a first battery with charging power supplied to the power transmission side coupling part is charged that. In addition, when the second transmission-side coupling portion is automatically coupled to the second power-receiving-side coupling part, the battery is charged by the charging power supplied to the second power-transmitting-side coupling portion. Thus, the work for charging the battery by causing artificially combine the power transmission side coupling portion to the power receiving side connecting portion, and the work for charging automatic power transmission-side coupling portion to the battery by coupling to a power receiving side connecting portion it is possible to perform both tasks.

[0070]

(2) a first receiving-side coupling portion which is the first transmisslon-side coupling portion which is provided in the charging power source is coupled via the contacts by hand, it is connected to the first power-receiving-side coupling part, both bond When the unit is attached, and a battery that is charged by the charging power source, further, to the battery, the second transmission-side coupling portion which is disposed a primary coil of the charging power is supplied noncontact The second power-receiving-side coupling portion which is automatically coupled in the state connected through a rectifier circuit, by disposing the secondary coil to the second power-receiving-side coupling portion, the second transmission-side coupling portion vehicle-side charging apparatus of a battery car to form a transformer at the time with the second of the primary coil of the power transmission-side coupling portion coupling with,

[0071]

With this configuration, when the first transmission-side coupling portion is coupled to the first power-receiving-side coupling portion artificially, a first battery with charging power supplied to the power transmission side coupling part is charged that. In addition, when the second transmission-side coupling portion is automatically coupled to the second power-receiving-side coupling part, a transformer is formed by the respective primary coils disposed on the coupling portion and the secondary coil. In this case, if the charging power is supplied to the second primary coil which is disposed on the power transmission side coupling portion, and the second power-receiving-side coupling part secondary coils disposed in the induced voltage is generated. Its induction voltage is applied to the battery and is rectified into a DC voltage by the rectifier circuit. As a result, the battery is charged. Therefore, the same effect as the technical idea (1) can be obtained by this configuration.

[0072]

As described above in detail, according to the present invention, according to the invention described in claims 1 to 6, low cost it is possible to manufacture the stationary-side charging apparatus capable of widespread, convenience of charging operation In response to both devices and stationary-side charging apparatus can be increased sex, it is possible to perform the charging operation to the battery from either of the devices.

In particular, according to the invention of claim 5, since the circuit is shared, it is possible to simplify the electrical configuration of the apparatus. Also, according to the invention of claim 6, it is possible to accurately perform the process operation for the charging operation to the battery.

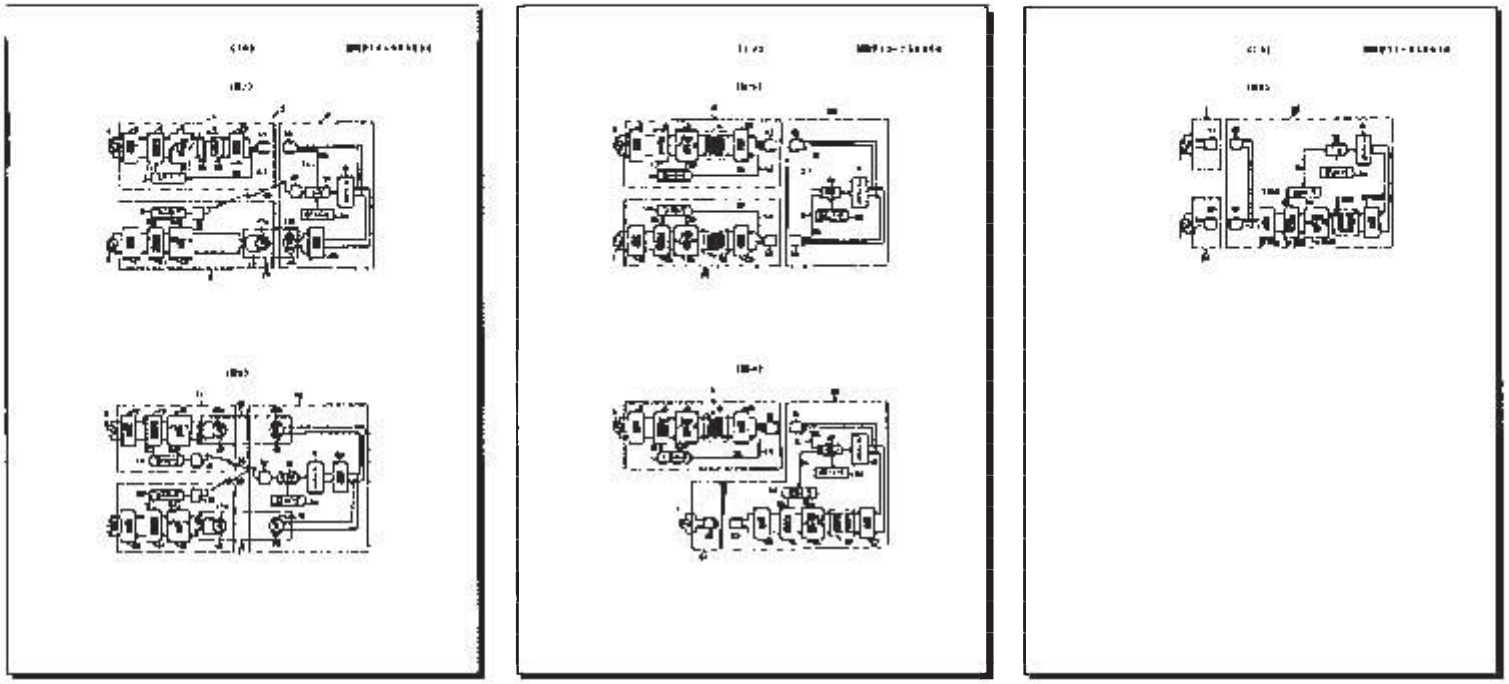
Notice

CLAIMS JPH11252810

[0004]

A vehicle-side charging apparatus for a battery vehicle in which a power receiving side bond portions capable of binding to the power transmission side coupling portion provided on the outside of the stationary-side charger, artificially power receiving side connecting portion of the first transmission-side coupling portion It corresponds to the first stationary side charging device to be coupled to, a first transmission-side coupling portion between the first power-receiving-side coupling portion capable of binding, automatically power-reception-side coupling part and the second transmission-side coupling portion corresponds to the second stationary side charging device to be coupled to a second power-receiving-side coupling portion capable of binding to a second power-transmitting-side coupling part, wherein the first power-receiving-side joint or the second power-receiving-side coupling One of the parts is, when it is combined with the corresponding power transmission side coupling portion, the vehicle-mounted side power receiving apparatus of a battery car in which a charging circuit for charging the battery by the charging power supplied to the power-transmitting-side coupling portion. A vehicle-side charging apparatus for a battery vehicle in which a power receiving side bond portions capable of binding to the power transmission side coupling portion provided on the outside of the stationary-side charger, artificially power receiving side connecting portion of the first transmission-side coupling portion corresponds to the first stationary side charging device to be coupled to, is capable of binding at its first transmission-side coupling portion and a non-contact state, when the can with the first transmission-side coupling portion primary coil disposed in the binding a first receiving-side coupling portion for the secondary coil is arranged to form a transformer, automatically corresponds to the second stationary side charging device for coupling the second transmission-side coupling portion to the power receiving side connecting portion, a It is capable of binding with the second transmission-side coupling portion and a non-contact state, coupled at a second and powered with provided secondary coil forming a transformer together with the second transmission-side coupling portion primary coil disposed in the and side coupling unit, the first is the one power-receiving-side joint or the second power-receiving-side coupling portion, when coupled with the corresponding power transmission side coupling portion, an AC power source for charging the primary coil of the power transmission side coupling portion There by being applied, the induced voltage generated in the secondary coil of the power receiving side coupling part, the vehicle-side charging apparatus for a battery vehicle with a rectifier circuit for rectifying a DC voltage for charging the battery. Characterized by conducting through the contacts, respectively binding, and the binding of the second power transmitting side connecting portion and the second power-receiving-side coupling portion between the first transmission-side coupling portion and the first power-receiving-side coupling portion The vehicle-side charging apparatus for a battery vehicle according to claim 1 to a. A vehicle-side charging apparatus for a battery vehicle in which a power receiving side bond portions capable of binding to the power transmission side coupling portion provided on the outside of the stationary-side charger, artificially power receiving side connecting portion of the first transmission-side coupling portion It corresponds to the first stationary side charging device to be coupled to a first power receiving side coupling portion capable of binding through its first power transmission side coupling part and the contact, automatically a second transmission-side coupling portion corresponding to the second stationary side charging device to be coupled to the power receiving side connecting portion, it is capable of binding at its second power transmission side coupling part and a non-contact state, at the time of bonding and is disposed in the second transmission-side coupling portion a second power-receiving-side coupling portion which is disposed a secondary coil forming a transformer with the primary coil. when the first power-receiving-side coupling portion is coupled to the first transmission-side coupling portion, the first of When a charging circuit for charging the battery at charging power supplied to the power transmission side coupling portion, said second power-receiving-side coupling portion coupled to the second transmission-side coupling portion, and the second of the transmission By charging AC power supply to the primary coil side coupling part is applied, a rectifier circuit for rectifying an induced voltage generated in the secondary coil of the second receiving-side coupling part, to a DC voltage for charging the battery vehicle-side charging apparatus of the battery car with a.

Claim, wherein during, and that it has to share the circuit with the same electrical configuration that is present between the second power-receiving-side connecting portion and said battery and said first power-receiving-side connecting portion and said battery The vehicle-side charging apparatus of a battery car according to claim 2 or 3. Whether carried out using a first stationary side charger when charging the battery, a selectable selection means whether carried out using a second stationary side charging device is providcd, based on the selection in the selection means, between one of the second controller provided in the first controller and the second stationary side charging device provided in the first stationary side charging device a processing operation for performing a charging operation for the battery The vehicle-side charging apparatus for a battery vehicle according to claim 4, characterized in that is provided control means tor executing.



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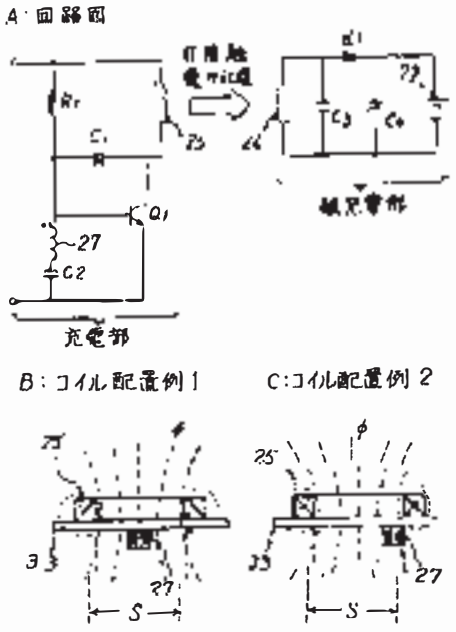
(54)【発明の名称】　非接触型電力伝送装置

(57)【要約】
【課題】本発明は非接触型電力伝送装置に関し、充電部の高周波発振回路として、ハートレイ発振回路を使用できるようにして、部品点数を削減し、ローコスト化すると共に、損失を低減し、電力伝送効率を改善する。
【解決手段】充電部と被充電部とを着脱可能に分離して構成し、充電部には送電コイル２５と高周波発振回路を備え、被充電部には受電コイル２６を備え、充電部から被充電部へ非接触で電力を伝送する非接触型電力伝送装置において、高周波発振回路を発振用コイル２７と前記送電コイル２５とを含んだハートレイ発振回路で構成し、発振用コイル２７と送電コイル２５とを分離独立したコイル部品で構成すると共に、発振用コイル２７の少なくとも一部が、送電コイル２５の巻線部分の内側領域Ｓ内に位置し、両コイルが電磁結合可能な状態に配置した。

本発明の原理説明図



【特許請求の範囲】

【請求項１】充電部と被充電部とを着脱可能に分離して構成し、前記充電部には送電コイルと、前記送電コイルを駆動するための高周波発振回路を備え、前記被充電部には前記送電コイルと電磁結合して電圧を誘起させるための受電コイルを備え、前記充電部から被充電部へ非接触で電力を伝送する非接触型電力伝送装置において、

前記高周波発振回路を発振用コイルと前記送電コイルとを含んだハートレイ発振回路で構成し、前記送電コイルと発振用コイルは、送電コイルの巻線面に対して発振用コイルの巻線面が平行となるように配置され、かつ、前記発振用コイルの少なくとも一部が、前記送電コイルの巻線部分の内側領域内に位置し、前記両コイルが電磁結合可能な状態に配置されていることを特徴とした非接触型電力伝送装置。

【請求項２】充電部と被充電部とを着脱可能に分離して構成し、前記充電部には送電コイルと、前記送電コイルを駆動するための高周波発振回路を備え、前記被充電部には前記送電コイルと電磁結合して電圧を誘起させるための受電コイルを備え、前記充電部から被充電部へ非接触で電力を伝送する非接触型電力伝送装置において、

前記高周波発振回路を発振用コイルと前記送電コイルとを含んだハートレイ発振回路で構成し、前記送電コイルと発振用コイルは、送電コイルの巻線面に対して発振コイルの巻線面が垂直方向となるように配置され、かつ、前記発振用コイルの少なくとも一部が、前記送電コイルの巻線領域内に位置し、前記両コイルが電磁結合可能な状態に配置されていることを特徴とした非接触型電力伝送装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、充電可能な２次電池を電源として動作する携帯電話機、ＰＨＳ電話機（簡易携帯電話機）、コードレスホン、各種電気機器、或いは電子機器等に利用可能な非接触型電力伝送装置に関する。特に、本発明は充電部から被充電部へ金属接点を介さず非接触で、電磁誘導作用により電力を伝送する非接触型電力伝送装置に関する。

【０００２】

【従来の技術】以下、図に基づいて従来例を説明する。

§１：非接触型電力伝送装置の説明・・・図１３参照

図１３は従来例の説明図（その１）であり、Aは充電部、被充電部の構成■、Bは充電状態説明図である。従来、充電部と被充電部とを着脱可能に分離して構成し、前記充電部に送電コイルと、前記送電コイルを駆動するための高周波発振回路を備え、前記被充電部に前記送電コイルと電磁結合して電圧を誘起させるための受電コイルと、前記受電コイルに誘起した電圧により充電する２次電池等を備え、前記送電部から受電部へ、金属接点を介さず非接触で、電磁誘導作用により電力を伝送する非接触型電力伝送装置が知られていた。

【０００３】前記非接触型電力伝送装置の１例（コイル部分）を図１３のAに示す。図１３のAに示したように、充電部と被充電部とを着脱可能に分離して構成し、充電部には送電コイル用ボビン６に巻いた送電コイル７、及び帰還コイル８が設けてある。この場合、送電コイル７と帰還コイル８は１つの送電コイル用ボビン６に巻いてあり、同軸的に配置されている。また、送電コイル用ボビン６にはコア９が挿入されている。

【０００４】そして、充電部には送電コイル７を駆動するために駆動回路１３が設けてあり、前記駆動回路１３には電源回路や前記高周波発振回路を備え、この高周波発振回路により送電コイル７を駆動するように構成されている。一方、被充電部には、受電コイル用ボビン１１に巻いた受電コイル１２が設けてある。

【０００５】そして、被充電部内の２次電池を充電する場合には、図１３のBに示したように、充電部の上に被充電部を載せる。この場合、充電部側ケース３の一部に、被充電部を載せるための凹部が形成されており、この凹部に被充電部を載せるようになっている。

【０００６】この状態で、送電コイル７と受電コイル１２は対向配置され、最も接近した状態となって充電待機状態になる。その後、充電部の電源を投入して駆動回路１３を動作させ、前記高周波発振回路により送電コイル７を駆動すれば、充電部から被充電部へ金属接点を介さず非接触で、電磁誘導作用により電力を伝送し、その電力を使用して前記２次電池の充電を行う。

【０００７】§２：高周波発振回路の説明・・・図１４参照

図１４は従来例の説明図（その２）であり、Aは発振原理図、Bはハートレイ発振回路を示す。前記駆動回路１３に設けた高周波発振回路としては、例えば、２個のトランジスタと、前記送電コイル７を含むＬＣ並列共振回路を使用したプッシュプル型の高周波発振回路を使用していたが、このような高周波発振回路は部品点数が多くなる。そこで、ＬＣ発振回路の中で最も部品点数の少ないハートレイ発振回路を使用することが考えられていた。

【０００８】一般的に、図１４のAに示した発振原理図において、インピーダンスZ_1、Z_2、Z_3の３つの素子と、増幅素子であるトランジスタＱ１が図示のように接続されている場合、インピーダンスZ_1の素子が誘導性素子（又は容量性素子）で、インピーダンスZ_2、Z_3の素子が容量性素子（又は誘導性素子）であれば、発振条件を満足し、発振状態を維持できることが知られている。

【０００９】そして、インピーダンスZ_1の素子として容量性素子、インピーダンスZ_2、Z_3の素子として誘導性素子を使用し、前記各素子とトランジスタＱ１を接続するとハートレイ発振回路を構成することができる。

このようなハートレイ発振回路（自励振型発振回路）を■１４のＢに示す。前記ハートレイ発振回路は、第１のコイルＴ１と、第２のコイルＴ２と、コンデンサＣ１と、トランジスタＱ１により構成され、部品点数が少なくて済む。しかし、前記充電部の高周波発振回路としてハートレイ発振回路をそのまま使用することは困難であった。以下、その理由を説明する。

【００１０】前記充電部の高周波発振回路をハートレイ発振回路で構成するには、前記送電コイル７を第１のコイルＴ１とし、前記帰還用コイル８を第２のコイルＴ２（発振用コイル）として使用することになる。この場合、第１のコイルＴ１を第２のコイルＴ２と電磁結合させて使用するが、電磁誘導により第２のコイルＴ２に発生した電圧がトランジスタＱ１のベースに印加する（逆バイアスとして印加する）。

【００１１】ところが、第２のコイルＴ２に発生する電圧が規定値より大きいと、トランジスタＱ１のベースに過大電圧が印加し、トランジスタＱ１を破壊することがある。また、第２のコイルＴ２に発生する電圧が規定値より小さいと、トランジスタＱ１のベースに適正電圧が印加せず損失が増大する。すなわち、トランジスタＱ１のベースに適切な正帰還電圧が印加すれば損失の少ない発振動作を行うが、正帰還電圧が小さいと損失が大きくなる。

【００１２】そこで、トランジスタＱ１のバイアスを適正に調整することが必要となるが、従来のコイル配置では図１３に示したように、前記２つのコイル（Ｔ１，Ｔ２）が同一コイルボビンに巻かれており、同軸的に固定配置されているので、第１のコイルＴ１と第２のコイルＴ２との電磁結合の度合いを調整することはできない。

【００１３】また、第１のコイルＴ１と第２のコイルＴ２との電磁結合の度合いを調整するために、第２のコイルＴ２の巻数を変えることも考えられるが、巻数を変えると第２のコイルＴ２の自己インダクタンス値が変化する。ハートレイ発振回路では、第１のコイルＴ１と第２のコイルＴ２の自己インダクタンス値が、或る値の時に発振条件を満たすので、前記のように第２のコイルＴ２の巻数を変えて自己インダクタンス値を変化させると、前記発振条件を満たさなくなり、発振動作ができなくなる。従って、トランジスタＱ１のバイアスを適正な値に調整することは困難であり、前記高周波発振回路をハートレイ発振回路で構成することは困難であった。

【００１４】

【発明が解決しようとする課題】前記のような従来の装置では次のような課題があった。

(1)：ハートレイ発振回路はＬＣ発振回路の内で最も部品点数が少なくて済む発振回路なので、前記充電部の高周波発振回路としてハートレイ発振回路を使用することが考えられていた。しかし、従来知られていた充電部の高周波発振回路としてハートレイ発振回路をそのまま使用することは困難であった。

【００１５】すなわち、前記充電部の高周波発振回路をハートレイ発振回路で構成するには、前記送電コイル７を第１のコイルＴ１とし、帰還用コイル８を第２のコイルＴ２（発振用コイル）として使用することになる。この場合、第１のコイルＴ１を第２のコイルＴ２と電磁結合させて使用するが、電磁誘導により第２のコイルＴ２に発生した電圧がトランジスタＱ１のベースに印加する。

【００１６】そして、第２のコイルＴ２に発生する電圧が規定値より大きいと、トランジスタＱ１のベースに過大電圧が印加し、該トランジスタＱ１を破壊することがある。また、第２のコイルＴ２に発生する電圧が規定値より小さいと、トランジスタＱ１に適正電圧が印加せず、損失が増大する。すなわち、トランジスタＱ１のベースに、適切な正帰還電圧が印加すれば損失の少ない発振動作を行うが、正帰還電圧が小さいと損失が大きくなる。

【００１７】そこで、トランジスタＱ１のバイアスを適正に調整することが必要となるが、従来のコイル配置では２つのコイルが同一コイルボビンに巻かれており、同軸的に固定配置されているので、第１のコイルＴ１と第２のコイルＴ２との電磁結合の度合いを調整することはできない。従って、トランジスタＱ１のベース電圧を適正な値に調整することは難しいので、前記高周波発振回路としてハートレイ発振回路をそのまま使用することは困難であった。

【００１８】(2)：また、従来のコイル配置において、第１のコイルＴ１と第２のコイルＴ２との電磁結合の度合いを調整するために、第２のコイルＴ２の巻数を変えることも考えられるが、巻数を変えると第２のコイルＴ２の自己インダクタンス値が変化する。

【００１９】ところが、ハートレイ発振回路では、第１のコイルＴ１と第２のコイルＴ２の自己インダクタンス値が、或る値の時に発振条件を満たすので、前記のように第２のコイルＴ２の巻数を変えて自己インダクタンス値を変化させると、前記発振条件を満たさなくなり、発振動作ができなくなる。このように、トランジスタＱ１のバイアスを適正な値に調整することが難しいので、前記高周波発振回路としてハートレイ発振回路をそのまま使用することは困難であった。

【００２０】(3)：前記のように、従来知られていた充電部の高周波発振回路としてハートレイ発振回路をそのまま使用することは困難なので、部品点数の削減が難しく、非接触型電力伝送装置のローコスト化を実現するのは困難であった。

【００２１】本発明は、このような従来の課題を解決し、トランジスタのベースに逆バイアスを印加するコイルの誘起電圧を調整可能にすることで、充電部の高周波発振回路としてハートレイ発振回路を使用できるように

して、部品点数を削減し、ローコスト化すると共に、トランジスタの逆バイアスを常に最適な値に調整することで損失を低減し、電力伝送効率を改善することを目的とする。

【００２２】

【課題を解決するための手段】図１は本発明の原理説明図であり、Ａは回路図、Ｂはコイル配置例１、Ｃはコイル配置例２である。図１において、Ｑ１はトランジスタ、Ｒ１は抵抗、Ｃ１、Ｃ２、Ｃ３、Ｃ４はコンデンサ、２５は送電コイル、２７は発振用コイル、２６は受電コイル、ｄ１はダイオード、２２は２次電池を示す。また、トランジスタＱ１、抵抗Ｒ１、コンデンサＣ１、Ｃ２、送電コイル２５、発振用コイル２７によりハートレイ発振回路を構成する。

【００２３】本発明は前記目的を達成するため、図１に示したように、充電部と被充電部とを着脱可能に分離して構成し、前記充電部には送電コイル２５と、前記送電コイル２５を駆動するための高周波発振回路を備え、前記被充電部には前記送電コイル２５と電磁結合して電圧を誘起させるための受電コイル２６を備え、前記充電部から被充電部へ非接触で電力を伝送する非接触型電力伝送装置において、前記高周波発振回路を、発振用コイル２７と前記送電コイル２５とを含んだハートレイ発振回路で構成し、前記送電コイル２５と発振用コイル２７は、送電コイル２５の巻線面に対して発振用コイル２７の巻線面が平行となるように配置され、かつ、前記発振用コイル２７の少なくとも一部が、前記送電コイル２５の巻線部分の内側領域Ｓ内に位置し、両コイルが電磁結合可能な状態に配置した。

【００２４】また、本発明は充電部と被充電部とを着脱可能に分離して構成し、前記充電部には送電コイル２５と、前記送電コイル２５を駆動するための高周波発振回路を備え、前記被充電部には前記送電コイル２５と電磁結合して電圧を誘起させるための受電コイル２６を備え、前記充電部から被充電部へ非接触で電力を伝送する非接触型電力伝送装置において、前記高周波発振回路を発振用コイル２７と前記送電コイル２５とを含んだハートレイ発振回路で構成し、前記送電コイル２５と発振用コイル２７は、送電コイル２５の巻線面に対して発振コイル２７の巻線面が垂直方向となるように配置され、かつ、前記発振用コイル２７の少なくとも一部が、前記送電コイル２５の巻線領域内に位置し、前記両コイルが電磁結合可能な状態に配置した。

【００２５】（作用）前記構成に基づく本発明の作用を、図１に基づいて説明する。先ず、充電部の部品を製作する場合、発振用コイル２７と送電コイル２５とを分離独立したコイル部品として製作する。その後、例えばプリント基板に送電コイル２５と発振用コイル２７の位置決めを行って実装することでコイルユニットを製作するが、発振用コイル２７の少なくとも一部が、送電コイル２５の巻線部分の内側領域Ｓ内に位置し、前記両コイルが電磁結合可能な状態に配置する。

【００２６】この場合、図１のＢに示したように、発振用コイル２７を送電コイル２５の巻線部分の内側領域Ｓ内の略中央に位置させたり、図１のＣに示したように、発振用コイル２７を送電コイル２５の巻線部分の内側領域Ｓ内の片隅（両側の片隅）に位置させたり、或いは前記各位置の中間の任意の位置に移動させながら、発振用コイル２７の位置を調整することで、トランジスタＱ１に常に最適な逆バイアスが印加するように設定する。

【００２７】このようにして送電コイル２５に対し発振用コイル２７を最適な位置に設定したコイルユニット、及び他の部品を充電部に組み込み、更に被充電部にも受電コイル２６や２次電池２２等の部品を組み込む。このようにして製作した充電部上の所定の位置に、被充電部を載せ、充電部に電源を投入すると、ハートレイ発振回路からなる高周波発振回路が発振動作を行う。

【００２８】前記のようにしてハートレイ発振回路により送電コイル２５を駆動することで、高周波の電磁波を発生させ、被充電部に対して電磁波による非接触電力伝送を行う。この時被充電部では送電コイル２５からの電磁誘導作用により受電コイル２６に誘導電圧が発生する。この誘導電圧により受電コイル２６とコンデンサＣ３による並列共振回路が共振状態となり受電された電圧の振幅を拡大する。そして、ダイオードｄ１により半波整流され、コンデンサＣ４により平滑化された直流電圧を負荷である２次電池２２に印加し、２次電池２２を充電する。

【００２９】前記のように、トランジスタＱ１のベースに逆バイアスを印加する発振用コイル２７の誘起電圧を調整可能にすることで、充電部の高周波発振回路としてハートレイ発振回路を使用できるようになる。このため、部品点数を削減し、ローコスト化できると共に、トランジスタの逆バイアスを常に最適な値に調整することができるので、損失を低減し、電力伝送効率を改善することが可能になる。

【００３０】また、送電コイル２５と発振用コイル２７を、送電コイル２５の巻線面に対して発振コイル２７の巻線面が垂直方向となるように配置し、かつ、発振用コイル２７の少なくとも一部が、送電コイル２５の巻線領域内に位置し、前記両コイルが電磁結合可能な状態に配置した場合にも、前記と同様にして、トランジスタＱ１のベースに逆バイアスを印加する発振用コイル２７の誘起電圧を調整可能にすることができるので、充電部の高周波発振回路としてハートレイ発振回路を使用できるようになる。

【００３１】従って、この場合にも部品点数を削減し、ローコスト化できると共に、トランジスタの逆バイアスを常に最適な値に調整することができるので、損失を低減し、電力伝送効率を改善することが可能になる。

【００３２】
【発明の実施の形態】以下、発明の実施の形態を図面に基づいて詳細に説明する。
§１：非接触型電力伝送装置の具体例の説明・・・図２参照
図２はコードレスホンの構成図であり、Ａは全体図、Ｂは一部拡大図（Ａに示したイの部分の拡大図）である。本発明に係る非接触型電力伝送装置は、例えば、図２に示したようなコードレスホンに適用することが可能である。このコードレスホンは、充電器２０とコードレスホン子機２１を備えている。そして、充電器２０を構成する充電器ケース２４内には送電コイル２５と、前記送電コイル２５を駆動するための高周波発振回路と、整流／平滑回路２８やヒューズ２９を含む電源回路が設けてある。また、前記電源回路には電源プラグ３０が接続されている。
【００３３】一方、コードレスホン子機２１を構成するコードレスホン子機ケース２３内には、前記送電コイル２５と電磁結合して電圧を誘起させるための受電コイル２６と、前記受電コイル２６に誘起した電圧により充電される２次電池２２等が設けてある。
【００３４】前記２次電池２２を充電する場合は、電源プラグ３０を商用電源（５０／６０Ｈｚ、１００Ｖ）に接続し、充電器２０上の所定の位置にコードレスホン子機２１を載せる。この状態で充電器２０内の高周波発振回路が発振動作を開始すると、送電コイル２５から受電コイル２６へ金属接点を介さず、非接触で電力伝送が行われる。この時、コードレスホン子機２１側では受電コイル２６に電圧が誘起し、その電圧により２次電池２２を充電する。なお、以下の説明では、充電器２０を「充電部」、コードレスホン子機を「被充電部」とも記す。
【００３５】§２：高周波発振回路の説明・・・図３参照
図３は回路図である。図３に示した回路は、図２に示した充電器２０（充電部）とコードレスホン子機２１（被充電部）の回路である。前記充電部と被充電部は着脱可能に分離して構成されており、前記充電部には送電コイル２５と、前記送電コイルを駆動するための高周波発振回路と、電源回路を備え、前記電源回路に電源プラグ３０が接続されている。
【００３６】前記電源回路は、整流／平滑回路２８とヒューズ２９により構成されており、電源プラグ３０を介して入力された交流電圧が前記整流／平滑回路２８に入力する。この場合、整流／平滑回路２８では、入力された交流電圧を基に整流／平滑化動作を行い、直流電圧を出力する。そして整流／平滑回路２８の出力を電源として高周波発振回路が動作する。
【００３７】また、前記高周波発振回路として、トランジスタＱ１と、送電コイル２５と、発振用コイル２７と、コンデンサＣ１、Ｃ２と、抵抗Ｒ１からなるハートレイ発振回路を使用し、このハートレイ発振回路により送電コイル２５を駆動するように構成されている。なお、前記ハートレイ発振回路において、送電コイル２５、発振用コイル２７は、それぞれ図１２に示した第１のコイル２５、第２のコイル２７に相当する。また、抵抗Ｒ１はトランジスタＱ１のベースに直流バイアス電流を供給するための抵抗であり、コンデンサＣ２は電源より抵抗Ｒ１、発振用コイル２７を介して接地側に直流電流が流れるのを阻止するためのコンデンサである。
【００３８】一方、前記被充電部には、前記送電コイル２５と電磁結合して電圧を誘起させるための受電コイル２６と、前記受電コイル２６に並列接続され、並列共振回路を構成するコンデンサＣ３（並列共振用コンデンサ）と、整流用のダイオードｄ１と、平滑用のコンデンサＣ４と、２次電池２２が設けてある。
【００３９】前記ハートレイ発振回路により送電コイル２５を駆動することで、高周波の電磁波を発生させ、被充電部に対して電磁波による非接触電力伝送を行う。この場合、被充電部では送信コイル２５からの電磁誘導作用により受電コイル２６に誘導電圧が発生する。この電圧により受電コイル２６とコンデンサＣ３による並列共振回路が共振状態となり受電された電圧の振幅を拡大する。そして、ダイオードｄ１により半波整流され、コンデンサＣ４により平滑化された直流電圧を負荷である２次電池２２に印加し、２次電池２２を充電する。
【００４０】§３：コイルの配置関係の説明・・・図４参照
図４はコイルの配置例説明図であり、Ａは例１、Ｂは例２、Ｃは例３、Ｄは例４を示す。以下、図４に基づいて、前記充電部に設けた送電コイル２５と発振用コイル２７との配置関係を説明する。前記従来例で説明したように、充電部の高周波発振回路としてハートレイ発振回路を使用できるようにするためには、送電コイル２５と発振用コイル２７との電磁結合の度合いを調整可能にする必要がある。
【００４１】そこで、送電コイル２５と発振用コイル２７を分離独立したコイル部品で構成すると共に、発振用コイル２７の少なくとも一部が、送電コイル２５の巻線部分の内側領域Ｓ内に位置し、両コイルが電磁結合可能な状態に配置する。この場合の配置例を図４のＡ、Ｂ、Ｃ、Ｄに示してある。以下、具体的に説明する。
【００４２】この例では、送電コイル２５はセメントワイヤにより巻かれ、固定化した１部品（ボビンレスの１コイル部品）として構成され、プリント基板３３の一方の面（表面）の略中央部に接着固定されている。一方、発振用コイル２７は、コイルボビン３１にワイヤを巻いた１部品として構成され、プリント基板３３の他方の面（裏面）に表面実装部品（ＳＭＤ）として搭載されている。また、プリント基板３３の他方の面（裏面）には、高周波発振回路の他の部品（コンデンサＣ１、Ｃ２、抵

抗Ｒ１、トランジスタＱ１等）や、電源回路の部品が表面実装部品として搭載されている。

【００４３】なお、この例では、送電コイル２５の巻線面はプリント基板３３の表裏面と平行であり、発振用コイル２７の巻線面もプリント基板３３の表裏面と平行である。すなわち、送電コイル２５と発振用コイル２７は、送電コイル２５の巻線面に対して発振用コイル２７の巻線面が平行となるように配置されている（送電コイル２５を縦置きとした場合、発振用コイル２７も縦置き）。

【００４４】このようにして、充電部の各部品をプリント基板３３に搭載するが、発振用コイル２７の搭載位置を移動させることで、送電コイル２５と発振用コイル２７との電磁結合の度合いを調整できるようにした。この場合、送電コイル２５の平面形状は円形、楕円形、四角形、多角形等で構成できるが、送電コイル２５の巻線部の内側の領域（円形の空芯コイルでは中空部内）を図示のように「巻線部分の内側領域Ｓ」と定義する。

【００４５】そして、発振用コイル２７の少なくとも一部が、送電コイル２５の巻線部分の内側領域Ｓ内に位置し、前記両コイルが電磁結合可能な状態に配置され、送電コイル２５の発生する磁束φ［Ｗｂ］が発振用コイル２７を貫き、磁束φの向きと発振コイル２７の巻線が垂直になるようにする。

【００４６】図４のＡは、発振用コイル２７が送電コイル２５の巻線部分の内側領域Ｓ内の略中央に位置している例である。この例では、送電コイル２５の発生する磁束φが発振用コイル２７を貫いている。図４のＢは、発振用コイル２７が送電コイル２５の巻線部分の内側領域Ｓ内の片隅に位置している例である。この例でも、送電コイル２５の発生する磁束φが発振用コイル２７を貫いている。

【００４７】図４のＣは、発振用コイル２７が送電コイル２５の巻線部分の内側領域Ｓ外に位置している例である。この例では、送電コイル２５の発生する磁束φが発振用コイル２７を殆ど貫いていないため、発振動作は可能であるが損失が極めて多くなる。図４のＤは、発振用コイル２７が送電コイル２５の巻線部分の内側領域Ｓ外に位置している例である。この例では、送電コイル２５の発生する磁束φが発振用コイル２７を貫いているが、磁束φの向きが逆向きであり、トランジスタＱ１に正常動作時の正帰還と逆向きの電圧が印加し、発振動作ができない。

【００４８】以上のように、前記図４のＡ、Ｂの状態では正常な発振動作を行い、損失も少ないが、図４のＣの状態では発振動作は可能であるが、損失が極めて多くなる。そして、図４のＤの状態では発振用コイル２７に誘起される電圧の向きが、逆向きになり、発振動作が停止する。従って、前記図４のＡ、Ｂのような状態で使用する必要がある。

【００４９】§４：コイルの配置と高周波発振回路の動作説明・・・図５参照

図５は高周波発振回路の波形図（その１）であり、Ａは例１、Ｂは例２である。図５において、I_C はトランジスタＱ１のコレクタ電流、V_{CE}はトランジスタのコレクタ・エミッタ間電圧、V_{BE}はトランジスタＱ１のベース・エミッタ間電圧、Ｔ１～Ｔ５は各タイミング（時刻）、P_0 は損失を示す。

【００５０】(1) ：例１の説明・・・図５のＡ参照

図５のＡに示した例１は、図３に示した送電コイル２５と発振用コイル２７の配置を図４のＡ、或いはＢのように、発振用コイル２７が送電コイル２５の巻線部分の内側領域Ｓ内にある場合の波形図である。この例では、タイミングＴ１～Ｔ２の間でトランジスタＱ１はオフ、タイミングＴ２～Ｔ３の間でトランジスタＱ１はオン、タイミングＴ３～Ｔ５の間でトランジスタＱ１はオフとなり、発振動作は行われる。

【００５１】すなわち、タイミングＴ１～Ｔ２の間でトランジスタＱ１には、大きなベース・エミッタ間電圧V_{BE}が逆バイアスとして印加しており、トランジスタＱ１はオフであり（逆バイアスが深い状態）、トランジスタＱ１のコレクタ電流I_Cは殆ど流れず、コレクタ・エミッタ間電圧V_{CE}は大きな値となっている。

【００５２】タイミングＴ２になると、トランジスタＱ１のベース・エミッタ間電圧V_{BE}が正方向バイアス（順方向バイアス）としてトランジスタＱ１に印加し、トランジスタＱ１はオンになり、コレクタ電流I_Cが流れ始める。そして、コレクタ電流I_Cが徐々に大きくなり、その後、コレクタ電流I_Cが小さくなって、タイミングＴ３でトランジスタＱ１はオフになる。以降同様にしてトランジスタＱ１はオン／オフを繰り返しながら発振動作を行う。

【００５３】前記動作において、トランジスタＱ１はタイミングＴ３でオフになろうとするが、トランジスタＱ１に蓄積されたキャリアの影響により、タイミングＴ４までコレクタ電流I_Cが流れ続ける。このような動作を行うため、タイミングＴ３～Ｔ４の間で損失P_0が発生する。

【００５４】しかし、この例では、トランジスタＱ１がオフになるべきタイミングにおいて、トランジスタＱ１のベース・エミッタ間電圧V_{BE}が負の大きな値となり、トランジスタＱ１のベースに逆バイアスとして印加するので、コレクタ電流I_Cが急速に減衰し、トランジスタＱ１は急速にオフとなる。そのため、損失P_0は極めて小さく問題はない。すなわち、例１では充電部の高周波発振回路が低損失で、正常に発振動作を行うことができる。

【００５５】(2) ：例２の説明・・・図５のＢ参照

図５のＢに示した例２は、図３に示した送電コイル２５と発振用コイル２７の配置を図４のＣのように、発振用

コイル２７が送電コイル２５の巻線部分の内側領域Ｓ内にない場合の波形図である。この例でも、前記例１と同様にして、タイミングＴ１～Ｔ２の間でトランジスタＱ１はオフ、タイミングＴ２～Ｔ３の間でトランジスタＱ１はオン、タイミングＴ３～Ｔ５の間でトランジスタＱ１はオフとなり、発振動作は行われる。

【００５６】しかし、この例では、トランジスタＱ１がオフになるべき期間、例えば、タイミングＴ１～Ｔ２間、或いはタイミングＴ３～Ｔ５間において、トランジスタＱ１に逆バイアスとして印加するベース・エミッタ間電圧V_{BE}が小さい（逆バイアスが浅い状態）。このため、例えば、トランジスタＱ１がオフになるべきタイミングＴ３～Ｔ４の間で、長い時間コレクタ電流I_Cが流れ続け、損失P_0が極めて大きくなる。

【００５７】すなわち、トランジスタＱ１をオンからオフにする時、トランジスタＱ１のベースに逆バイアスを印加することで、該トランジスタＱ１をオフにするが、前記逆バイアスが小さいと（逆バイアスが浅いと）、トランジスタＱ１を急速にオフにできなくなる。そのため、トランジスタＱ１がオフになるべきタイミングＴ３～Ｔ４の間で、長い時間コレクタ電流I_Cが流れ続け、損失P_0が極めて大きくなる。

【００５８】§５：コイルの配置とトランジスタのバイアス調整の説明・・・図６参照

図６は高周波発振回路の波形図（その２）であり、Ａ～Ｄは発振用コイル２７の位置を変えた場合のトランジスタのベース・エミッタ間電圧（V_{BE}）波形を示す。このベース・エミッタ間電圧（V_{BE}）波形は、所定の実験条件を設定し、図３に示した回路の発振用コイル２７の位置を、図４に示したように変化させながら実験を行い、測定した波形例である。

【００５９】(1)：図６のＡは、発振用コイル２７を図４のＡに示した位置に配置した場合のトランジスタＱ１のベース・エミッタ間電圧（V_{BE}）波形である。この場合、発振用コイル２７が送電コイル２５の巻線部分の内側領域Ｓ内の略中央に位置しており、送電コイル２５の発生する磁束φが発振用コイル２７を貫いている。このため、発振用コイル２７には十分大きな電圧が発生し、これがトランジスタＱ１のベースに逆バイアスとして印加している。

【００６０】すなわち、トランジスタＱ１のベース・エミッタ間電圧V_{BE}は、タイミングＴ２～Ｔ３の間でV_{BE}＝－８［Ｖ］程度と大きくなり、トランジスタＱ１のベースに大きな逆バイアス電圧が印加しており（逆バイアスが深い状態）、発振動作が正常に行われている。

【００６１】この実験の場合、高周波発振回路の直流入力電圧（整流／平滑回路２８の直流出力電圧）をV_{IN}、被充電部の出力電圧（コンデンサＣ４の出力電圧）をV_0、出力電流（２次電池２２の流入電流）をI_0とすると、V_{IN}＝１４．１［Ｖ］、V_0＝５．９［Ｖ］、I_0＝１３０［ｍＡ］であった。

【００６２】(2)：図６のＢは、発振用コイル２７を図４のＢに示した位置に配置した場合のトランジスタＱ１のベース・エミッタ間電圧（V_{BE}）波形である。この場合、発振用コイル２７が送電コイル２５の巻線部分の内側領域Ｓ内の片隅に位置しているが、送電コイル２５の発生する磁束φが発振用コイル２７を貫いている。

【００６３】このため、タイミングＴ２～Ｔ３の間で発振用コイル２７には大きな電圧が発生し、これがトランジスタＱ１のベースに逆バイアスとして印加している。すなわち、トランジスタＱ１のベース・エミッタ間電圧V_{BE}は、タイミングＴ２～Ｔ３の間でV_{BE}＝－３［Ｖ］程度となり、この電圧がトランジスタＱ１のベースに逆バイアスとして印加し、発振動作が正常に行われている。ただし、この例では前記図６のＡに示した波形に比べて、逆バイアスは小さくなっている。

【００６４】(3)：図６のＣは、発振用コイル２７を図４のＣに示した位置に配置した場合のトランジスタＱ１のベース・エミッタ間電圧（V_{BE}）波形である。この場合、発振用コイル２７が送電コイル２５の巻線部分の内側領域Ｓ外に位置しており、送電コイル２５の発生する磁束φが発振用コイル２７を殆ど貫いていない。

【００６５】このため、タイミングＴ２からＴ３の間で、発振用コイル２７には小さな電圧が発生し、これがトランジスタＱ１のベースに逆バイアスとして印加している。すなわち、トランジスタＱ１のベース・エミッタ間電圧V_{BE}は、タイミングＴ２～Ｔ３の間でV_{BE}＝－０．６［Ｖ］程度と極めて小さくなり、発振動作は可能であるが、損失は極めて大きくなっている。

【００６６】(4)：図６のＤは、発振用コイル２７を図４のＤに示した位置に配置した場合のトランジスタＱ１のベース・エミッタ間電圧（V_{BE}）波形である。この場合、発振用コイル２７が送電コイル２５の巻線部分の内側領域Ｓ外に位置しており、送電コイル２５の発生する磁束φが発振用コイル２７を貫いているが、磁束φの向きが正帰還の場合と逆向きであり、発振は停止している。

【００６７】前記図６のＡ～Ｄに示したように、発振用コイル２７の位置を変えることで、トランジスタＱ１のベースに逆バイアスとして印加する電圧の大きさを変化させることができる。従って、発振用コイル２７の位置調整により、トランジスタＱ１のバイアスを最適な値に調整して、最も損失の少ない発振動作を行わせることができる。なお、発振用コイル２７の位置調整は発振用コイル２７の組み込み工程で行う。

【００６８】§６：電力伝送効率の説明・・・図７、図８参照

図７は電力伝送効率の説明図（その１）、図８は電力伝送効率の説明図（その２）である。前記図３に示した高周波発振回路の発振用コイル２７を図４に示したように

移動させた場合の電力伝送効率の変化を実験により確認した。以下、その実験例について説明する。

【００６９】前記実験では、図3に示した回路において、充電部の直流入力電力（整流／平滑回路２８の入力電力）をP_{IN}、被充電部の出力電圧（コンデンサＣ４の出力電圧）をV_0、出力電流（２次電池２２の流入電流）をI_0、出力電力をP_0、電力伝送効率をηとした。そして、$\eta = P_0 / P_{IN} = \{(V_0 \times I_0) / P_{IN}\} \times 100$［％］の式により電力伝送効率を求めた。

【００７０】また、図7のBに示したように送電コイル２５の平面図上でＸ－Ｙ直行座標を設定し、送電コイル２５の中心位置を原点0にする。そして、前記原点0から発振用コイル２７の外側位置までの距離をｘ（＋ｘ、－ｘ）として、ｘを変えながら実験を行った。その結果求めた電力伝送効率ηは図7のAに示したように変化した。

【００７１】図7のAにおいて、ｘがSの領域内にある時は、発振用コイル２７の位置が送電コイル２５の巻線部分の内側領域内にある状態、すなわち、発振用コイル２７が図4のA、Bに示した位置にある場合である。このように、発振用コイル２７の位置が送電コイル２５の巻線部分の内側領域S内にあれば、発振用コイル２７の位置が最適な位置であり、最高効率で電力伝送を行うことができることが分かる。

【００７２】また、図7のAにおいて、ｘがMの領域内にある時は、発振用コイル２７が図4のCに示した位置にある状態である。この状態では自励発振は可能であるが、損失が極めて多くなり、電力伝送効率も悪化する。更に、図7のAにおいて、ｘがNの領域内にある時は、発振用コイル２７が図4のDに示した位置にある状態である。この状態では自励発振が不可能であり、当然、電力伝送はできなくなる。なお、発振用コイル２７が送電コイル２５から極めて遠くに離れ、互いに電磁結合しない状態でも発振動作が可能であるが、損失が極めて多くなり、電力伝送効率も極めて悪くなって、実用に耐えない。

【００７３】また、前記電力伝送効率ηの比較の為に、発振用コイル２７の位置を図4のA、及びBに示した位置と、図4のCに示した位置とで実験を行い、図8に示したデータを得た。図8において、横軸は出力電流I_0［ｍＡ］、縦軸は効率η［％］、は発振用コイル２７の位置を図4のA、及びBに示した位置での効率をボし、は発振用コイル２７の位置を図4のCに示した位置での効率を示している。

【００７４】に示した効率ηは出力電流I_0の変化に対し、広い範囲で高効率を示しているが、に示した効率ηは出力電流I_0の変化に対し、全体としてより効率が低いことが判明した。１例として、出力電流I_0の値がI_0－１３０［ｍＡ］の場合、の効率ηはη＝６０％であり、の効率ηはη＝４１％であった。従って、との効率の差は、６０－４１＝１９％となり、の効率が理想的であることが分かる。

【００７５】§７：コイル実装例の説明・・・図9、■１０参照

■9は充電部のコイル実装例であり、Aは送電コイルユニット例１（平面図、及び側面図）、Bは送電コイルユニット例２（平面図、及び側面図）、Cは送電コイルユニットと受電コイルの例（斜視図）である。図１０は充電状態でのコイル配置説明図であり、Aは図９のAに示した送電コイルユニット使用時、Bは図９のBに示した送電コイルユニット使用時、Cは送電コイル２５と受電コイルに空芯コイルを使用した場合の説明図である。以下、図９、図１０に基づいてコイル実装例を説明する。

【００７６】(1)：図９のAに示した送電コイルユニット例1では、送電コイル２５はセメントワイヤにより巻かれ、固定化した１部品（空芯コイル）として構成され、プリント基板３３の一方の面（表面）の略中央部に接着固定されている。一方、発振用コイル２７は、コイルボビン３１にワイヤを巻いた１部品として構成され、プリント基板３３の他方の面（裏面）に表面実装部品（ＳＭＤ）として搭載されている。

【００７７】更に、プリント基板３３の他方の面（裏面）には、高周波発振回路の他の部品や、電源回路の部品が表面実装部品として搭載されている。この場合、発振用コイル２７が送電コイル２５の巻線部分の内側領域Ｓ内の片隅に位置している例であり、送電コイル２５の発生する磁束φが発振用コイル２７を貫く。

【００７８】(2)：図９のBに示した送電コイルユニット例２では、送電コイル２５はセメントワイヤにより巻かれ、固定化した１部品（空芯コイル）として構成され、プリント基板３３の一方の面（表面）の略中央部に接着固定されている。一方、発振用コイル２７も、セメントワイヤにより巻かれ、固定化した１部品（空芯コイル）として構成され、プリント基板３３の一方の面（表面）上であって、前記送電コイル２５の中空部内に接着固定されている。

【００７９】更に、プリント基板３３の他方の面（裏面）には、高周波発振回路の他の部品や、電源回路の部品が表面実装部品として搭載されている。この場合も、発振用コイル２７が送電コイル２５の巻線部分の内側領域Ｓ内の片隅に位置している例であり、送電コイル２５の発生する磁束φが発振用コイル２７を貫く。

【００８０】(3)：図９のCに示した送電コイルユニットと受電コイルの例では、前記図９のA、又はBに示した送電コイルユニットを使用する。また、この送電コイルユニットと組み合わせて使用する受電コイル２６は、例えば、セメントワイヤにより巻かれ、固定化した１部品（空芯コイル）として構成されている。

【００８１】(4)：図１０のAに示した配置例1では、

前記図９のＡに示した送電コイルユニットと、図９のＣに示した受電コイル２６の組み合わせによる充電状態でのコイル配置例を示している。この状態では、発振用コイル２７が送電コイル２５の巻線部分の内側領域Ｓ内の片隅に位置しており、送電コイル２５の発生する磁束φが発振用コイル２７を貫いている。

【００８２】(5)：図１０のＢに示した配置例２では、前記図９のＢに示した送電コイルユニットと、図９のＣに示した受電コイル２６の組み合わせによる充電状態でのコイル配置例を示している。この状態では、プリント基板３３の同一面上に、発振用コイル２７と送電コイル２５が配置され、かつ、送電コイル２５の中空部内の片隅に発振用コイル２７が配置されている。そして、送電コイル２５の発生する磁束φが発振用コイル２７を貫いている。

【００８３】(6)：図１０のＣは、図９のＡに示した送電コイルユニットと、図９のＣに示した受電コイル２６を組み合わせて使用した例である。この場合、前記送電コイルユニットは図２に示した充電器ケース２４内に取り付けられ、前記受電コイル２６は前記コードレスホン子機ケース２３内に取り付けられている。

【００８４】そして、充電器ケース２４上にコードレスホン子機ケース２３を載せて、充電状態にすると、図１０のＣに示したように、送電コイル２５と受電コイル２６が対向した位置に位置決めされ、送電コイル２５から受電コイル２６へ非接触電力伝送を行うことが可能になる。

【００８５】この場合、送電コイル２５と受電コイル２６はコイルボビンを使用せずに、セメントワイヤにより巻いたコイルを使用しているので、送電コイル２５と受電コイル２６との間は、コードレスホン子機ケース２３の厚みと、充電器ケース２４の厚みだけとなり、両コイル間の距離が最も小さくなる。このため、電力伝送が効率良く行える。

【００８６】§８：他の実施の形態におけるコイルの配置関係の説明・・・図１１参照

図１１は他の実施の形態におけるコイル配置例説明図であり、Ａは例１、Ｂは例２、Ｃは例３、Ｄは例４、Ｅは前記例３の一部拡大図である。以下、図１１に基づいて、他の実施の形態における送電コイル２５と発振用コイル２７との配置関係を説明する。

【００８７】前記従来例で説明したように、充電部の高周波発振回路としてハートレイ発振回路を使用できるようにするためには、送電コイル２５と発振用コイル２７との電磁結合の度合いを調整可能にする必要がある。そこでこの例では、送電コイル２５と発振用コイル２７を分離独立したコイル部品で構成すると共に、送電コイル２５の巻線面に対し発振用コイル２７の巻線面が垂直方向となるように配置し、かつ、前記発振用コイル２７の少なくとも一部が、前記送電コイル２５の巻線領域内に位置し、前記両コイルが電磁結合可能な状態に配置した。

【００８８】すなわち、送電コイル２５の巻線面をプリント基板３３の表裏面と平行に配置し、発振用コイル２７の巻線面をプリント基板３３の表裏面と垂直に配置する（送電コイル２５を縦置きとした場合、発振用コイル２７を横置きにする）。なお、この例では、送電コイル２５の巻線幅Ｗと発振用コイル２７のコイル長Ｌを等しく（Ｗ＝Ｌ）したが、任意のサイズで実施可能である。

【００８９】この場合の配置例を図１１のＡ、Ｂ、Ｃ、Ｄに示してある。以下、図示のようにＸ－Ｙ直行座標を設定し具体的に説明する。この例では、送電コイル２５はセメントワイヤにより巻かれ、固定化した１部品（ボビンレスの１コイル部品）として構成され、プリント基板３３の一方の面（表面）の略中央部に接着固定されている。この場合、プリント基板３３、及び送電コイル２５の巻線面はＸ軸と平行である。

【００９０】一方、発振用コイル２７は、円柱のフェライトコア３５をセンターボールとして、その周りに巻線したものを１部品として構成し、プリント基板３３の他方の面（裏面）に表面実装部品（ＳＭＤ）として搭載されている。また、プリント基板３３の他方の面（裏面）には、高周波発振回路の他の部品（コンデンサＣ１、Ｃ２、抵抗Ｒ１、トランジスタＱ１等）や、電源回路の部品が表面実装部品として搭載されている（図示省略）。

【００９１】このようにして、充電部の各部品をプリント基板３３に搭載するが、発振用コイル２７の搭載位置を移動させることで、送電コイル２５と発振用コイル２７との電磁結合の度合いを調整できるようにした。この場合、送電コイル２５の平面形状は円形、楕円形、四角形、多角形等で構成できるが、図１１に示した状態で、送電コイル２５の巻線部分の下側の領域（巻線部分のＸ軸方向の幅）を「巻線領域Ｍ」と定義する。

【００９２】図１１のＡに示した例１は、送電コイル２５の巻線部分の内側領域Ｓの中央に発振コイル２７を配置した例である。この場合、送電コイル２５で発生し、発振コイル２７付近を通る磁束φの向きはＹ軸方向であり、発振用コイル２７の巻線面はＹ軸と平行に置かれているので、送電コイル２５で発生した磁束φは、発振用コイル２７を貫通しない。従って、送電コイル２５と発振用コイル２７は電磁結合しておらず、ハートレイ発振回路のトランジスタＱ１に正帰還も負帰還もかからない。この場合、発振動作は可能であるが、損失が多く電力伝送効率も低下する。

【００９３】図１１のＢに示した例２は、発振用コイル２７が送電コイル２５の巻線部分の内側領域Ｓの片隅に位置している例である。この例では、送電コイル２５の発生する磁束φが僅かに発振用コイル２７を貫いている。この場合、発振動作は可能であるが、損失が多く電力伝送効率も低下する。

【００９４】図１１のCに示した例3は、発振用コイル２７が送電コイル２５の巻線領域M内に位置する例であり、一部拡大図を図１１のEに示す。この位置では送電コイル２５で発生した磁束φが発振用コイル２７を最も良く貫通しており、両コイル間の磁気的結合の度合いが最も高くなっている。従って、トランジスタQ１には正帰還が最も良くかかり、最も損失の少ない理想的な発振動作ができる。

【００９５】図１１のDに示した例4は、発振用コイル２７が送電コイル２５の巻線領域Mの外側まではみ出している例である。しかし、発振用コイル２７の少なくとも一部が巻線領域M内にある状態である。この位置では、送電コイル２５の発生する磁束φが発振用コイル２７を貫通しているが、発振用コイル２７が巻線領域Mから遠ざかるに従って、貫通する磁束φが次第に減少する位置である。しかし、この位置では発振動作は低損失で正常に行われるので、前記図１１のCの位置と同様に実施可能である。

【００９６】また、発振用コイル２７の位置が送電コイル２５の巻線領域Mの外側の領域では、トランジスタQ１に適切な逆バイアスがかからず、損失の多い発振動作となる。更に、発振用コイル２７が前記巻線領域Mから遠くに離れている場合（例えば、X軸方向に送電コイル２５の径の２倍以上離れている場合）でも発振動作は可能であるが、損失は多くなり、電力伝送効率も低下する。

【００９７】以上のように、図１１のC、Dの状態では正常な発振動作を行い、損失も少ないが、図１１のA、Bの状態では発振動作は可能であるが、損失が極めて多くなる。従って、前記図１１のC、Dのような状態で使用することが望ましい。

【００９８】なお、前記他の実施の形態においても、発振用コイル２７の位置を変えることで、トランジスタQ１のベースに逆バイアスとして印加する電圧の大きさを変化させることができる。従って、発振用コイル２７の位置調整により、トランジスタQ１のバイアスを最適な値に調整して、最も損失の少ない発振動作を行わせることができる。また、発振用コイル２７の位置調整は発振用コイル２７の組み込み工程で行う。

【００９９】§９：他の実施の形態における電力伝送効率の説明・・・図１２参照

図１２は他の実施の形態における電力伝送効率の説明図である。図３に示した高周波発振回路の発振用コイル２７を、図１１のように移動させた場合の電力伝送効率の変化を実験により確認した。以下、その実験例について説明する。

【０１００】前記実験では図３に示した回路において、充電部の直流入力電力（整流／平滑回路２８の入力電力）をP_{IN}、被充電部の出力電圧（レギュレータ３１の出力電圧）をV_0、出力電流（２次電池２２の流入電流）をI_0、出力電力をP_0、電力伝送効率をηとした。そして、$\eta = P_0 / P_{IN} = \{(V_0 \times I_0) / P_{IN}\} \times 100$［%］の式により電力伝送効率を求めた。

【０１０１】また、図１２に示したようにX－Y直行座標を設定し、送電コイル２５の中心位置を原点０にする。そして、前記原点０から発振用コイル２７の外側までのX軸方向の距離x（＋x、－x）を変えながら実験を行った。その結果求めた電力伝送効率ηは図１２に示したように変化した。

【０１０２】図１２において、xがSの領域内にある時は、発振用コイル２７の位置が送電コイル２５の巻線部分の内側領域内にある状態、すなわち、発振用コイル２７が図１１のA、Bに示した位置にある場合である。このように、発振用コイル２７の位置が送電コイル２５の巻線部分の内側領域S内にあると、電力伝送効率ηはη＝４６%と低かった。

【０１０３】また、図１２において、xがMの領域内にある時は、例えば、発振用コイル２７が図１１のCに示した位置（送電コイル２５の真下）にある状態である。この状態では送電コイル２５で発生した磁束φが発振用コイル２７を最も良く貫通しており、両コイル間の磁気的結合の度合いが最も高くなっている。

【０１０４】従って、トランジスタQ１には正帰還が最も良くかかり、損失が最も少なく、電力伝送効率ηが最も高くなる。すなわち、この位置では効率ηが最大のη＝６０%になる点があり、最も望ましい位置である。なお、発振用コイル２７の少なくとも一部が送電コイル２５の巻線領域M内にあれば（例えば、図１１のDの状態）、前記と同様に電力伝送効率が高く、損失の少ない発振動作を行うことが確認できた。

【０１０５】更に、図１２において、x＝Nの領域内にある時は、発振用コイル２７が図１１のDに示した位置より更に遠くに離れた状態である。この状態では送電コイル２５で発生した磁束φが発振用コイル２７を貫通しているが、貫通する磁束は減少する。このため、この領域では電力伝送効率ηもη＝４６%程度まで低下した。

【０１０６】（他の実施の形態）以上実施の形態について説明したが、本発明は次のようにしても実施可能である。

【０１０７】(1)：送電コイル２５、発振用コイル２７、受電コイル２６は空芯コイルでも良いが、前記コイル内にコア（例えば、フェライトコア）を挿入しても良い。

(2)：送電コイル２５、発振用コイル２７、受電コイル２６は、円形、楕円形、四角形、多角形等、任意の形状で実施可能である。

【０１０８】

【発明の効果】以上説明したように、本発明によれば次のような効果がある。

(1)：送電コイルに対して発振用コイルの位置を変化さ

せることで、ハートレイ発振回路を構成するトランジスタの逆バイアスを常に最適な値に調整することが可能となる。従って、非接触型電力伝送装置を構成する充電部の高周波発振回路として、ハートレイ発振回路を使用できるので、部品点数を削減し、ローコスト化が可能である。

【0109】(2)：ハートレイ発振回路を構成するトランジスタの逆バイアスを常に最適な値に調整することができるので、損失を低減し、電力伝送効率を改善することができる。

【0110】(3)：送電コイルに対して発振用コイルの位置を変化させることで、ハートレイ発振回路を構成するトランジスタの逆バイアスを常に最適な値に調整することが可能となる。従って、発振用コイルを小型化しても損失の少ない発振動作をさせることができる。すなわち、発振用コイルを送電コイルに比べて極めて小さくしても、ハートレイ発振回路を低損失で駆動できると共に、電力伝送効率を向上させることが可能である。

【図面の簡単な説明】

【図1】本発明の原理説明図である。

【図2】実施の形態におけるコードレスホンの構成図である。

【図3】実施の形態における回路図である。

【図4】実施の形態におけるコイルの配置例説明図である。

【図5】実施の形態における高周波発振回路の波形図（その1）である。

【図6】実施の形態における高周波発振回路の波形図（その2）である。

【図7】実施の形態における電力伝送効率の説明図（その1）である。

【図8】実施の形態における電力伝送効率の説明図（その2）である。

【図9】実施の形態におけるコイル実装例である。

【図10】実施の形態における充電状態でのコイル配置説明図である。

【図11】他の実施の形態におけるコイル配置例説明図である。

【図12】他の実施の形態における電力伝送効率説明図である。

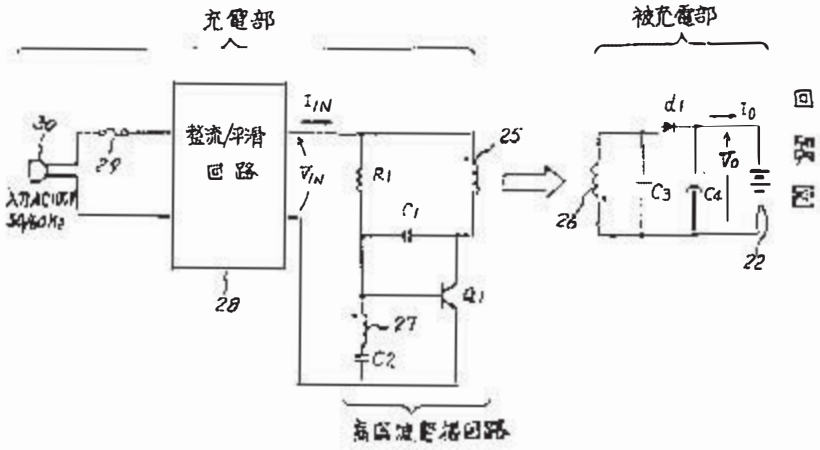
【図13】従来例の説明図（その1）である。

【図14】従来例の説明図（その2）である。

【符号の説明】

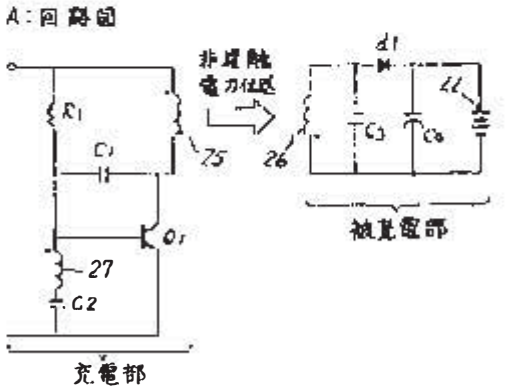
20　充電器
21　コードレスホン子機
22　2次電池
23　コードレスホン子機ケース
24　充電器ケース
25　送電コイル
26　受電コイル
27　発振用コイル
28　整流/平滑回路
33　プリント基板
35　フェライトコア

【図3】



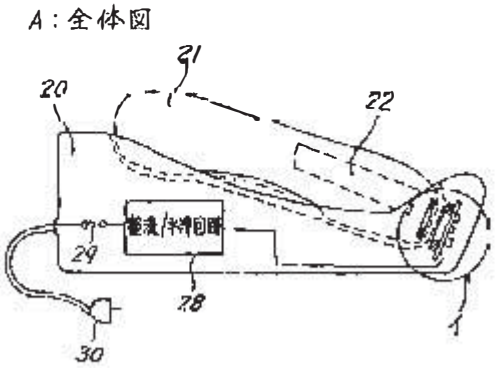
【図１】

本発明の原理説明図



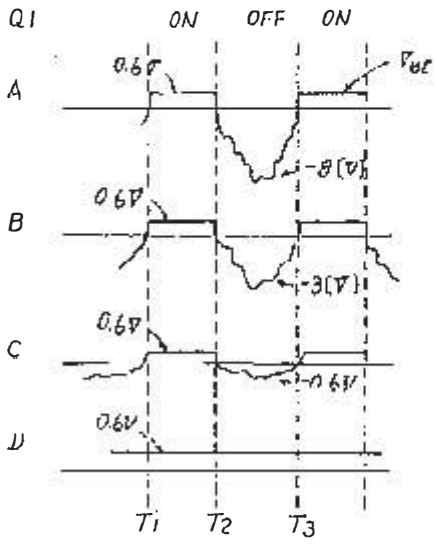
【図２】

コードレスホンの構成図



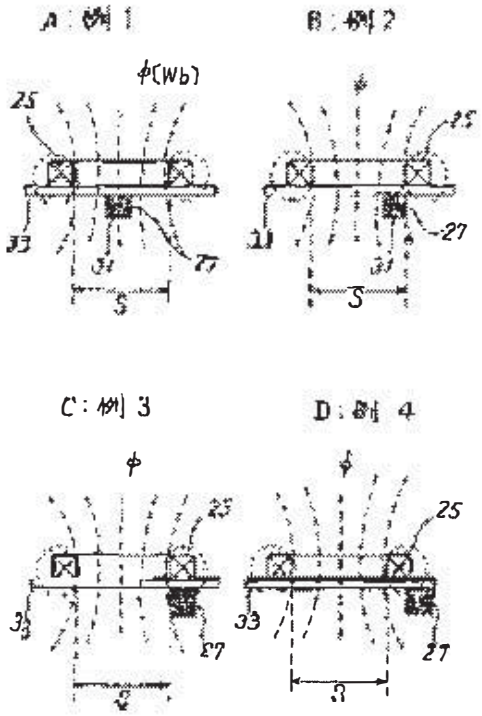
【図６】

高周波発振回路の波形図（その２）



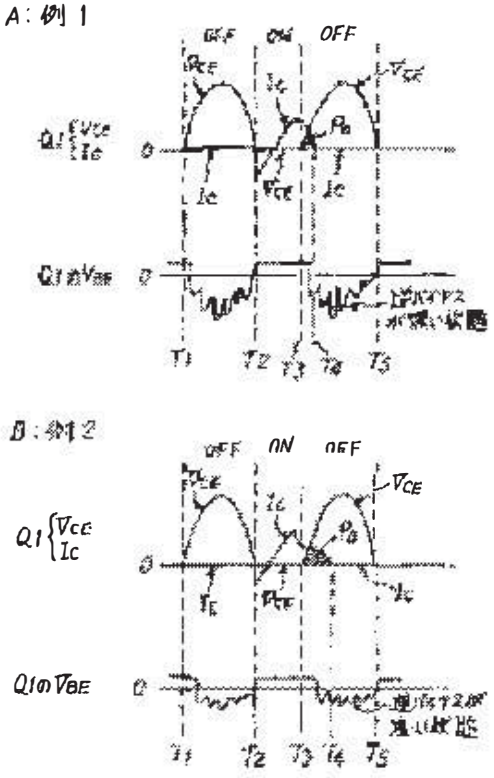
【図４】

コイルの配置例説明図



【図５】

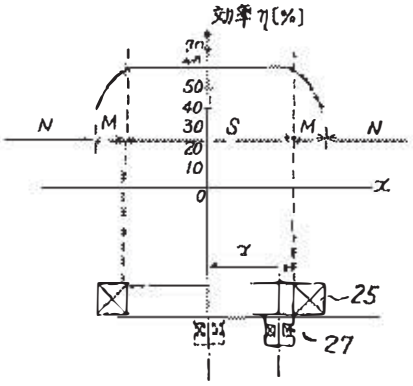
高周波発振回路の波形図(その1)



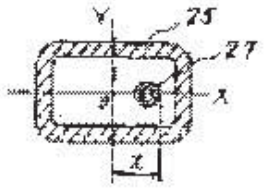
【図7】

電力伝送効率の説明図（その1）

A：効率の説明図

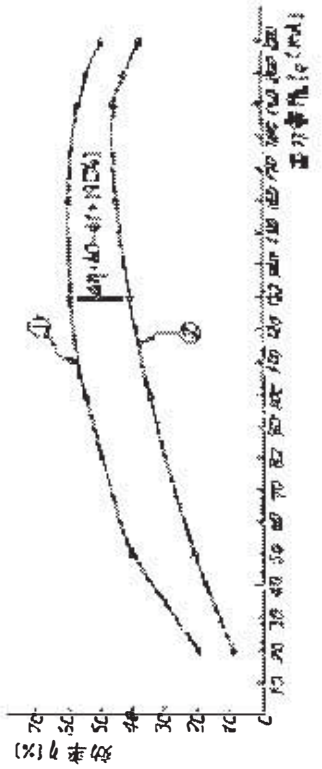


B：コイルの配置説明図



【図8】

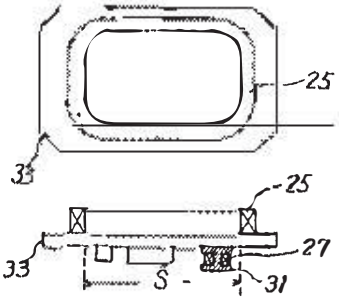
電力伝送効率の説明図（その2）



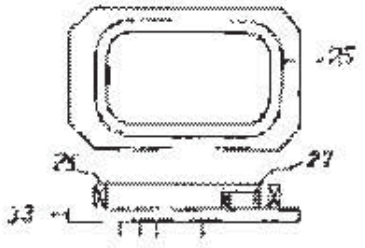
【図9】

コイル実装例

A：送電コイルユニット例1



B：送電コイルユニット例2

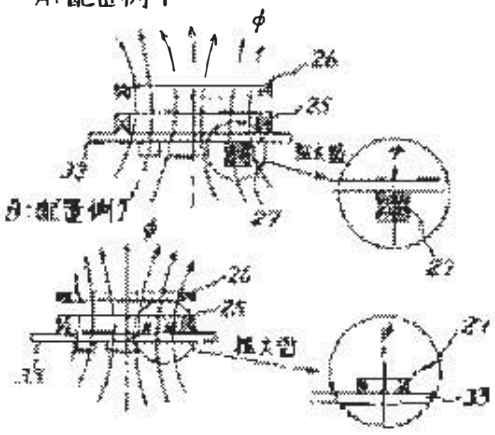


C：送電コイルユニットと受電コイルの例

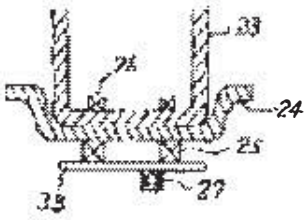
【図10】

充電状態でのコイル配置説明図

A：配置例1

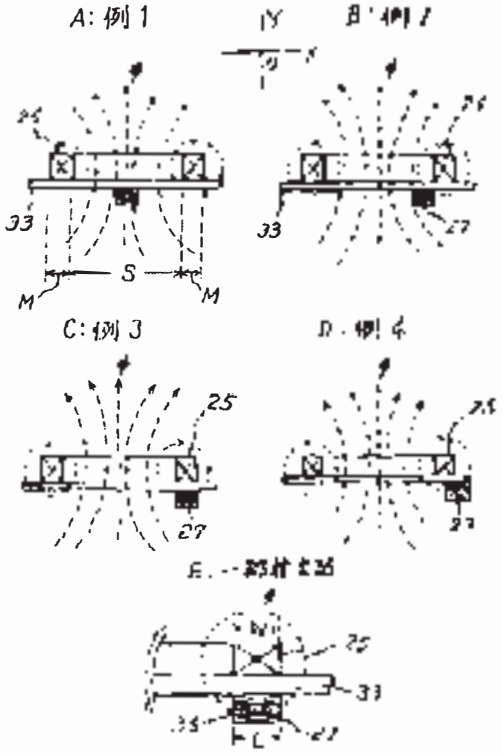


C：配置例3



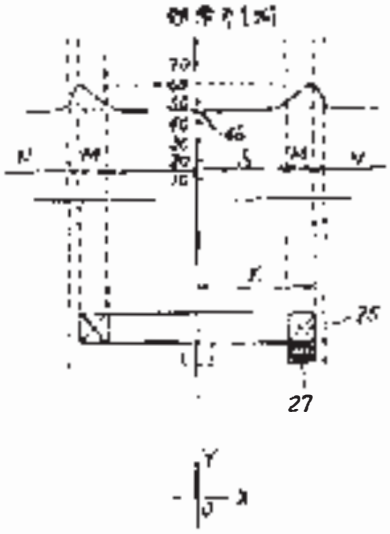
【図１１】

他の実施の形態におけるコイル配置例説明図

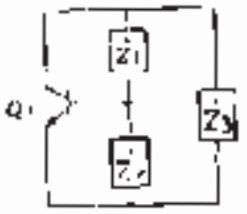


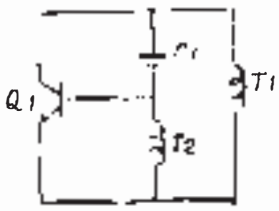
【図１２】

他の実施の形態における電力伝送効率説明図



【図１４】

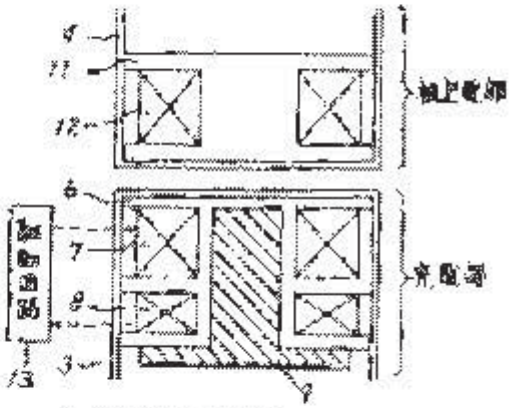




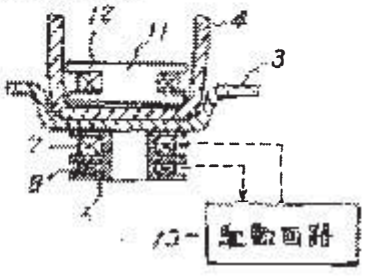
【図１３】

従来例の説明図（その1）

A：充電部,被充電部の構成図



B：



Espacenet

Bibliographic data: JPH10189369 (A) — 1998-07-21

NON-CONTACT-TYPE POWER TRANSMISSION DEVICE

Inventor(s): URANO TAKASHI; TAKAHASHI MINORU ± (URANO TAKASHI, ; TAKAHASHI MINORU)

Applicant(s): TDK CORP ± (TDK CORP)

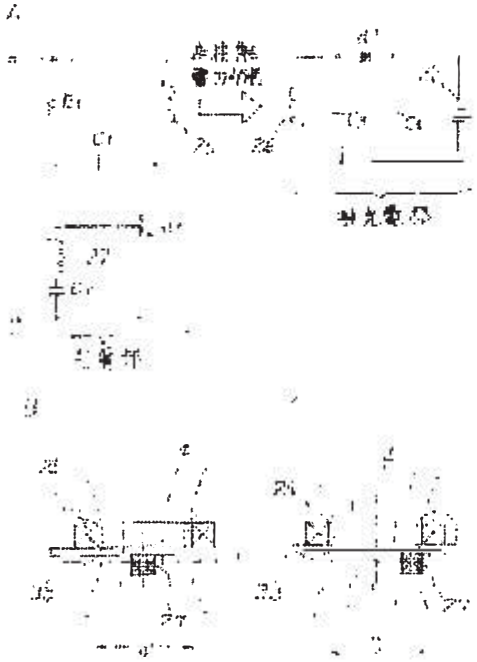
Classification: - international: ***H01F38/14; H02J17/00; H02J7/00; H04B7/26; H04M1/02;*** (IPC1-7): H01F38/14; H02J17/00; H02J7/00; H04B7/26; H04M1/02

- cooperative:

Application number: JP19960343213 19961224

Priority number (s): JP19960343213 19961224

Abstract of JPH10189369 (A)



PROBLEM TO BE SOLVED: To enable Hartley oscillator to be used as the high-frequency oscillation circuit of a charging part, reduce the number of parts and cost, and at the same time reduce loss and hence improve a power transmission efficiency in a non-contact-type power transmission device. SOLUTION: In a power transmission device, a charging part and a part to be charged are constituted while they are detachably separated, the charging part has a transmission coil 25 and a high-frequency oscillation circuit, the part to be charged has a reception coil 26, and power is transmitted without any contact from the charging part to the part to be charged. In this case, the high frequency oscillation circuit is composed of Hartley oscillator including a coil 27 for oscillation and the transmission coil 25, the oscillation coil 27 and the transmission coil 25 are composed of separated, independent coil parts, at the same time at least one portion of the oscillation coil 27 is located in an inner region S of the coil winding part of the transmission coil 25, and both coils are arranged in an electromagnetically connectable state.

Notice

DESCRIPTION JPH10189369

[0001]

BACKGROUND OF THE INVENTION The present invention, a mobile phone that acts as a power supply a rechargeable secondary battery, PI IS phone (simple mobile phone), cordless phones, non-contact type that can be used for various electrical equipment, or electronic equipment, etc. on power transmission equipment. In particular, the present invention is a non-contact not via the metal contact from the charging unit to the charging unit to a non-contact power transmission apparatus for transmitting power by electromagnetic induction.

[0002]

BACKGROUND OF THE INVENTION below, explaining a conventional example with reference to FIG. §1; Explanation . 13 see Figure 13 of a contactless power transmission system is an explanatory view of a conventional example (No. 1), A charge unit, block diagram of the charging unit, B is charged state diagram It is. Conventionally, constituted by detachably separating the charging portion and the charging unit, and a power transmission coil in the charging unit comprises a radio frequency oscillator for driving the transmitting coil, said transmitting coil to the target charging unit a power receiving coil for inducing a is electromagnetically coupled to a voltage, with a secondary battery or the like for charging the voltage induced in the receiving coil, from said power transmission portion to the power receiving unit, in a non-contact not via the metal contact, electromagnetic induction contactless power transmission apparatus has been known for transmitting electric power by the action.

[0003]

It said one example of a non-contact power transmission device (coil portion) I is shown in A of Figure 13. As shown in A of FIG. 13, it is constituted by detachably separating the charging portion and the charging unit, the transmitting coil 7 wound around the power transmission coil bobbin 6 in the charging unit, and a feedback coil 8 is provided is there. In this case, the transmitting coil 7 and the feedback coil 8 is Yes wound on a bobbin 6 for one of the power transmission coil, it has been coaxially disposed. Further, the power transmission coil bobbin 6 core 9 is inserted.

[0004]

Then, it is provided with a driving circuit 13 for driving the transmitting coil 7 to the live parts, comprising the driving circuit 13 a power supply circuit and the high-frequency oscillation circuit to, and to drive the transmitting coil 7 by the high-frequency oscillator and it is configured to. On the other hand, the charging unit, the power receiving coil 12 that is wound on the receiving coil bobbin 11 is provided.

[0005]

When charging the secondary battery in the charger unit, as shown in B of Figure 13, it is placed an object to be charged portion on the charging unit. In this case, a part of the charging unit side case 3, the recess for placing an object to be charged portion is formed so that put the live parts in the recess.

[0006]

In this state, the power receiving coil 12 and the power transmission coil 7 is opposed, it becomes charge standby state becomes closest to the state. Then, to operate the driving circuit 13 on the power to the charging unit, by driving the transmitting coil 7 by the high-frequency oscillating circuit, in a non-contact not via the metal contact from the charging unit to the charging unit, by electromagnetic induction The transmit power and to charge the secondary battery by using the power.

[0007]

§2: Explanation ... 14 see Figure 14 of a high frequency oscillator circuit is an explanatory view of a conventional example (No. 2), A is the oscillation principle view, B shows a Hartley oscillator circuit. The high frequency oscillation circuit provided in the drive circuit 13, for example, the two transistors, although the were using a push-pull high frequency oscillator circuit using an LC parallel resonant circuit including a power transmission coil 7, as the a high frequency oscillator circuit is the number of parts. Accordingly, it has been considered to use a Hartley oscillator circuit the least parts in the LC oscillator circuit.

[0008]

In general, the oscillation principle diagram shown in A of FIG. 14, when the three elements of the impedance Z1, Z2, Z3, transistor Q1 is an amplifier element Is connected as shown, the elements of the impedance Z1 In inductive element (or capacitive elements), if the impedance Z2, Z3 of the element is a capacitive element (or the inductive element) to satisfy the oscillation conditions, it is known that the oscillation state can be maintained.

[0009]

Then, using the inductive element as an element of a capacitive element, the impedance Z2, Z3 as an element of the impedance Z1, it is possible to configure the Hartley oscillator circuit Connecting the elements and the transistor Q1. Such a Hartley oscillation circuit (the self-excited oscillation circuit) I is shown in B of FIG. 14. The Hartley oscillator circuit, the first coil T1, the second coil T2, a capacitor C1, is constituted by transistors Q1, fewer number of parts. However, it has been difficult to keep the Hartley oscillator circuit as a high-frequency oscillating circuit of the charging unit. The following, we will explain why.

[0010]

To configure the high-frequency oscillating circuit of the charging part at Hartley oscillator circuit, the power transmission coil 7 is the first coil T1, to the use of the feedback coil 8 as the second coil T2 (oscillating coil) Become. In this case, the first coil T1 second coil T2 and it is used by electromagnetic coupling, the voltage generated in the second coil T2 is (is applied as a reverse bias) is applied to the base of the transistor Q1 by electromagnetic induction .

[0011]

However, the voltage generated In the second coil T2 is larger than the specified value, an excessive voltage is applied to the base of the transistor Q1, which may destroy the transistor Q1. In addition, when the voltage generated in the second coil T2 is smaller than the prescribed value, base without applying the proper voltage loss of the transistor Q1 increases. That is, if base applied appropriate positive feedback voltage of the transistor Q1 to conduct a low oscillation loss, but the loss a positive feedback voltage is small becomes large.

[0012]

Therefore, although it is necessary to properly adjust the bias of the transistor Q1, as shown in FIG. 13 in the conventional coil arrangement, and the two coils (T1, T2) are wound on the same bobbin, coaxial Since manner is fixedly disposed, it is not possible to adjust the first coil T1 of the degree of electromagnetic coupling between the second coil T2.

[0013]

Further, the first coil T1 to adjust the degree of electromagnetic coupling between the second coil T2. it is considered changing the number of turns of the second coil T2, the changing the number of turns of the second coil T2 self-inductance value changes. In the Hartley oscillator circuit, the first coil T1 self-inductance value of the second coil T2 is, the oscillation condition is satisfied at a certain value, the self-inductance value by changing the number of turns of the second coil T2 as described above Varying, and will not satisfy the oscillation conditions, It can not oscillation. Therefore, by adjusting the bias of transistor Q1 at an appropriate value it is difficult, it is difficult to configure the high-frequency oscillator circuit in Hartley oscillator circuit.

[0014]

In [0005] the conventional devices, such as had the following problems. (1): Hartley oscillator circuit so that oscillation circuit requires less most parts within the LC oscillator circuit, it was considered to use a Hartley oscillator circuit as a high-frequency

oscillating circuit of the charging unit. However, it is difficult to keep the Hartley oscillator circuit as a high-frequency oscillating circuit of the charging portion which was known conventionally.

[0015]

That is, in order to constitute a high-frequency oscillating circuit of the charging part at Hartley oscillator circuit, and said power transmission coil 7 is the first coil T1, using the feedback coil 8 as the second coil T2 (oscillating coil) become. In this case, the first coil T1 second coil T2 and it is used by electromagnetic coupling, the voltage generated in the second coil T2 through electromagnetic induction is applied to the base of transistor Q1.

[0016]

The voltage generated in the second coil T2 is larger than the specified value, an excessive voltage is applied to the base of the transistor Q1, which may destroy the transistor Q1. In addition, when the voltage generated in the second coil T2 is smaller than the prescribed value, it is not applied properly voltage to the transistor Q1, loss increases. That is, the base of transistor Q1, and by applying an appropriate positive feedback voltage is performed with less oscillation loss, but the loss is increased as the positive feedback voltage is low.

[0017]

Therefore, it becomes a possible need to bias the proper adjustment of the transistor Q1, in the conventional coil arrangement has two coils wound on the same coil bobbin, and because it is coaxially fixed arrangement, the first coil T1 If it is not possible to adjust the degree of electromagnetic coupling between the second coil T2. Therefore, since it is difficult to adjust the base voltage of the transistor Q1 to the proper value, it is difficult to keep the Hartley oscillator circuit as the high frequency oscillator circuit.

[0018]

(2). Further, In the conventional coil arrangement, to adjust the first coil T1 of the degree of electromagnetic coupling between the second coil T2, it is considered changing the number of turns of the second coil T2, self-inductance value of the second coil T2 is changed and changing the number of turns

[0019]

However, in the Hartley oscillator circuit, the first coil T1 self-inductance value of the second coil T2 is, the oscillation condition is satisfied at a certain value, by changing the number of turns of the second coil T2 as the self- Varying the inductance value, it will not satisfy the oscillation conditions, can not oscillation. Thus, since it is difficult to adjust the bias of transistor Q1 at an appropriate value, it is difficult to keep the Hartley oscillator circuit as the high frequency oscillator circuit.

[0020]

(3): As described above, since it is used as a Hartley oscillator circuit as a high-frequency oscillating circuit of the charging portion which was known conventionally difficult, reducing the number of components is difficult, the cost reduction of the contactless power transmission apparatus it has been difficult to achieve.

[0021]

The present invention is to solve such conventional problems, and by enabling adjusting the induced voltage of a coil for applying a reverse bias to the base of the transistor, to be able to use Hartley oscillator circuit as a high-frequency oscillating circuit of the charging unit Te, reduced the number of parts, as well as cost reduction, reduce loss by adjusting the reverse bias of the transistors optimum value, it is an object to improve the power transfer efficiency.

[0022]

Figure 1 [Means for Solving the Problems] Is a principle explanatory diagram of the present invention, A is the circuit diagram, B is a coil arrangement example 1, C is a coil arrangement example 2. In Figure 1, Q1 is a transistor, R1 is the resistance and C1, C2, C3, C4 capacitors, 25 power transmission coil, the oscillation coil 27, the power receiving coil 26, d1 is a diode, 22 shows a cooondary battery. In addition, the transistor Q1, resistor R1, capacitor C1, C2, the transmitting coil 25, by the oscillation coil 27 constitute a Hartley oscillation circuit.

[0023]

Since the present invention to achieve the above object, as shown in Figure 1, configured to detachably separating the charging portion and the charging unit, the transmitting coil 25 to the charging unit, the power transmission coil 25 comprising a high-frequency oscillation circuit for driving said to be charged portion includes a power receiving coil 26 in order to induce a voltage in the power transmission coil 25 and the electromagnetic coupling power contactlessly from said charging unit to be charged portion The non-contact type power transmission apparatus for transmitting said high frequency oscillating circuit, is constituted by Hartley oscillator circuit including the above power transmission coils 25 and the oscillator coil 27, the power transmission coil 25 and the oscillation coil 27, the power transmission coil 25 winding surface of the oscillating coil 27 relative to the winding surface is arranged so as to be parallel and at least a portion of the oscillating coil 27, the inside area S of the winding portion of the power transmission coil 25 Located on both coils are disposed in electromagnetic coupling ready.

[0024]

The present invention is constructed by detachably separating the charging portion and the charging unit, the said charging part and the power transmission coil 25, and a high-frequency oscillation circuit for driving the transmitting coil 25, the to-be-charged part and a receiving coil 26 for inducing a voltage is electromagnetically coupled with the transmitting coil 25, in the contactless power transmission apparatus for transmitting power without contact to the live parts from the charging unit, the high-frequency oscillator constitute a circuit Hartley oscillator circuit including the above power transmission coils 25 and the oscillator coil 27, the power transmission coil 25 and the oscillation coil 27, the winding surface of the oscillation coil 27 for the winding surface of the power transmission coil 25 is arranged so as to be vertical, and at least a portion of the oscillation coil 27 is located in the winding region of the power transmission coil 25, the two coils are placed in a state capable of electromagnetic coupling.

[0025]

(Operation) The operation of the present invention based on the above construction will be explained with reference to FIG. First, if you want to manufacture the parts of the charging unit, to manufacture the power transmission coil 25 and the oscillation coil 27 as a separate and independent coil component was. Then, for example, to a printed circuit board with the transmitting coil 25 to produce a coil unit by implementing by performing positioning of the oscillating coil 27, but at least a part of the oscillating coil 27, the inner area of the winding portion of the power transmission coil 25 Located in S, the two coils are placed on the electromagnetic coupling ready.

[0026]

In this case, as shown in B of FIG. 1, or to position the oscillating coil 27 substantially at the center of the inner space S of the winding portion of the power transmission coil 25, as shown in C in Fig. 1, oscillator or to position the coil 27 in the corner in the inner area S of the winding portion of the power transmission coil 25 (the corner of each side), or while moving to an arbitrary position of the intermediate in each position, and adjusting the position of the oscillating coil 27 By doing to, optimum reverse bias to the transistor Q1 is set to be applied.

[0027]

In this way, the coil unit to set the oscillation coil 27 in the optimum position relative to the power transmission coils 25 and integration with other components in the charging portion, further components such as the power receiving coil 26 and the secondary battery 22 to be charged portion, me incorporate. At a predetermined position on the charging unit which is manufactured in this way, it is placed an object charging part, and turning on the power to the charging unit, a high-frequency oscillation circuit performs an oscillating operation consisting Hartley oscillator circuit.

[0028]

By doing to drive the power transmission coil 25 by the Hartley oscillator circuit as described above, by generating electromagnetic waves of high frequency, and performs non-contact power transmission using electromagnetic waves with respect to the charging unit. This time in the charging unit induced voltage is generated in the receiving coil 26 by electromagnetic induction from the power transmission coil 25. Parallel resonant circuit by receiving coil 26 and the capacitor C3 by the induced voltage I to expand the amplitude of receiving voltages become a resonance state. Then, the half-wave rectified by the diode d1, it is loaded DC voltage smoothed by the capacitor C4 is applied to the secondary battery 22 to charge the secondary battery 22.

[0029]

As described above, by enabling adjusting the induced voltage of the oscillation coil 27 for applying a reverse bias to the base of transistor Q1, it is possible to use a Hartley oscillator circuit as a high-frequency oscillating circuit of the charging section. Therefore, to reduce the number of parts, it is possible to cost reduction, it is possible to adjust the reverse bias of the transistors optimum values, reduce loss, it becomes possible to improve the power transfer efficiency.

[0030]

In addition, the oscillating coil 27 and the power transmission coil 25, the winding surface of the oscillation coil 27 is disposed such that the direction perpendicular to the winding plane of the transmitting coil 25, and at least a portion of the oscillating coil 27 , located in the winding area of the power transmission coil 25, the when both coils have been placed on the electromagnetic coupling ready also, in the same manner as mentioned above, and the oscillation coil 27 for applying a reverse bias to the base of transistor Q1 it is possible to enable adjusting the induced voltage, it is possible to use a Hartley oscillator circuit as a high-frequency oscillating circuit of the charging section.

[0031]

Therefore, this case also reduces the number of parts, it is possible to cost reduction, it is possible to adjust the reverse bias of the transistors optimum values. reduce loss, it becomes possible to improve the power transfer efficiency .

[0032]

BEST MODE FOR CARRYING OUT THE INVENTION Hereinafter, will be described in detail with reference to embodiments of the invention with reference to the drawings. §1: Explanation · Figure 2 refer Figure 2 embodiment of the contactless power transmission apparatus is a configuration diagram of a cordless phone, A is an overall view, B is the portion of the stomach shown in partially enlarged view (A It is an enlarged view). Contactless power transmission apparatus of the present invention are, for example, can be applied to a cordless phone as shown in Fig. This cordless phone is equipped with a charger 20 and the cordless phone handset unit 21. Then, the transmitting coil 25 to the battery charger case 24 within which constitute the charger 20, a high-frequency oscillation circuit for driving the power transmission coil 25, a power supply circuit is provided with a rectifying / smoothing circuit 28 and a fuse 29 . The power supply plug 30 is connected to the power supply circuit.

[0033]

On the other hand, the cordless handset unit casing 23 constituting the cordless phone handset unit 21, and the receiving coil 26 for inducing a voltage in the power transmission coil 25 and the electromagnetic coupling, and is charged by the voltage induced in the receiving coil 26 such secondary battery 22 is provided.

[0034]

When charging the secondary battery 22 is to connect the power plug 30 to a commercial power supply (50 / 60HZ, 100V), it is placed a cordless phone handset unit 21 in place on the charger 20. When the high-frequency oscillator circuit in the battery charger 20 in this state starts oscillation operation, not through the metal contacts from the transmitting coil 25 to the receiving coil 26, the power transmission is performed without contact. At this time, the voltage is induced in the receiving coil 26 in the cordless phone handset unit 21 side, I charge the secondary battery 22 by the voltage. In the following description, "charging unit" of the battery charger 20, the cordless phone slave unit also referred to as "the charging unit".

[0035]

§2: Description ... Figure 3 See Figure 3 of the high-frequency oscillation circuit is a circuit diagram. The circuit shown in FIG. 3 is a circuit of the battery charger 20 shown in Fig. 2 (charging unit) and the cordless handset unit 21 (the charging unit). The charging portion and the charging unit is configured to detachably separation comprises a transmitting coil 25 to the charging unit, and a high-frequency oscillation circuit for driving the transmitting coil, a power supply circuit, said power supply circuit power plug 30 is connected to.

[0036]

The power supply circuit includes a rectifier / is composed of a smoothing circuit 28 and the fuse 29, the AC voltage inputted through the power plug 30 is input to the rectifying / smoothing circuit 28. In this case, the rectifying / smoothing circuit 28 performs rectifying / smoothing operation based on the input AC voltage and outputs the DC voltage. And high-frequency oscillation circuit to operate the output of the rectifier / smoothing circuit 28 as a power source.

[0037]

Furthermore, the driving as the high-frequency oscillating circuit, a transistor Q1, a power transmission coil 25, the oscillation coil 27, and capacitors C1, C2, and by using the Hartley oscillator circuit comprising a resistor R1, a power transmission coil 25 by the Hartley oscillator circuit and it is configured to. Incidentally, in the Hartley oscillator circuit, the power transmission coil 25, the oscillation coil 27, first coil 25 is shown in FIGS 12 correspond to the second coil 27. The resistor R1 is a resistor for

supplying a DC bias current to the base of transistor Q1, capacitor C2 to prevent the resistor from the power supply R1, a DC current to the ground side through the oscillating coil 27 flows It is a capacitor.

[0038]

On the other hand, said to be charged portion, and the receiving coil 26 for inducing a voltage in the power transmission coil 25 and the electromagnetic coupling, wherein connected in parallel to the power receiving coil 26, a capacitor C3 (for the parallel resonance to constitute the parallel resonant circuit a capacitor), a diode d1 for rectification, a capacitor C4 for smoothing, is provided with a secondary battery 22.

[0039]

The Hartley oscillator circuit by and by driving the power transmission coil 25 generates a high-frequency electromagnetic waves, and performs non-contact power transmission using electromagnetic waves with respect to the charging unit. In this case, the induced voltage is generated in the receiving coil 26 by electromagnetic induction from the transmitting coil 25 in the charging unit. Parallel resonant circuit by receiving coil 26 and the capacitor C3 by this voltage is I to expand the amplitude of receiving voltages become a resonance state. Then, the half-wave rectified by the diode d1, it is loaded DC voltage smoothed by the capacitor C4 is applied to the secondary battery 22 to charge the secondary battery 22.

[0040]

§3: Explanation ... Figure 4 reference 4 of the positional relationship of the coils an arrangement example illustration of the coil, A is Example 1, B is Example 2, C is Example 3, D is an example 4. Hereinafter, based on FIG. 4, a description will be given of the positional relationship between the transmitting coil 25 provided in the charging unit and the oscillator coil 27. As described in the conventional example, in order to be able to use the Hartley oscillator circuit as a high-frequency oscillating circuit of the charging unit, it is necessary to allow adjusting the degree of electromagnetic coupling between the transmitting coil 25 and the oscillating coil 27 is there.

[0041]

Therefore, the oscillation coil 27 and the power transmission coil 25 as well as consists of a separate independent coil component, at least part of the oscillating coil 27 is located in the inner region within the S of the winding portion of the power transmission coil 25, is both coils It will be placed in the electromagnetic coupling ready. The A in Figure 4 an example of arrangement when, B, C, is shown in D. Below, specifically explained.

[0042]

In this example, the power transmission coil 25 is wound by a cement wire is configured as the immobilized one component (1 coil component Bobinresu), and is bonded and fixed to the substantially central portion of one surface of the printed circuit board 33 (surface) . Meanwhile, the oscillation coil 27 is configured in the coil bobbin 31 as one component of wound wires are mounted as a surface mounted component (SMD) on the other surface of the printed circuit board 33 (the back side). Further, the other surface of the printed circuit board 33 (the back side), the other components of the high frequency oscillator circuit (capacitors C1, C2, resistors R1, the transistor Q1 and the like) and the parts of the power circuit are mounted as a surface mount component

[0043]

In this example, the winding surface of the power transmission coil 25 is parallel to the front and back surfaces of the printed circuit board 33 is parallel to the front and back surfaces of the winding surface of the oscillating coil 27 is also a printed circuit board 33. That is, the oscillation coil 27 and the power transmission coil 25, when the winding surface of the oscillating coils 27 is set to vertically and in which (power transmission coil 25 are arranged so as to be parallel to the winding plane of the transmitting coil 25 , oscillation coil 27 is also vertically).

[0044]

Thus, it will be mounted on the printed board 33 to each component of the charging unit, and by moving the mounting position of the oscillating coil 27, so that it is possible to adjust the degree of electromagnetic coupling between the transmitting coil 25 and the oscillating coil 27 I was in. In this case, the planar shape of the power transmission coil 25 is circular, oval, square, but can be configured in a polygon or the like, inside the area of the winding portion of the power transmission coil 25 (the hollow portion is a circular air-core coil) as shown It is defined as "inner area S of the winding portion" in.

[0045]

At least a portion of the oscillating coil 27 is positioned inside area S of the winding portion of the power transmission coil 25, the two coils are arranged on the electromagnetic coupling ready, the magnetic flux φ generated by the transmitting coil 25 ' Wb] is pierced oscillation coil 27, the windings of the direction and the oscillation coil 27 of the magnetic flux φ is set to be vertical.

[0046]

A in Fig. 4 is an example of the oscillation coil 27 is positioned substantially at the center of the inner space S of the winding portion of the power transmission coil 25. In this example, the magnetic flux φ generated by the power transmission coil 25 is through the oscillation coil 27. B of FIG. 4 is an example of the oscillation coil 27 is positioned in the corner of the inner space S of the winding portion of the power transmission coil 25. In this example, the magnetic flux φ generated by the power transmission coil 25 is through the oscillation coil 27.

[0047]

C in Fig. 4 is an example of the oscillation coil 27 is positioned outside the inner space S of the winding portion of the power transmission coil 25. In this example, the magnetic flux φ generated by the transmitting coil 25 is not through most of the oscillating coil 27, the oscillation operation but is capable loss is very large. D In Fig. 4 is an example of the oscillation coil 27 is positioned outside the inner area S of the winding portion of the power transmission coil 25. In this example, the magnetic flux φ generated by the power transmission coil 25 is through the oscillating coil 27, an orientation opposite to the magnetic flux φ, the voltage of the positive feedback the opposite direction of normal operation is applied to the transistor Q1 , it can not be oscillation operation.

[0048]

As described above, the Figure 4 A, make the normal oscillation operation in the state of B, but the loss is small, but in the state of C of FIG. 4, which is a possible oscillation operation. loss is very large. Then, in the state of D in Figure 4 the direction of the voltage induced to the oscillation coil 27, reverses direction, the oscillating operation is stopped. Thus, A of FIG. 4, it is necessary to use in such a B.

[0049]

§4: Operation ... Figure 5 reference view of an arrangement and a high-frequency oscillating circuit of the coil 5 is a waveform diagram of a high frequency oscillator circuit (Part 1), A is Example 1, B is an example 2. In Figure 5, IC is the collector current of the transistor Q1, VCE collector-emitter voltage of the transistor, VBE is the base-emitter voltage of the transistor Q1, T1~T5 oooh timing (time), P0 indicates the loss.

[0050]

(1): Example shown in A of the A reference Figure 5 description ... Figure 5 in Example 1 1, A in Figure 4 the arrangement of the power transmission coils 25 and the oscillator coil 27 shown in Figure 3, or B As is a waveform diagram when the oscillation coil 27 is in the inner region S of the winding portion of the power transmission coil 25, In this example, the transistor Q1 during the timing T1~T2 off, the transistor Q1 during the timing T2~T3 is turned on, the transistor Q1 during the timing T3~T5 is turned off, the oscillation operation is performed.

[0051]

Namely, the transistor Q1 during the timing T1~T2, and applying a reverse bias Is large base-emitter voltage VBE, transistor Q1 is off (reverse bias deeper state), the collector current IC of the transistor Q1 almost no flow, the collector-emitter voltage VCE is a major value.

[0052]

When it comes to the timing T2, the base-emitter voltage VBE of the transistor Q1 is applied to the transistor Q1 as a forward bias (forward bias), the transistor Q1 turns on, the collector current IC begins to flow. Then, gradually increases the collector current IC, then the collector current IC Is reduced, the transistor Q1 is turned off at timing T3. Since in the same way the transistor Q1 performs the oscillation operation while repeating ON / OFF.

[0053]

In the above operation, the transistor Q1 is to become off at timing T3, the influence of the carriers accumulated in the transistor Q1, the collector current IC continues to flow until the timing T4. To perform this operation, the loss P0 occurs between the timing T3~T4.

[0054]

However, in this example, at the timing of the transistor Q1 is turned off, a large value base-emitter voltage VBE is a negative of the transistors Q1, so applied as a reverse bias to the base of transistor Q1, the collector current IC rapidly damped, transistor Q1 is rapidly turned off. Therefore, loss P0 is not very small problem. In other words, a high-frequency oscillation circuit a low loss of the charging unit case, it is possible to perform a normal oscillation operation.

[0055]

(2): Example shown in B of the B reference Figure 5 description ... Figure 5 Example 2 2, a power transmission coil 25 shown in Figure 3 the arrangement of the oscillation coil 27 as shown in C in FIG. 4 , oscillating coil 27 is a waveform diagram of the case is not in the inside area S of the winding portion of the power transmission coil 25. In this example, similarly to the Example 1, the transistor Q1 during the timing T1~T2 off, the transistor Q1 during the timing T2~T3 is turned on, the transistor Q1 during the timing T3~T5 is turned off, the oscillation operation is performed.

[0056]

However, in this example, the period should the transistor Q1 is turned off, for example, between the timing T1~T2, or in between time T3~T5, the base-emitter voltage VBE applied as a reverse bias to the transistor Q1 is low (the reverse bias shallow state). Thus, for example, the transistor Q1 is between the timings T3~T4 be turned off, it continues to flow longer collector current IC, loss P0 becomes extremely large.

[0057]

That is, when turning off the transistor Q1 from the ON, by applying a reverse bias to the base of transistor Q1, it is to turn off the transistor Q1, and the reverse bias is small (a reverse bias is shallow), the transistor Q1 rapidly it will not be able to turn off. Therefore, transistor Q1 is between the timing T3~T4 should be turned off, continues to flow a long time collector current IC, loss P0 becomes extremely large.

[0058]

§5: Description of the bias adjustment of the placement and the transistor of the coil ... Figure 6 refer Figure 6 is a waveform diagram of a high frequency oscillator circuit (Part 2), A~D is the case of changing the position of the oscillating coil 27 It shows the base-emitter voltage (VBE) waveform of the transistor. The base-emitter voltage (VBE) waveform, and sets a predetermined experimental conditions, the position of the oscillating coil 27 of the circuit shown in Figure 3, and conducted experiments while changing as shown in Figure 4, measuremont it is o waveform example that was.

[0059]

(1): A in FIG. 6 is a base-emitter voltage (VBE) waveform of the transistor Q1 when it is placed on the oscillation coil 27 is shown in A in Fig. 4 position. In this case, the oscillation coil 27 is positioned substantially at the center of the inner space S of the winding portion of the power transmission coil 25, the magnetic flux φ generated by the power transmission coil 25 is through the oscillating coil 27. Therefore, sufficiently large voltage is generated in the oscillation coil 27, which is applied as a reverse bias to the base of transistor Q1.

[0060]

That is, the base-emitter voltage VBE of the transistor Q1 becomes large as VBE = -8 [V] degree between the time T2~T3, and applying a large reverse bias voltage to the base of the transistor Q1 (reverse bias deep state), oscillation operation is performed normally.

[0061]

In this experiment, a DC Input voltage of a high frequency oscillator circuit (DC output voltage of the rectifying / smoothing circuit 28) VIN, the output voltage of the charging unit (output voltage of the capacitor C4) VO, output current (the secondary battery 22 When the flowing current) and IO, VIN = 14.1 [V], VO = 5.9 [V], and it was IO = 130 [mA].

[0062]

(2): B in FIG. 6 is a base-emitter voltage (VBE) waveform of the transistor Q1 when it is placed on the oscillation coil 27 is shown in B in Fig. 4 position. In this case, the oscillation coil 27 is located in a corner of the inner area S of the winding portion

of the power transmission coil 25, the magnetic flux φ generated by the power transmission coil 25 is through the oscillation coil 27.

[0063]

Therefore, a large voltage is generated in the oscillation coil 27 during the time T2~T3, which is applied as a reverse bias to the base of transistor Q1. In other words, the base-emitter voltage VBE of the transistor Q1, becomes a VBE = -3 [V] degree between Taiminku T2~T3, this voltage is applied as a reverse bias to the base of the transistor Q1, the oscillation operation is normal line We have that. However, in this example as compared with the waveform shown in A of FIG. 6, the reverse bias is small.

[0064]

(3): C of FIC. 6 is a base-emitter voltage (VBE) waveform of the transistor Q1 when it is placed on the oscillation coil 27 is shown in C in Fig. 4 position. In this case, the oscillation coil 27 is positioned outside the inner space S of the winding portion of the power transmission coil 25, the magnetic flux φ generated by the transmitting coil 25 is not through little oscillation coil 27.

[0065]

Therefore, between the timing T2 of T3, a small voltage is generated in the oscillation coil 27, which is applied as a reverse bias to the base of transistor Q1. That Is, the base-emitter voltage VBE of the transistor Q1 becomes extremely small as VBE = -0.6 [V] degree between the time T2~T3, the oscillation operation is possible. the loss is extremely large .

[0066]

(4): D in FIG. 6 is a base-emitter voltage (VBE) waveform of the transistor Q1 when it is placed on the oscillation coil 27 shown in D in FIG. 4 position. In this case, the oscillation coil 27 is located outside the inner area S of the winding portion of the power transmission coil 25, but the magnetic flux φ generated by the power transmission coil 25 is through the oscillation coil 27, the orientation of the magnetic flux φ is a case of positive feedback in the opposite direction, oscillation is stopped.

[0067]

As shown in A~D of FIG 6, by changing the position of the oscillating coil 27, it is possible to vary the magnitude of the voltage applied as a reverse bias to the base of transistor Q1. Therefore. the position adjustment of the oscillation coil 27, by adjusting the bias of the transistor Q1 to an optimum value, it can be performed with less oscillation the least loss. The position adjustment of the oscillation coil 27 I carried out in the built-in process of the oscillating coil 27.

[0068]

§6: Power transmission efficiency explanatory ... 7, 8 see Figure 7 is an explanatory view of a power transfer efficiency (Part 1), Fig. 8 is an explanatory diagram of a power transmission efficiency (Part 2). It was confirmed by experiments the change in the power transmission efficiency when the oscillation coil 27 of the high frequency oscillator circuit shown in FIG 3 is moved as shown in Fig. The following, we will describe the experimental example.

[0069]

In the experiments, the circuit shown in Fig. 3, PIN DC input power of the charging unit (input power of the rectifying / smoothing circuit 28), the output voltage of the charging unit (output voltage of the capacitor C4) VO, output current (IO the inflow current) of the secondary battery 22, the output power PO, the power transmission efficiency I was η. And, we asked the power transmission efficiency by the equation of η = PO / PIN = {(VO × IO) / PIN} × 100 [%].

[0070]

It also sets the X-Y rectangular coordinate in plan view of the power transmission coil 25, as shown in B of FIG. 7, is the origin 0 of the center of the transmitting coil 25. Then, the distance x (+ x, -x) from the origin 0 to the outside position of the oscillating coil 27 as. an experiment was conducted while changing the x. As a result the power transmission efficiency η obtained were changed as shown in A in Fig.

[0071]

In A of FIG. 7, when the x is within the range of S is, the state in which the position of the oscillating coil 27 is inside the area of the winding portion of the power transmission coil 25, ie, the oscillation coil 27 in Figure 4 A , it is when in the position shown in

B. Thus, if in the inner area S of the winding portions of the position in the power transmission coil 25 of the oscillation coil 27, a position is the optimum position of the oscillating coil 27, it is possible to perform power transmission at maximum efficiency You see that.

[0072]

Further, in A of FIG. 7, when the x is within the range of M is the state of the oscillation coil 27 is in the position shown in C of FIG. While in this state is a possible self-oscillation, the loss is very large, also worsening the power transmission efficiency. Further, in A of FIG. 7, when the x is within the range of N is the state of the oscillation coil 27 is in the position shown in D of FIG. This state is not a self-oscillation, of course, can not be the power transmission. The oscillation coil 27 is extremely far away from the power transmission coil 25 is susceptible to oscillation operation even when not electromagnetically coupled with each other, the loss is extremely large, the power transmission efficiency becomes extremely poor, it is not suitable for practical use.

[0073]

For comparison of the power transmission efficiency η, A in position 4 of the oscillating coil 27, and a position shown in B, we conducted experiments in the position shown in C in FIG. 4, FIG. 8 to give the data shown. 8, the horizontal axis output current IO [mA], the vertical axis represents the efficiency η [%], indicates the efficiency at the position A, and as shown in B of Figure 4 the position of the oscillating coil 27, the oscillation the position of use the coil 27 shows the efficiency at the position shown in C of FIG.

[0074]

The efficiency η shown in the relative change of the output current IO, there is shown a high efficiency over a wide range, the efficiency η shown in the relative change of the output current IO, was found to be less efficient than the whole. As an example, the value of the output current IO is the case of IO = 130 [mA], is of efficiency η is η = 60%, was of the efficiency η η = 41%. Thus the difference between the efficiency of, the, it can be seen that the next 60-41 = 19%, the efficiency of is ideal.

[0075]

§7: Description ... Figure 9 coil implementation example. see Figure 9 Figure 10 is a coil implementation of the charging unit, A power transmission coil unit Example 1 (plan view, and side view), B is the transmitting coil unit Example 2 (plan view, and side view), C is an example of a transmitting coil unit and the receiving coil (perspective view). Figure 10 is a coil arrangement diagram in a charge state, A Is when the power transmission coil unit used as shown in A in Fig. 9, B when the power transmission coil unit used as shown in B of FIG. 9, C is the transmitting coil 25 It is an explanatory view of a case of using an air-core coil to receiving coil. Hereinafter, Fig. 9, a coil implementation will be described with reference to FIG.

[0076]

(1): In the transmitting coil unit case 1 as shown in A in FIG. 9, the power transmission coil 25 is wound by a cement wire is configured as immobilized one component (air-core coil), one surface of the printed circuit board 33 (and it is bonded and fixed to the substantially central portion of the surface). Meanwhile, the oscillation coil 27 is configured in the coil bobbin 31 as one component of wound wires are mounted as a surface mounted component (SMD) on the other surface of the printed circuit board 33 (the back side).

[0077]

Further, the other surface of the printed circuit board 33 (the back side), the other components and the high frequency oscillator circuit, the components of the power supply circuit are mounted as a surface mount component. In this case, it is an example of the oscillation coil 27 is positioned in the corner of the inner space S of the winding portion of the power transmission coil 25, the magnetic flux φ generated by the power transmission coil 25 through the oscillation coil 27.

[0078]

(2): In the transmitting coil unit case 2 shown in B of FIG. 9, the power transmission coil 25 is wound by a cement wire is configured as immobilized one component (air-core coil), one surface of the printed circuit board 33 (and it is bonded and fixed to the substantially central portion of the surface). Meanwhile, the oscillation coil 27 is also wrapped by the cement wire is configured as immobilized one component (air-core coil), a on one side of the printed board 33 (the surface), the hollow portion of the power transmission coils 25 and it is bonded and fixed to.

[0079]

Further, the other surface of the printed circuit board 33 (the back side), the other components and the high frequency oscillator circuit, the components of the power supply circuit are mounted as a surface mount component. Again, it is an example of the oscillation coil 27 is positioned in a corner of the inside area S of the winding portion of the power transmission coil 25, the magnetic flux φ generated by the power transmission coil 25 through the oscillation coil 27.

[0080]

(3): In the case of a transmitting coil unit and receiving coil shown in C in FIG. 9, using A in FIG 9, or the power transmission coil unit shown in B. Further, the power receiving coil 26 to be used in conjunction with the power transmission coil unit, for example, is wound by a cement wire is configured as immobilized one component (air-core coil).

[0081]

(4): In the arrangement example 1 shown in A of FIG. 10, the power transmission coil unit shown in A of FIG. 9, the coil arrangement of a charged state by the combination of the receiving coil 26 shown in C in FIG. 9 shows. In this state, the oscillation coil 27 is positioned in the corner of the inner space S of the winding portion of the power transmission coil 25, the magnetic flux φ generated by the power transmission coil 25 is through the oscillating coil 27.

[0082]

(5): In arrangement example 2 shown in B of FIG. 10, the power transmission coil unit shown in B of FIG. 9, the coil arrangement of a charged state by the combination of the receiving coil 26 shown in C in FIG. 9 shows. In this state, on the same surface of the printed circuit board 33, the oscillation coil 27 and the power transmission coil 25 is disposed, and the oscillation coil 27 is disposed in a corner of the hollow portion of the power transmission coil 25. Then, the magnetic flux φ generated by the power transmission coil 25 is through the oscillation coil 27.

[0083]

(6): C of FIG. 10, a power transmission coil unit shown in A of FIG. 9, an example of using a combination of the receiving coil 26 shown in C of FIG. In this case, the power transmission coil unit is attached to the charger case 24 in shown in Figure 2, the power receiving coil 26 is mounted within the cordless handset unit case 23.

[0084]

Then, place the cordless handset unit case 23 on the charger case 24, when the charging state, as shown in C in FIG. 10, the transmitting coil 25 and the receiving coil 26 is positioned at a position opposite the transmitting coil 25 it becomes possible to perform non-contact power transmission to the power receiving coil 26 from.

[0085]

In this case, the power transmission coil 25 and the receiving coil 26 without using a coil bobbin, because it uses a coil that is wound by a cement wire, between the transmitting coil 25 and the receiving coil 26, the thickness of the cordless handset unit case 23 If, becomes only the thickness of the charger case 24, the distance between the coils is minimized. For this reason, it makes power transmission efficiently.

[0086]

§8: a coil arrangement relationship in the other embodiments described.. 11 see Figure 11 is a coil arrangement example illustration of another embodiment, A is Example 1, B is Example 2, C is Example 3, D is Example 4, E is a partially enlarged view of the Example 3. Hereinafter, with reference to FIG. 11, a description will be given of the positional relationship between the power transmission coil 25 according to another embodiment the oscillation coil 27.

[0087]

As described in the conventional example, in order to be able to use the Hartley oscillator circuit as a high-frequency oscillating circuit of the charging unit, it is necessary to allow adjusting the degree of electromagnetic coupling between the transmitting coil 25 and the oscillating coil 27 is there. Therefore, in this example, the oscillating coil 27 and the power transmission coil 25 as well as composed of separate independent coil component, winding surfaces of the oscillating coils 27 are arranged such that the direction perpendicular to the winding surface of the power transmission coil 25 and at least a portion of the oscillation coil 27 is located in the winding region of the power transmission coil 25, the two coils are placed in a state capable of electromagnetic coupling,

[0088]

In other words, the winding surface of the power transmission coil 25 is parallel to the front and back surfaces of the printed circuit board 33, and O are vertically the front and back surfaces and perpendicular to the arrangement (power transmission coil 25 of the printed circuit board 33 to the winding surface of the oscillating coil 27 If you and transversely oscillating coil 27). In this example, equal to the winding width W of the power transmission coils 25 of the coil length L of the oscillating coils 27 (W = L) was, but can be implemented in any size.

[0089]

A of Figure 11 an arrangement example of this case, B, C, is shown in D. Below, set the X-Y orthogonal coordinate As shown I will be specifically described. In this example, the power transmission coil 25 is wound by a cement wire is configured as the immobilized one component (1 coil component Bobinresu), and is bonded and fixed to the substantially central portion of one surface of the printed circuit board 33 (surface) . In this case, printed circuit board 33, and the winding surface of the power transmission coil 25 is parallel to the X axis.

[0090]

Meanwhile, the oscillation coil 27, the ferrite core 35 of the cylinder as the center pole, and constitutes what has been wound around it as one component, a surface mounted component (SMD) on the other surface of the printed circuit board 33 (the back surface) It is mounted. Further, the other surface of the printed circuit board 33 (the back side), the other components of the high frequency oscillator circuit (capacitors C1, C2, resistors R1, the transistor Q I and the like) and the parts of the power circuit are mounted as a surface mount component (not shown).

[0091]

Thus, it will be mounted on the printed board 33 to each component of the charging unit, and by moving the mounting position of the oscillating coil 27, so that it is possible to adjust the degree of electromagnetic coupling between the transmitting coil 25 and the oscillating coil 27 I was in. In this case, the planar shape of the power transmission coil 25 is circular, oval, square, but can be configured In a polygon or the like, in the state shown in Figure 11, the lower side of the winding portion of the power transmission coil 25 region (winding portions the width) in the X-axis direction it is defined as a "winding region M".

[0092]

Examples shown in A of FIG. 11. 1 is an example in which the oscillation coil 27 in the center of the inner space S of the winding portion of tho power transmission coil 25. In this case, generated by the transmitting coil 25, the direction of the magnetic flux φ passing through the vicinity of the oscillation coil 27 is Y-axis, since the winding faces of the oscillating coil 27 is placed parallel to the Y-axis power transmission coil 25 magnetic flux φ that in occurred, it does not penetrate the oscillation coil 27. Therefore, the oscillation coil 27 and the power transmission coil 25 are not electromagnetically coupled, do not take less than positive feedback also negative feedback to the transistor data Q1 of Hartley oscillation circuit. In this case, the oscillation is possible, the loss is much power transmission efficiency is lowered

[0093]

Example 2 shown in B of FIG. 11 is an example of the oscillation coil 27 is positioned in a corner of the inner space S of the winding portion of the power transmission coil 25. In this example, the magnetic flux φ generated by the power transmission coil 25 is through a slightly oscillating coil 27. In this case, the oscillation is possible, the loss is much power transmission efficiency is lowered.

[0094]

Example 3 shown in C in FIG. 11 is an example of the oscillation coil 27 is positioned in the winding region M of the power transmission coils 25 shows a partially enlarged view E in Fig. In this position the magnetic flux φ generated by the transmitting coil 25 is most often through the oscillating coil 27, the degree of magnetic coupling between the two coils is the highest. Therefore, the transistor Q1 positive feedback is applied best, may ideally oscillating operation the least loss.

[0095]

Example 4 shown in D in FIG. 11 is an example of the oscillation coil 27 is protruded to the outside of the winding region M of the power transmission coil 25. However, it is a state in which at least a part is within the winding region M of the oscillating coil 27. In this position, the magnetic flux φ generated by the power transmission coil 25 is through the oscillation coil 27, according to the oscillation coil 27 moves away from the winding region M, the magnetic flux φ passing through is a position to decrease

gradually. However, since the normally performed at low loss oscillation operation at this position, it can be performed as well as the position of C in FIG 11.

[0096]

The position of the oscillating coil 27 is in the outer region of the winding region M of the power transmission coil 25, not applied proper reverse bias to the transistor Q1, a high oscillation loss. Furthermore, when the oscillation coil 27 is far away from the winding region M (for example, when you are away in the X direction more than two times the diameter of the power transmission coil 25) or the oscillation operation it is possible, the loss is increased, also decreases the power transmission efficiency.

[0097]

Thus, C in Figure 11, performs a normal oscillation operation in the state of D, but the loss is small, A in Fig. 11, but in the state of B are possible oscillation operation, loss is very large. Thus, C of FIG 11, it is preferable to use in conditions such as D.

[0098]

Also in the other embodiments, by changing the position of the oscillating coil 27, it is possible to vary the magnitude of the voltage applied as a reverse bias to the base of transistor Q1. Therefore, the position adjustment of the oscillation coil 27, by adjusting the bias of the transistor Q1 to an optimum value, it can be performed with less oscillation the least loss. Also, the position adjustment of the oscillation coil 27 I do with the built-process of the oscillating coil 27.

[0099]

§9: the power transmission efficiency in the other embodiments described.. 12 see FIG. 12 is an explanatory diagram of the power transmission efficiency according to another embodiment. The oscillation coil 27 of the high frequency oscillator circuit shown in Figure 3, was confirmed by experiments the change in the power transmission efficiency when it is moved as shown in Figure 11. Thc following, we will describe tlie experimental example.

[0100]

In the circuit shown in Figure 3 in the experiment, PIN DC input power of the charging unit (input power of the rectifying / smoothing circuit 28), the output voltage of the charging unit (output voltage of the capacitor C4) VO, an output current (2 IO the inflow current) of thc next cell 22, the output power PO, the power transmission efficiency I was η. And, we asked the power transmission efficiency by the equation of η = PO / PIN = {(VO × IO) / PIN} × 100 [%].

[0101]

It also sets the X-Y orthogonal coordinates as shown in Figure 12, it is the origin 0 of the center of the transmitting coil 25. Then, the origin 0 the distance in the X-axis direction to the outside of the oscillation coil 27 from the x (+ x, -x) an experiment was conducted while changing the. As a result the power transmission efficiency η obtained were changed as shown in Figure 12.

[0102]

12, whcn x is in the range of S is, tlie state in which the position of the oscillating coil 27 is inside the area of the winding portion of the power transmission coil 25, that is, A of the oscillating coil 27 in FIG. 11, B this is a case where it is in the position shown In. In this way, the position of the oscillating coil 27 is to be in the inner region within the S of the winding portion of the power transmission coil 25, the power transmission efficiency η was as low as η = 46%.

[0103]

Further, in FIG 12, when x is in the range of M is, for example, a state in which the oscillation coil 27 is in the position shown in C in FIG. 11 (directly below the power transmission coil 25). The magnetic flux φ generated by the transmitting coil 25 in this state has the best through the oscillating coil 27, the degree of magnetic coupling between the two coils is the highest.

[0104]

Therefore, the transistor Q1 positive feedback Is applied best, loss smallest, the power transmission efficiency η is maximized. That is, in this position there is a point where the efficiency η becomes a maximum of η = 60%, it is most desirable position. In addition, if at least a part of the winding in the region M of the power transmission coil 25 of the oscillation coil 27 (for example,

the state of the D in FIG. 11), said as well as high power transmission efficiency, the less oscillation operation loss it was confirmed to be done.

[0105]

Further, in FIG. 12, when in the region of x = N is the state of the oscillation coil 27 is spaced further away from the position shown in D in FIG. 11. In this state the magnetic flux φ generated by the transmitting coil 25 extends through the oscillating coil 27, but the magnetic flux penetrating decreases. Therefore, even the power transmission efficiency η was reduced to about η = 46% in this region.

[0106]

It has been described embodiments (other embodiment) or more, but the present invention can be carried out also in the following manner.

[0107]

(1): the power transmission coils 25, the oscillation coil 27, the power receiving coil 26 is also an air-core coil, a core within the coil (for example, a ferrite core) may be inserted. (2): the power transmission coils 25, the oscillation coil 27, the power receiving coil 26 can be circular, oval, square, polygonal, etc., may be implemented in any shape.

[0108]

As has been described, according to the present invention, the present invention has the following effects. (1): By changing the position of the oscillating coil with respect to the power transmission coils, it is possible to adjust the reverse bias of the transistors constituting the Hartley oscillator to optimum values. Therefore, as a high-frequency oscillating circuit of the charging portion constituting the contactless power transmission system, it is possible to use a Hartley oscillator circuit, to reduce the number of parts, it is possible to cost reduction.

[0109]

(2): Since Hartley oscillator circuit can be adjusted to the optimum value of the reverse bias of the transistors constituting the, it is possible to reduce loss and improve power transmission efficiency.

(3): By changing the position of the oscillating coil with respect to the power transmission coils, it is possible to adjust the reverse bias of the transistors constituting the Hartley oscillator to optimum values. Therefore, it can be less oscillating behavior of even miniaturized loss oscillation coil. That Is, as compared with the oscillation coil to the power transmission coil can be very small, it is possible to drive with low loss Hartley oscillator circuit, it is possible to improve the power transfer efficiency.

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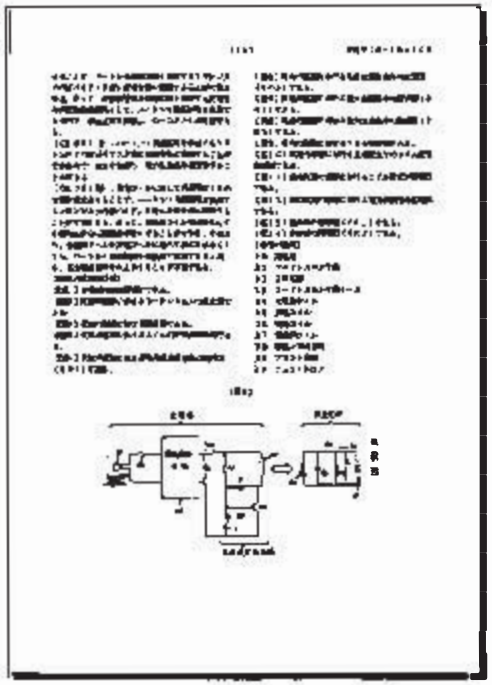
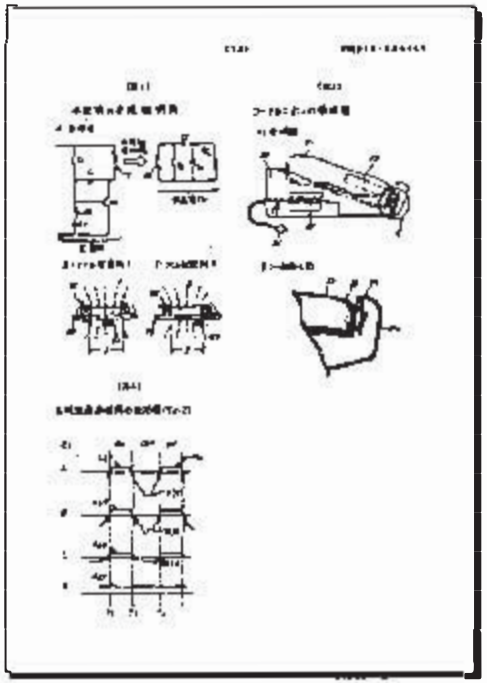
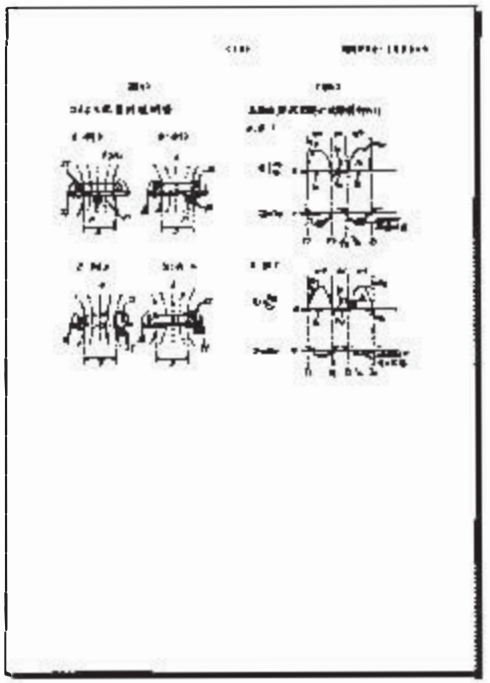
Is constituted by detachably separating the charging portion and the charging unit, and a power transmission coil in the charging unit comprises a radio frequency oscillator for driving the power transmission coil, and with the above to be charged portion transmitting coil and a power receiving coil for inducing a is electromagnetically coupled to the voltage at the non-contact type power transmission apparatus for transmitting power without contact to the live parts from the charging unit. the said radio frequency oscillator and the oscillation coil transmitting coil is constituted by Hartley oscillator circuit including the door, the power transmission coil and oscillation coil, winding surfaces of the oscillating coil is arranged so as to be parallel to the winding plane of the transmitting coil. and for the oscillation At least a portion of the coil, the positioned in the inner region of the winding portion of the power transmission coils, wherein the coils are non-contact power transmission apparatus is characterized in that it is arranged on the electromagnetic coupling ready. Is constituted by detachably separating the charging portion and the charging unit, and a power transmission coil in the charging unit compnses a radio frequency oscillator for driving the power transmission coil, and with the above to be charged portion transmitting coil and a power receiving coil for inducing a is electromagnetically coupled to the voltage at the non-contact type power transmission apparatus for transmitting power without contact to the live parts from the charging unit. the said radio frequency oscillator and the oscillation coil transmitting coil is constituted by Hartley oscillator circuit including the door, the power transmission coil and oscillation coil, winding surface of the oscillation coil is disposed such that the direction perpendicular to the winding plane of the transmitting coil, and for the oscillation At least a portion of the coil, the located in the power transmission coils in the winding region, the two coils is a non-contact type power transmission device is characterized in that it is arranged on the electromagnetic coupling ready.







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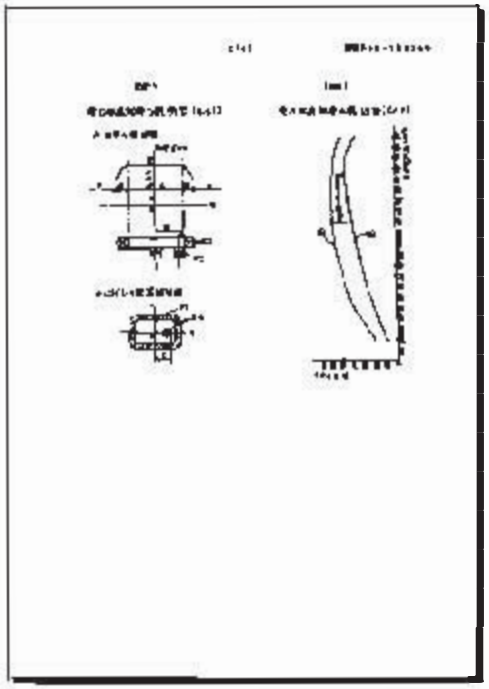

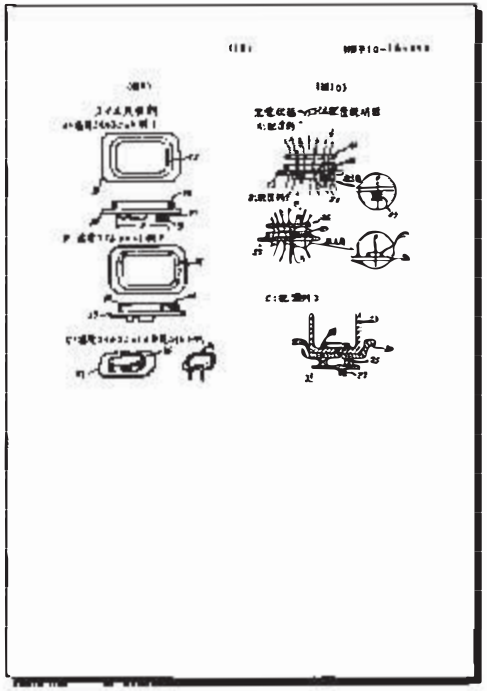

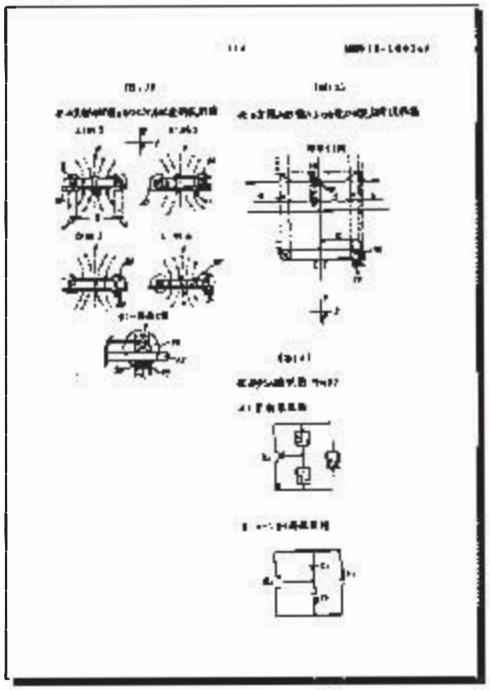

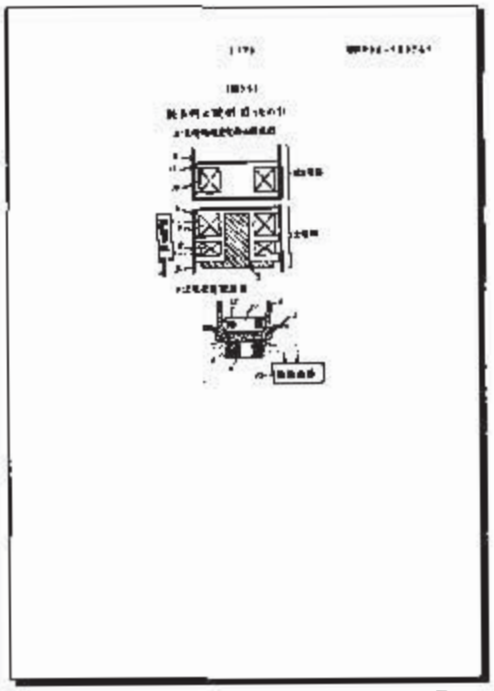

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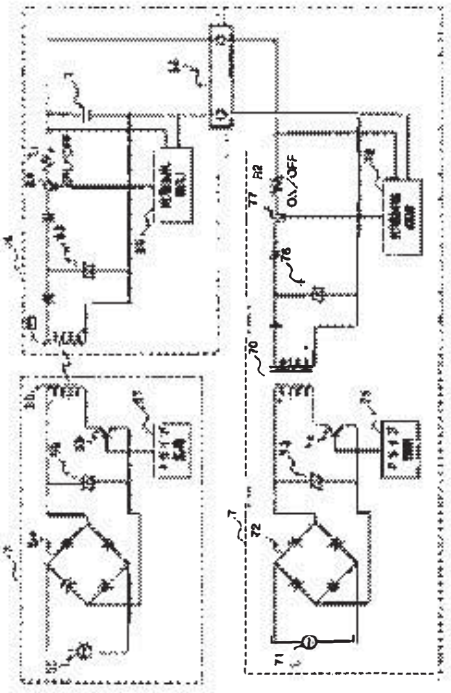
(54)【発明の名称】　電動車両の充電システム

(57)【要約】

【課題】　電動車両に搭載された電動モータのバッテリーを充電するシステムにおいて、エネルギー効率は多少低くとも電気接続のための作業が不要な第1の充電方式と、電気接続のための作業が必要であってもエネルギー効率の高い第2の充電方式の何れかを、任意に選択出来る充電システムを提供する。

【解決手段】　本発明の充電システムは、磁気的エネルギーの出力部を具えた通常充電一次回路5と、充電電流の出力部を具えた急速充電一次回路7とを具え、電動車両には、通常充電一次回路5の出力部と磁気的に結合されて充電電流をバッテリー3へ供給する第1入力部、及び急速充電一次回路7の出力部と電気的に接続されて充電電流をバッテリー3へ供給する第2入力部を具えた充電二次回路6が装備される。



【特許請求の範囲】
【請求項１】　電動車両に搭載された電動モータの電源となるバッテリーを充電するシステムであって、
磁気的エネルギーの出力部を具えた第１の充電一次回路と、
充電電流の出力部を具えた第２の充電一次回路と、
電動車両に装備され、第１の充電一次回路の出力部と磁気的に結合されて、充電電流をバッテリーへ供給する第１入力部、及び第２の充電一次回路の出力部と電気的に接続されて充電電流をバッテリーへ供給する第２入力部を具えた充電二次回路とから構成される電動車両の充電システム。
【請求項２】　第１の充電一次回路の出力部は一次コイルによって構成されると共に、充電二次回路の第１入力部は二次コイルによって構成され、第２の充電一次回路の出力部と充電二次回路の第２入力部とは、コネクターによって互いに接続可能である請求項１に記載の充電システム。
【請求項３】　充電二次回路の第１入力部及び第２入力部は、共通の充電制御回路によって充電動作が制御される請求項１又は請求項２に記載の充電システム。
【請求項４】　第１の充電一次回路の出力部と充電二次回路の第１入力部とが互いに磁気的に結合され得る状態を検知する第１のセンサー手段と、第２の充電一次回路の出力部と充電二次回路の第２入力部とが互いに電気的に接続された状態を検知する第２のセンサー手段とを具え、第１のセンサー手段による検知信号に基づいて第１の充電一次回路が起動され、第２のセンサー手段による検知信号に基づいて第２の充電一次回路が起動される請求項１乃至請求項３の何れかに記載の充電システム。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、電動モータ付き自転車などの電動車両に搭載されたバッテリを充電するための充電システムに関するものである。
【０００２】
【従来の技術】近年、人力により駆動可能な自転車本体に電動モータを搭載して、人力による駆動力を補助する電動モータ付き自転車の開発が進んでいる。図８は、電動モータ付き自転車の概略構成を表わしており、自転車本体(１)のペダルを踏むことによって発生するトルクはトルクセンサー(21)により検出され、該検出信号はコントローラ(22)に入力される。これに応じてコントローラ(22)では、入力されたトルク検出信号に応じたトルク指令が作成され、電動モータ(２)へ供給される。この結果、自転車本体(１)には、人力トルクに加え、該人力トルク値に応じた大きさのモータ出力トルクが供給され、人力による駆動力が補助される。自転車本体(１)には、電動モータ(２)の電源となるバッテリー(３)が搭載されており、バッテリー(３)の出力電圧が低下したときは、該バッテリー(３)を自転車本体(１)から取り外し、これを専用の充電装置に接続して充電を施す。
【０００３】充電装置によれば、バッテリー(３)の充電端子に印加すべき電圧やバッテリー(３)の温度を適切に制御した上で、比較的大きな充電電流をバッテリー(３)に供給することにより、例えば３０分程度の短時間で充電を完了することが可能である。
【０００４】
【発明が解決しようとする課題】しかしながら、上記の充電方法においては、充電装置の出力端子をワイヤーによってバッテリー(３)の充電端子に接続する作業が必要であり、この作業が面倒である問題がある。これに対し、電気的接続によらず、一次コイルと二次コイルの電磁結合によって、充電装置から自転車本体のバッテリーへ充電電流を供給する方式が考えられるが、この方式においては、一次コイルと二次コイルの間の電磁結合にエネルギー損失が伴い、特に充電電流が大きくなると、エネルギー効率が低下する問題がある。
【０００５】そこで本発明の目的は、充電作業を行なうべき場所、時刻、その他の状況に応じて、エネルギー効率は多少低くとも電気接続のための作業が不要な第１の充電方式と、電気接続のための作業が必要であってもエネルギー効率の高い第２の充電方式の何れかを、任意に選択出来る充電システムを提供することである。
【０００６】
【課題を解決する為の手段】本発明に係る電動車両の充電システムは、磁気的エネルギーの出力部を具えた第１の充電一次回路と、充電電流の出力部を具えた第２の充電一次回路と、電動車両に装備され、第１の充電一次回路の出力部と磁気的に結合されて、充電電流をバッテリーへ供給する第１入力部、及び第２の充電一次回路の出力部と電気的に接続されて充電電流をバッテリーへ供給する第２入力部を具えた充電二次回路とから構成される。
【０００７】上記充電システムにおいては、エネルギー効率は多少低くとも電気接続のための作業を省略せんとする場合、電動車両を移動させて、充電二次回路の第１入力部を第１の充電一次回路の出力部に接近させて配置し、第１の充電一次回路を動作させる。これによって、第１の充電一次回路の出力部から磁気的エネルギーが放出されて、充電二次回路の第１入力部に入力され、第１の充電一次回路の出力部と充電二次回路の第１入力部とが互いに磁気的に結合されることになる。この結果、充電二次回路の第１入力部からバッテリーへ充電電流が供給され、バッテリーが充電されることになる(第１の充電方式)。
【０００８】これに対し、電気接続のための作業が必要であっても高いエネルギー効率で充電を行なわんとする場合は、第２の充電一次回路の出力部を充電二次回路の第２入力部に接続し、第２の充電一次回路を動作させ

る。これによって、第２の充電一次回路の出力部と充電二次回路の第２入力部とが互いに電気的に接続されることになる。この結果、第２の充電一次回路の出力部から充電二次回路の第２入力部へ充電電流が流れ、該充電電流はバッテリーへ供給されて、バッテリーが充電されることになる(第２の充電方式)。

【０００９】具体的構成において、第１の充電一次回路の出力部は一次コイルによって構成されると共に、充電二次回路の第１入力部は二次コイルによって構成され、第２の充電一次回路の出力部と充電二次回路の第２入力部とは、コネクターによって互いに接続可能である。該具体的構成によれば、一次コイルを二次コイルに近づけることによって、一次コイルから放出される磁力線が二次コイルを貫通して、一次コイルと二次コイルが互いに磁気結合する。又、第２の充電一次回路の出力部を充電二次回路の第２入力部に係合させることによって電気的接続が為され、第２の充電一次回路の出力部を充電二次回路の第２入力部から離脱させることによって電気的接続が切り離される。

【００１０】又、具体的構成において、充電二次回路の第１入力部及び第２入力部は、共通の充電制御回路によって充電動作が制御される。該具体的構成において、充電二次回路の第１入力部と第２入力部とは基本的に同じ制御動作を行なうところから、第１入力部による充電が行なわれるときは、充電制御回路によって第１入力部を制御し、第２入力部による充電が行なわれるときは、充電制御回路によって第２入力部を制御する。これによって、両入力部を別個の回路で制御する場合に比べ、回路構成が簡易となる。

【００１１】更に具体的には、第１の充電一次回路の出力部と充電二次回路の第１入力部とが互いに磁気的に結合され得る状態を検知する第１のセンサー手段と、第２の充電一次回路の出力部と充電二次回路の第２入力部とが互いに電気的に接続された状態を検知する第２のセンサー手段とを具え、第１のセンサー手段による検知信号に基づいて第１の充電一次回路が起動され、第２のセンサー手段による検知信号に基づいて第２の充電一次回路が起動される。

【００１２】上記具体的構成によれば、第１の充電一次回路の出力部を充電二次回路の第１入力部に接近させて設置すると、この状態を第１のセンサー手段が検知し、第１の充電一次回路を起動する。これに対し、第２の充電一次回路の出力部を充電二次回路の第２入力部に接続することによって、この状態を第２のセンサー手段が検知し、第２の充電一次回路を起動する。従って、第１の充電一次回路と第２の充電一次回路は自動的に切り換えられて充電に必要な回路が動作することになる。

【００１３】

【発明の効果】本発明に係る電動車両の充電システムによれば、電気接続の作業性を重視した第１の充電方式と、エネルギー効率を重視した第２の充電方式の何れかを、任意に選択することが出来る。

【００１４】

【発明の実施の形態】以下、本発明を図８に示す電動モータ付き自転車に実施した形態につき、図面に沿って具体的に説明する。図８の如く、自転車本体(１)には、電動モータ(２)の電源となるバッテリー(３)が搭載されており、該バッテリー(３)は後述の如く２つの方式で充電することが可能である。

【００１５】第１実施例

図４乃至図７は、自宅或いは駐輪場の所定位置に設置した充電装置(４)によって、自転車本体(１)のバッテリー(図示省略)を充電している状態を表わしている。充電装置(４)は、自転車本体(１)の後輪(11)の位置決め溝(44)が凹設されたベース(41)を具え、該ベース(41)上には、スタンド受け部材(42)が設けられている。スタンド受け部材(42)には、自転車本体(１)を支えるスタンド脚(12)の接地部(13)を係合させるべき凹部(43)が形成され、該凹部(43)を包囲して一次コイル装置(51)が埋設されると共に、後述の通常充電一次回路を構成すべき他の回路素子が内蔵されている。又、ベース(41)からは、商用電源のコンセントに接続すべき電源コード(45)が伸びている。一方、自転車本体(１)のスタンド脚(12)の接地部(13)には、二次コイル装置(61)が内蔵されており、該二次コイル装置(61)は、スタンド脚(12)及びフレーム(14)に沿わせて張設した線路(図示省略)を介して前記バッテリーと接続され、該線路中に介在する他の回路素子と共に、後述の充電二次回路を構成している。

【００１６】図７に示す如く、充電装置(４)の一次コイル装置(51)は鉄芯(52)及び一次コイル(50)から構成され、一次コイル(50)は後述する通常充電一次回路の出力部を構成している。一方、自転車本体に設置された二次コイル装置(61)は鉄芯(62)及び二次コイル(60)から構成され、二次コイル(60)は後述する充電二次回路の第１入力部を構成している。又、充電装置(４)のスタンド受け部材(42)には、自転車本体(１)のスタンド脚(12)の接地部(13)が係合した状態を検知するセンサー(46)が取り付けられている。

【００１７】図１に示す如く、前述の充電装置に内蔵されている通常充電一次回路(５)は、商用電源(53)、全波整流回路(54)、平滑用のコンデンサ(55)、一次コイル(50)、スイッチング用のトランジスタ(56)等から構成されて、トランジスタ(56)は、ドライブ回路(57)から供給されるドライブ信号によって駆動される。一方、自転車本体に装備されている充電二次回路(６)は、二次コイル(60)、平滑用のコンデンサ(63)、充電オン／オフ用のトランジスタ(64)、バッテリー(３)等から構成され、バッテリー(３)の両充電端子には、コネクター(66)が接続されている。トランジスタ(64)は、充電制御回路(65)から供給されるＯＮ／ＯＦＦ信号によってオン／オフされる。

充電制御回路(65)には、バッテリー(３)の両端電圧が入力されており、充電制御回路(65)は、バッテリー(３)の両端電圧が所定の閾値を下回っているとき、トランジスタ(64)をオンとして充電を継続し、バッテリー(３)の両端電圧が一旦所定の閾値を越えると、トランジスタ(64)をオフとして、充電を停止する。

【００１８】上記の通常充電一次回路(５)において、商用電源(53)から得られる交流の電流は、全波整流回路(54)を経て整流され、更にコンデンサ(55)によって平滑化された後、一次コイル(50)へ供給される。ここで、トランジスタ(56)は、ドライブ回路(57)からのドライブ信号によってスイッチングされる。この結果、一次コイル(50)から高周波の磁力線が発生し、該磁力線が充電二次回路(６)の二次コイル(60)を貫通して、一次コイル(50)と二次コイル(60)とが互いに電磁結合することになる。

【００１９】上記電磁結合によって、二次コイル(60)から高周波のパルス電流が得られ、該パルス電流はコンデンサ(63)によって平滑化され、略直流の充電電流となって、バッテリー(３)に供給される。この結果、バッテリー(３)が充電されることになる。

【００２０】急速充電一次回路(７)は、上述の通常充電一次回路(５)よりも大きな充電電流をバッテリー(３)へ供給して、比較的短時間(例えば１００分間)で充電を施すためのものである。急速充電一次回路(７)は、従来の充電一次回路と同様の構成であって、商用電源(71)、全波整流回路(72)、平滑用のコンデンサ(73)、スイッチング用のトランジスタ(74)、トランジスタ(74)へドライブ信号を供給するドライブ回路(75)、絶縁トランス(70)、平滑用のコンデンサ(76)、充電オン／オフ用のトランジスタ(77)、トランジスタ(77)をオン／オフ制御する充電制御回路(78)等から構成され、その出力部は前記コネクター(66)によって充電二次回路(６)と接続される。充電制御回路(78)には、コネクター(66)からバッテリー(３)の両端電圧が供給され、充電制御回路(78)は、バッテリー(３)の両端電圧が所定の閾値を下回っているとき、トランジスタ(77)をオンとして充電を継続し、バッテリー(３)の両端電圧が一旦所定の閾値を越えると、トランジスタ(77)をオフとして、充電を停止する。

【００２１】上記の急速充電一次回路(７)において、商用電源(71)から得られる交流の電流は、全波整流回路(72)を経て整流され、更にコンデンサ(73)によって平滑化された後、絶縁トランス(70)の一次巻線へ供給される。ここで、トランジスタ(74)はドライブ回路(75)からのドライブ信号によってスイッチングされる。この結果、絶縁トランス(70)の二次巻線から高周波のパルス電流が得られ、該パルス電流はコンデンサ(76)によって平滑化され、略直流の充電電流となってトランジスタ(77)及びコネクター(66)を通過し、バッテリー(３)に供給される。この結果、バッテリー(３)が充電されることになる。

尚、急速充電一次回路(７)において、バッテリー(３)へ供給すべき充電電流は、通常充電一次回路(５)による充電電流よりも大きく設定されており、これによって、短時間で充電が完了することになる。

【００２２】図１に示す充電システムによれば、自転車本体(１)のバッテリー(３)を充電するに際して、充電に時間がかかっても簡便に充電を行なわんとする場合は、図４及び図５の如く自転車本体(１)の後輪(11)を充電装置(４)上に設置して、スタンド脚(12)をスタンド受け部材(42)に係合させれば、充電装置(４)に設けた通常充電一次回路(５)と自転車本体(１)に設けた充電二次回路(６)とが互いに磁気的に接続され、バッテリーを充電することが出来る。従って、従来の如きワイヤーによる接続は不要であり、便利である。

【００２３】これに対し、短時間で充電を完了せんとする場合は、図１に示すコネクター(66)を用いて、自転車本体の充電二次回路(６)に急速充電一次回路(７)を接続する。これによって、急速充電一次回路(７)と充電二次回路(６)とが互いに電気的に接続され、バッテリーを短時間で充電することが出来る。又、通常充電一次回路(５)による充電に比べて、高いエネルギー効率でバッテリー(３)を充電することが出来る。

【００２４】第２実施例

図１に示す第１実施例では、充電二次回路(６)のトランジスタ(64)を制御する充電制御回路(65)と、急速充電一次回路(７)のトランジスタ(77)を制御する充電制御回路(78)とが別個に構成されているが、両トランジスタ(64)(77)の制御動作は同一であるので、図２に示す第２実施例では、両充電制御回路を共通化している。

【００２５】通常充電一次回路(５)は第１実施例と同一の構成である。一方、自転車本体に装備されている充電二次回路(８)は、二次コイル(80)、平滑用のコンデンサ(81)、充電オン／オフ用のトランジスタ(82)、バッテリー(３)等、第１実施例の充電二次回路(６)と同一の構成に加えて、後述の急速充電一次回路(９)による充電をオン／オフするためのトランジスタ(85)と、急速充電一次回路(９)との接続に用いるコネクター(86)が装備され、両トランジスタ(82)(85)のオン／オフが共通の充電制御回路(83)によって制御されている。

【００２６】充電制御回路(83)には、通常充電一次回路(５)による充電と急速充電一次回路(９)による充電とを切り換えるためのスイッチ(84)が接続されており、該スイッチ(84)からの信号に基づいて、充電制御回路(83)の制御対象が切り換えられる。

【００２７】急速充電一次回路(９)は、商用電源(91)、全波整流回路(92)、平滑用のコンデンサ(93)、スイッチング用のトランジスタ(94)、トランジスタ(94)へドライブ信号を供給するドライブ回路(95)、絶縁トランス(90)、平滑用のコンデンサ(96)等から構成され、その出力部は前記コネクター(86)によって充電二次回路(８)と接続される。

【００２８】図２に示す充電システムの回路動作は、充電制御回路(83)によるトランジスタ(82)(85)の制御を除き、図１に示す充電システムと同じであるので、ここでは説明を省略する。尚、充電制御回路(83)による制御動作は、バッテリー(３)の両端電圧を監視する方式に限らず、バッテリー(３)の両端電圧の変化率や、バッテリー(３)の温度を監視する方式の採用も可能である。

【００２９】図２に示す充電システムによれば、充電二次回路(８)に装備された充電制御回路(83)が、通常充電一次回路(５)による充電のオン／オフ制御と、急速充電一次回路(９)による充電のオン／オフ制御の両方を行なっているので、図１に示す充電システムよりも回路構成が簡易となる。

【００３０】第３実施例

図１に示す第１実施例及び図２に示す第２実施例では、通常充電一次回路(５)と急速充電一次回路(７)(９)とが別個の筐体に内蔵されているが、図３に示す第３実施例では、共通の筐体に、通常充電一次回路部Ａ及び急速充電一次回路部Ｂの両方を具えた充電一次回路(100)が組み込まれている。又、図３に示す第３実施例では、充電一次回路(100)の通常充電一次回路部Ａと充電二次回路(200)とが互いに磁気的に結合され得る状態を検知して、通常充電一次回路部Ａを自動的に起動する一方、充電一次回路(100)の急速充電一次回路部Ｂと充電二次回路(200)とが互いに電気的に接続された状態を検知して、急速充電一次回路部Ｂを自動的に起動する構成を採用した。

【００３１】充電一次回路(100)は、商用電源(101)、全波整流回路(102)、コンデンサ(103)、一次コイル(104)、スイッチング用のトランジスタ(105)等から通常充電一次回路部Ａを構成している。又、全波整流回路(102)から得られる電流が供給される絶縁トランス(106)、スイッチング用のトランジスタ(107)等から急速充電一次回路部Ｂを構成している。更に充電一次回路(100)は、通常充電一次回路部Ａのトランジスタ(105)及び急速充電一次回路部Ｂのトランジスタ(107)へ夫々ドライブ信号Ｇ１、Ｇ２を供給すべき一次制御部(108)を具えている。

【００３２】具体的には一次制御部(108)は、通常充電一次回路部Ａの電圧Ｖ１、電流Ｉ１、及び急速充電一次回路部Ｂの電流Ｉ２に基づいてパルス幅変調信号Ｐ１、Ｐ２を作成する一次制御回路(109)と、一次制御回路(109)から得られるパルス幅変調信号Ｐ１、Ｐ２に基づいて前記ドライブ信号Ｇ１、Ｇ２を作成し、前記トランジスタ(105)(107)へ夫々供給するドライブ回路(110)(111)とから構成される。一次制御回路(109)には、前記充電装置(４)のスタンド受け部材(42)に装備されたセンサー(46)からの第１検出信号Ｄ１と、後述の如く急速充電一次回路部Ｂが充電二次回路(200)に接続された状態を検知したときの第２検知信号Ｄ２とが供給され、一次制御回路(109)は、第１検出信号Ｄ１が供給されたとき、ドライブ回路(110)へパルス幅変調信号Ｐ１を送出し、第２検出信号Ｄ２が供給されたとき、ドライブ回路(111)へパルス幅変調信号Ｐ２を送出する。

【００３３】一方、充電二次回路(200)は、前記充電一次回路(100)の一次コイル(104)と電磁結合すべき二次コイル(201)、二次コイル(201)から供給される電流又は充電一次回路(100)の絶縁トランス(106)から供給される電流の何れか一方を選択するリレー(202)、スイッチング用のトランジスタ(203)、平滑用のコンデンサ(204)、バッテリー(３)、トランジスタ(203)へドライブ信号Ｇ３を供給すべき二次制御部(206)等を具えると共に、リレー(202)及びバッテリー(３)の負極にはコネクター(205)が接続されている。コネクター(205)は、充電二次回路(200)に充電一次回路(100)が接続された状態を検知して検知信号Ｄ２を出力する機能を有し、該検知信号Ｄ２は一次制御部(108)の一次制御回路(109)へ供給される。

【００３４】具体的には二次制御部(206)は、コネクター(205)からの入力電圧Ｖ２、バッテリー(３)に対する充電電流Ｉ３及び充電電圧Ｖ３に基づいて、前記リレー(202)を切り換えるための制御信号Ｓ及びパルス幅変調信号Ｐ３を作成する二次制御回路(207)と、二次制御回路(207)から得られるパルス幅変調信号Ｐ３に基づいてドライブ信号Ｇ３を作成し、前記トランジスタ(203)へ供給するドライブ回路(208)とから構成される。ここで、二次制御回路(207)は、バッテリー(３)に対する充電電流及び充電電流を夫々規定値に制御するべく、パルス幅変調制御を行なうものである。

【００３５】図３に示す充電システムにおいて、通常充電一次回路部Ａを用いた簡便な充電を行なう場合は、第１実施例と同様、図４及び図５の如く自転車本体(１)の後輪(11)を充電装置(４)上に設置して、スタンド脚(12)をスタンド受け部材(42)に係合させる。これによって、図３の如くセンサー(46)から一次制御回路(109)へ検出信号Ｄ１が供給され、これに応じて一次制御回路(109)は、ドライブ回路(110)へパルス幅変調信号Ｐ１を供給し、これによって、通常充電一次回路部Ａのトランジスタ(105)へ自動的にドライブ信号Ｇ１の供給が開始される。又、充電二次回路(200)のリレー(202)が二次コイル(201)側へ切り換えられる。この結果、通常充電一次回路部Ａによってバッテリー(３)の充電が行なわれることになる。

【００３６】これに対し、急速充電一次回路部Ｂによる急速充電を行なう場合は、コネクター(205)を用いて、充電二次回路(200)に充電一次回路(100)を接続する。これによって、コネクター(205)から一次制御部(108)の一次制御回路(109)へ検出信号Ｄ２が供給され、これに応じて一次制御回路(109)は、ドライブ回路(111)へパルス幅変調信号Ｐ２を供給し、これによって、急速充電一次回路部Ｂのトランジスタ(107)へ自動的にドライブ信号

Ｇ２の供給が開始される。又、充電二次回路(200)のリレー(202)がコネクター(205)側へ切り換えられる。この結果、急速充電一次回路部Ｂによってバッテリー(３)の充電が行なわれることになる。

【００３７】尚、充電一次回路(100)の通常充電一次回路部Ａと急速充電一次回路部Ｂの両方が充電二次回路(200)と接続された場合は、急速充電一次回路部Ｄを優先的に起動する構成が採用出来る。又、充電一次回路(100)の一次制御回路(109)は、通常充電一次回路部Ａから得られる電力を監視し、規定の電力が得られないときは、誤動作によって起動したものとして、ドライブ回路(110)(111)に対するパルス幅変調信号の供給を停止する構成の採用が可能である。

【００３８】上述の如く図３に示す充電システムによれば、充電一次回路(100)の通常充電一次回路部Ａと急速充電一次回路部Ｂが、充電二次回路(200)との接続状態に基づいて切り換えられ、必要な一方の回路部が自動的に動作するので、操作性が良好である。

【００３９】上記実施の形態の説明は、本発明を説明するためのものであって、特許請求の範囲に記載の発明を限定し、或は範囲を減縮する様に解すべきではない。又、本発明の各部構成は上記実施の形態に限らず、特許請求の範囲に記載の技術的範囲内で種々の変形が可能である。例えば本発明に係る充電システムは、電動モータ付き自転車のみならず、電気自動車等、広く電動車両に実施出来るのは言うまでもない。

【図面の簡単な説明】

【図１】本発明に係る充電システムの第１実施例を表わす回路図である。

【図２】同上の第２実施例を表わす回路図である。

【図３】同上の第３実施例を表わす回路■である。

【図４】充電装置による充電状態を表わす一部破断平面図である。

【図５】同上の一部破断正面図である。

【図６】充電装置の斜視図である。

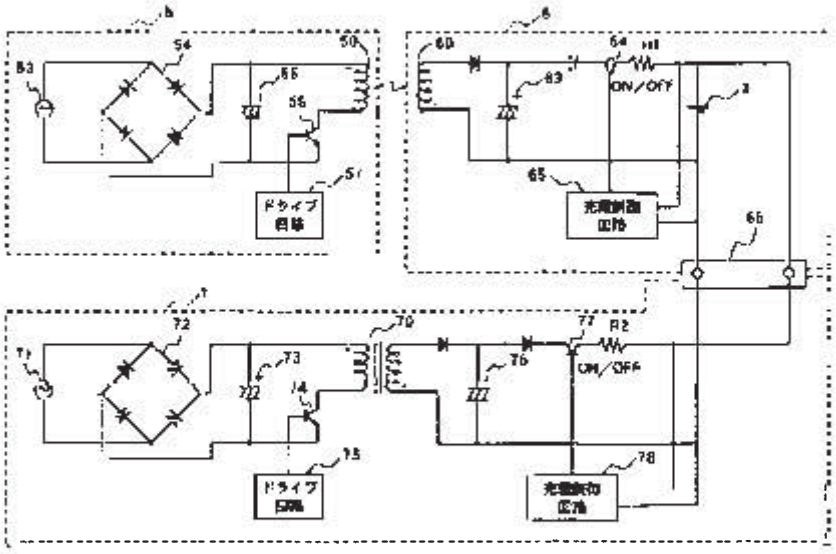
【図７】一次コイル装置及び二次コイル装置の構成を表わす図である。

【図８】電動モータ付き自転車の概略構成を表わす図である。

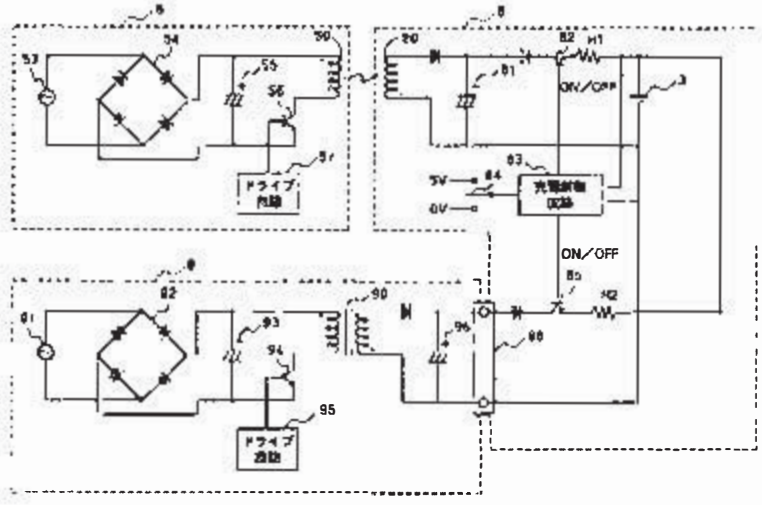
【符号の説明】

(１)　自転車本体
(２)　電動モータ
(３)　バッテリー
(５)　通常充電一次回路
(53)　商用電源
(50)　一次コイル
(６)　充電二次回路
(60)　二次コイル
(bb)　コネクター
(７)　急速充電一次回路
(71)　商用電源
(70)　絶縁トランス

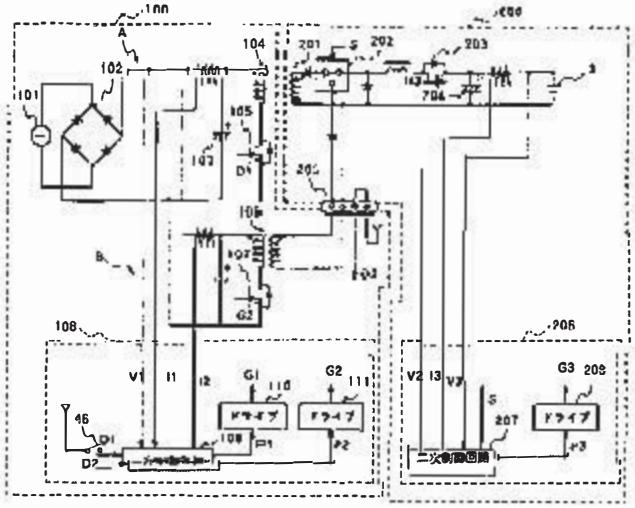
【図１】



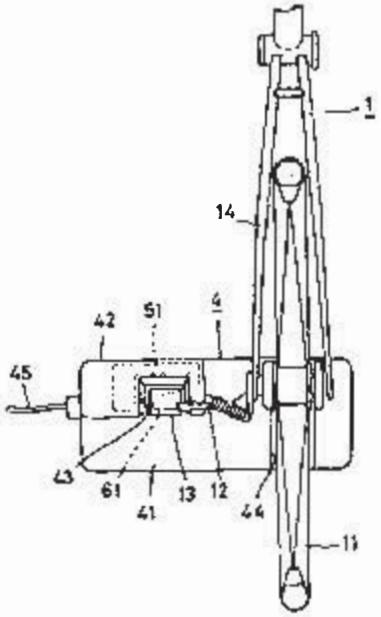
【図2】



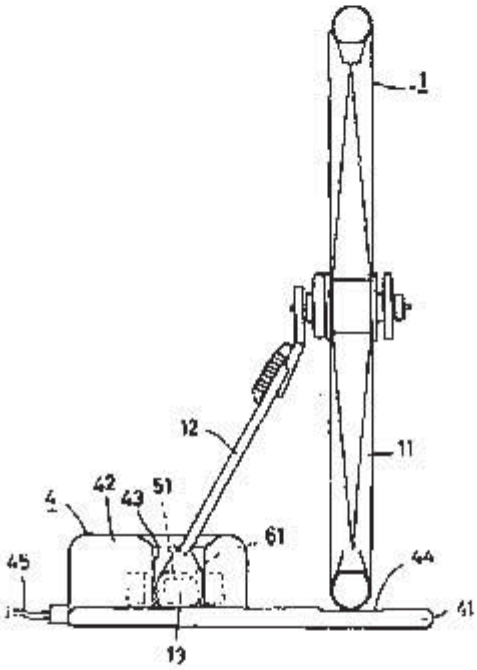
【図3】



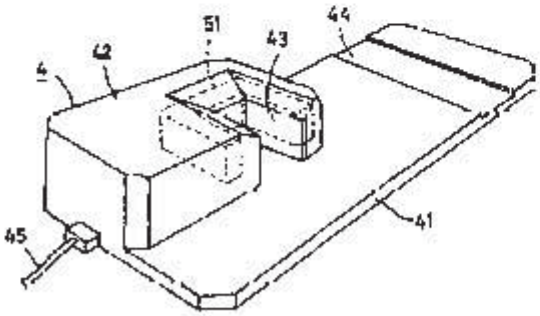
【図4】



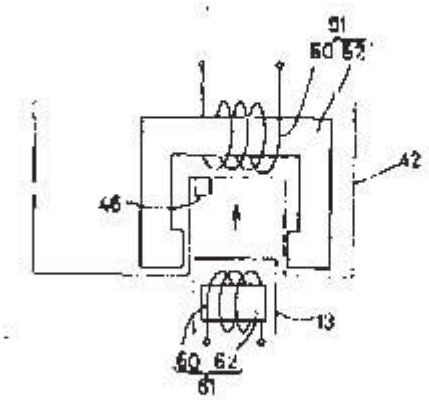
【図５】



【図６】



【図７】



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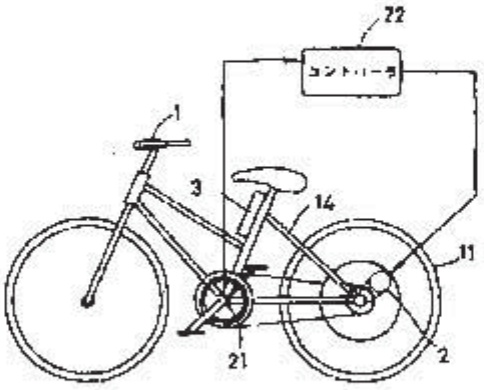

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CHARGE SYSTEM OF MOTORIZED VEHICLE

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Abstract of JPH10136588 (A)

PROBLEM TO BE SOLVED: To provide a charge system which can optionally select either a first charge mode where the work for electric connection is needless, though energy efficiency is a little low, or a second charge mode where energy efficiency is high, though the work the electric connection is necessary, in the system for charging the battery of an electric motor mounted on a motorized vehicle. SOLUTION: This charge system provided with a normal charge primary circuit 5 equipped with the output part of magnetic energy, and a quick charge primary circuit 7 equipped with the output part of a charge current, and a motorized vehicle is equipped with the first input part which supplies a battery 3 with a charge current, being usually magnetically connected with the output part of the charge primary circuit 5, and a charge secondary circuit 6 having the second input part which supplies the battery 3 with a charge current, being electrically connected with the output part of the quick charge primary circuit 7.

Notice

DESCRIPTION JPH10136588

[0001]

[Field of the Invention The present invention relates to a charging system for charging a battery mounted in an electric vehicle, such as a bicycle with an electric motor.

[0002]

In recent years, by mounting an electric motor to be driven bicycle body by human power, it is being developed bicycle with an electric motor to assist the driving force by human power. Figure 8 represents a schematic structure of a bicycle with an electric motor, the torque generated by stepping on the bicycle pedal body (1) Is detected by a torque sensor (21), the detection signal is input to the controller (22) differentially. The controller In response to this (22), a torque command corresponding to the input torque detection signal is generated and supplied to the electric motor (2). Consequently, the bicycle body (1), in addition to the human power torque, the motor output torque magnitude corresponding to the person force torque value is supplied, the driving force by man power is assisted. The bicycle body (1), the power supply serving the battery (3) is mounted on the electric motor (2), when the output voltage of the battery (3) is lowered, the battery (3) the bicycle body (1 Remove from), it is subjected to charging by connecting it to the dedicated charging device.

[0003]

According to the charging device, the temperature of the battery voltage and the battery to be applied to the charging terminal (3) (3) above it is suitably controlled, by supplying a relatively large charging current to the battery (3), for example, It is possible to complete the charging in a short time of about 30 minutes.

[0004]

[0007] However, in the above-mentioned charging method, it is necessary to work to be connected by wire to the output terminal of the charging device to the charging terminal of the battery (3), is a problem in this work is troublesome is there. In contrast, irrespective of the electrical connection, by electromagnetic coupling of the primary and secondary coils, it can be considered a method for supplying a charge current to the bicycle body of the battery from the charger, in this system, the primary coil and two energy loss due to the electromagnetic coupling between the next coil, especially the charge current is large, there is a problem that energy efficiency is lowered.

[0005]

An object of the present invention, where to perform a charging operation, the time, depending on the other circumstances, the energy efficiency is less and the first charging method work is not required for electrical connection with low, for electrical connection Any of the higher work even require energy efficient second charging method, it is to provide an arbitrarily selectable charging system.

[0006]

Charging system for an electric vehicle according to the present invention In order to solve the problems] includes a first charging the primary circuit equipped with an output portion of the magnetic energy, the second charge primary equipped an output of the charging current and circuitry are mounted in an electric vehicle, the first being the output section magnetically

coupled to the charging primary circuit, an output unit electrically of the first input unit, and the second charging the primary circuit which supplies a charging current to the battery manner is connected composed of a charging secondary circuit provided with a second input for supplying a charge current to the battery.

[0007]

In the charging system, the energy efficiency is more or less low to omit cents work for electrical connection, to move the electric vehicle, the output of the first charging the primary circuit a first input of the charging the secondary circuit It is allowed to approach the parts are arranged to operate the first charging the primary circuit. Thereby, the output of the first charging the primary circuit is magnetic energy is released, and Is Input to the first input of the charging the secondary circuit, the output portion and the charging the secondary circuit of the first charging the primary circuit so that the one and the input part are magnetically coupled to each other. As a result, the charging current from the first input of the charging the secondary circuit to the battery is supplied, the battery will be charged (first charging method).

[0008]

In contrast, when a do not charge a high energy efficiency even necessary work for electrical connection, and connects the output of the second charging the primary circuit to the second input of the charging the secondary circuit It is, to operate the second charging the primary circuit. Thus, I will be a second input of the output unit and the charging the secondary circuit of the second charging the primary circuit are electrically connected to each other. As a result, the charging current from the output of the second charging the primary circuit to the second input of the charging the secondary circuit flows, the charging current is supplied to the battery. the battery will be charged (second charging method).

[0009]

In a particular configuration, the output of the first charging the primary circuit as well as constituted by the primary coil, the first input of the charging the secondary circuit is constituted by a secondary coil, the output of the second charging the primary circuit The second input of the charging the secondary circuit is connectable to each other by the connector. According to the specific construction, by bringing the primary coil to the secondary coil, magnetic force lines emitted from the primary coil through the secondary coil, the primary coil and the secondary coil are magnetically coupled to each other. Moreover, the electrical connection is made by engaging the output of the second charging the primary circuit to the second input of the charging the secondary circuit. the charging secondary circuit the output of the second charging the primary circuit electrical connection is cut off by disengaging the two inputs.

[0010]

Further, in a specific configuration. the first input unit and the second input of the charging the secondary circuit is controlled charging operation by a common charge control circuit. In specific construction, the place to perform essentially the same control operation as the first input and the second input of the charging the secondary circuit, when the charging by the first input unit is performed, the the charge control circuit 1 controls the input unit, when the charging by the second input unit is performed, and controls the second input unit by the charge control circuit. Thereby, as compared with the case of controlling both the inputs with separate circuits, the circuit configuration is simplified.

[0011]

More specifically, the first sensor means for detecting the state in which the first input of the output unit and the charging the secondary circuit of a first charging the primary circuit can be magnetically coupled to each other, the second charging primary and comprising a second sensor means for detecting the state of an output portion of the circuit and a second input of the charging the secondary circuit are electrically connected to each other, first on the basis of a detection signal by the first sensor means charging the primary circuit is activated and the second charging the primary circuit is activated based on the detection signal of the second sensor means.

[0012]

According to the specific construction, when the output of the first charging the primary circuit is installed to be brought close to the first input of the charging the secondary circuit, the state first sensor means detects the first charge It will start the primary circuit. In contrast, by connecting the output of the second charging the primary circuit to the second input of the charging the secondary circuit, the state second sensor means detects and activates the second charging the primary circuit . Therefore. the first charging the primary circuit and the second charging the primary circuit so that the operation of the circuit required to charge and automatically switched.

[0013]

According to the charging system for an electric vehicle according to the present invention, a first charging system with an emphasis on the work of the electrical connection, one of the second charging system with an emphasis on energy efficiency, in any You can be selected.

[0014]

DESCRIPTION OF THE PREFERRED EMBODIMENTS Hereinafter, embodiments of the present invention was carried out on the bicycle with an electric motor shown in Fig. 8 will be specifically described along the drawings. As shown in Figure 8, the bicycle body 1, the power supply serving the battery (3) is mounted on the electric motor (2), the battery (3) can be charged in two ways as described below It is.

[0015]

First Embodiment FIG. 4 to 7, by the charging device installed at a predetermined position of the home or bicycle parking (4) represents a state in which charging the battery (not shown) of the bicycle body (1). Charging device (4) comprises a base of the positioning groove (44) is recessed in the annulus (11) (41) after a bicycle body (1), the said base (41) on, the stand receiving member (42) it is provided. The stand receiving member (42), the grounding portion of the stand legs (12) supporting the bicycle body 1 (13) is engaged cell to the recess (43) is formed, one to surrounding recess (43) next together with the coil unit (51) is embedded, other circuit elements to be configured to normally charge the primary circuit to be described later is built. Also, from the base (41), is extended power cord should be connected to the outlet of the commercial power supply (45). On the other hand, the grounding portion of the stand legs (12) of the bicycle body 1 (13), the secondary coil unit (61) is built, the secondary coil unit (61), the stand legs (12) and it is placed along the frame (14) is connected to the battery through and stretched the line (not shown), along with other circuit elements to be interposed in 該線 path, and constitutes a charging secondary circuit to be described later,

[0016]

As shown in Figure 7, the primary coil unit of the charging device (4) (51) is composed of iron core (52) and primary coil (50), primary coil (50) is the output of the normal charging the primary circuit to be described later is constructed. Meanwhile, the secondary coil unit (61) installed on the bicycle body is composed of iron core (62) and a secondary coil (60), a secondary coil (60) the first input of the charging the secondary circuit to be described later It has configured. In addition, the stand receiving member of the charging apparatus (4) (42), the sensor (46) which grounding portions of the stand leg (12) of the bicycle body 1 (13) detects the state of engagement with the attached there.

[0017]

As shown in Figure 1, the normal charging primary circuit incorporated in the battery charger in the above (5), the commercial power supply (53), a full-wave rectifier circuit (54), a capacitor (55) for smoothing the primary coil (50), it is composed of a transistor (56) or the like for switching the transistor (56) is driven by the drive signal supplied from the drive circuit (57). Meanwhile, the charging secondary circuit is equipped in the bicycle body (6), a secondary coil (60), a capacitor (63) for smoothing, the transistor for charging on / off (64), from the battery (3), etc. It is configured, on both the charging terminal of the battery (3), the connector (66) is connected. Transistors (64) is turned on / off by the ON / OFF signal supplied from the charging control circuit (65). The charge control circuit (65), battery and is input the voltage across the (3), the charge control circuit (65) when the voltage across the battery (3) is below a predetermined threshold, the transistor (64) and continues charging as on, it exceeds a once predetermined threshold voltage across the battery (3), transistor (64) as off to stop charging.

[0018]

In the above normal charging the primary circuit (5), the alternating current obtained from a commercial power supply (53) is rectified through the full-wave rectifier circuit (54), further after being smoothed by the capacitor (55), the primary coil and it is supplied to (50). Here, the transistors (56) is switched by a drive signal from the drive circuit (57). As a result, it causes a high frequency magnetic field lines from the primary coil (50), the magnetic flux lines through the secondary coil (60) for charging the secondary circuit (6), the primary coil (50) and the secondary coil (60) bet is I will be electromagnetically coupled to each other.

[0019]

By the electromagnetic coupling, obtained is a high-frequency pulse current from the secondary coil (60), the pulse current is smoothed by the capacitor (63) and a charging current of substantially direct current and supplied to the battery (3) . As a result, it will be that the battery (3) is charged.

[0020]

Rapid charging primary circuit (7), a large charging current than the normal charge the primary circuit of the above-mentioned (5) was supplied to the battery (3), intended for applying a charge in a relatively short period of time (eg, 100 minutes) is there. Rapid charging primary circuit (7) is a same configuration as conventional charging the primary circuit, the commercial power supply (71), a full-wave rectifier circuit (72), a capacitor (73) for smoothing, the transistor for switching (74), the transistor (74) drive circuit (75 supplies a drive signal to), isolation transformer (70), a smoothing capacitor (76), the transistor for charging on / off (77), the transistor (77) on / and it is composed of a charge control circuit (78) such that the off control, its output is connected to the charging the secondary circuit (6) by said connector (66). When the charge control circuit (78), the voltage across the supply connector (66) from the battery (3), the charge control circuit (78), the voltage across the battery (3) is below a predetermined threshold, and continuing the charging transistor (77) as turned on exceeds a predetermined threshold value once the voltage across the battery (3), transistor (77) as off to stop charging.

[0021]

In the fast-charge the primary circuit (7), after the alternating current obtained from a commercial power supply (71), which is rectified through the full-wave rectifier circuit (72), it was further smoothed by the capacitor (73), isolation transformer It is supplied to the primary winding (70). Here, transistor (74) is switched by a drive signal from the drive circuit (75). As a result, the insulation transformer (70) high-frequency pulse current from the secondary winding is obtained of the pulse current is smoothed by the capacitor (76) and a charging current of substantially direct current transistor (77) and the connector (66) passes through, and is supplied to the battery (3). As a result, it will be that the battery (3) is charged. Incidentally, in the rapid charging the primary circuit (7), the battery charging current to be supplied to the (3) is set larger than the charging current by the normal charge the primary circuit (5), whereby a short time charging is completed it is to be.

[0022]

According to the charging system shown in Figure 1, and when charging the battery (3) of the bicycle body (1), when the no performed easily charged even if it takes time to charge, as shown in FIGS. 4 and 5 by installing a ring (11) after a bicycle body (1) to the charging device (4) above, if ask engage the stand leg (12) on the stand receiving member (42), is provided in the charging device (4) charging the secondary circuit provided in the normal charge the primary circuit (5) and the bicycle body 1 (6) and are magnetically connected to each other, it is possible to charge the battery. Therefore, the connection according to the [illegible] it is convenient.

[0023]

In contrast, when completing cents charged in a short time, using a connector (66) shown in Figure 1, to connect the quick charging the primary circuit (7) for charging the secondary circuit of the bicycle body (6). Thereby, the rapid charging primary circuit (7) and charging the secondary circuit (6) are electrically connected to each other, a battery in a short time and can be charged. Also, compared to the charging by the ordinary charging the primary circuit (5), it is possible to charge the battery (3) with high energy efficiency.

[0024]

In the first embodiment shown in the second embodiment Figure 1, a charge control circuit for controlling the transistor (64) of charging the secondary circuit (6) (65), of the rapid charging primary circuit (7) transistor (77) While the control for the charging control circuit (78) are separately configured, the control operation of the transistors (64) (77) is the same, in the second embodiment shown in FIG. 2, and both the charge control circuit It is common.

[0025]

Typically charging the primary circuit (5) is the same configuration as the first embodiment. Meanwhile, the charging secondary circuit is equipped in the bicycle body (8), a secondary coil (80), a capacitor (81) for smoothing, the transistor for charging on / off (82), batteries (3) or the like, In addition to the same configuration as the charging the secondary circuit of the first embodiment (6), a transistor (85) for turning on / off the charging by the quick charging the primary circuit to be described later (9), the rapid charging primary circuit (9) connector is used for connection to a (86) is equipped, it is controlled by two transistors (82) (85) on / off the common charge control circuit (83).

[0026]

The charge control circuit (83), is connected to a switch (84) for switching the charging with the rapid charging primary circuit and the charge in the normal charging the primary circuit (5) (9) from the switch (84) Based on the signal, is switched is controlled charge control circuit (83).

[0027]

Rapid charging primary circuit (9), commercial power supply (91), full-wave rectifier circuit (92), a smoothing capacitor (93), the transistor (94) for switching, drive supplies the drive signal to the transistor (94) circuit (95), an insulating transformer (90) is a capacitor (96), and a smoothing, its output is connected to the charging the secondary circuit (8) by said connector (86).

[0028]

Circuit operation of the charging system shown in Figure 2, except for the control of the charge control circuit (83) by the transistor (82) (85) is the same as the charging system shown in Figure 1, the description thereof is omitted here. Incidentally, the control operation by the charge control circuit (83), is not limited to the method of monitoring the voltage across the battery (3), the change rate and the voltage across the battery (3), method to monitor the temperature of the battery (3) adoption of are also possible.

[0029]

According to the charging system shown in Figure 2, the charge control circuit that is provided in the charging secondary circuit (8) (83), and on / off control of the charging by the normal charging the primary circuit (5), the rapid charging primary circuit (9) Since by being subjected to both the on / off control of the charging, the circuit configuration is simpler than the charging system shown in FIG.

[0030]

In the second embodiment shown in the first embodiment and Figure 2 shows a third embodiment Figure 1, normal charging the primary circuit (5) and quick charging the primary circuit (7) (9) and is incorporated in a separate housing In that although, in the third embodiment shown in FIG. 3, in a common housing, is incorporated charging the primary circuit equipped with both a normal charge the primary circuit portion A and the rapid charging primary circuit B (100). Also, in the third embodiment shown in Figure 3, by detecting a normal state in which the charging primary circuit portion A and a charging secondary circuit (200) can be magnetically coupled to each other in charging the primary circuit (100), the normal charge While starting the primary circuit section A automatically detects the rapid state charged with the primary circuit portion B where the charged secondary circuit (200) is electrically connected to one another in charging the primary circuit (100), the quick charge It was adopted automatically start to configure the primary circuit section B.

[0031]

Charging the primary circuit (100), a commercial power supply (101), a full-wave rectifier circuit (102), a capacitor (103), a primary coil (104), constitutes a normal charge the primary circuit portion A from the transistor (105), and for switching are doing. In addition, the isolation transformer (106) the current obtained from the full-wave rectifier circuit (102) is supplied, thereby constituting a quick charging primary circuit part B of the transistor (107), and for switching. Further charged primary circuit (100), usually charging primary circuit portion A of the transistor (105) and fast-charge primary circuit section primary control unit to be supplied to the transistor to (107) each drive signal G1, G2 of B (108) It is equipped.

[0032]

The primary controller is specifically (108), the voltage V1 of the normal charge the primary circuit A, currents I1, and rapid charging the primary circuit a primary control to create a pulse-width modulated signal P1, P2 based on the current I2 of B a circuit (109), based on the pulse width modulated signals P1, P2 obtained from the primary control circuit (109) to create the drive signals G1, G2, the transistors (105) (107) to respectively supply drive circuit (110) made from (111). The primary control circuit (100), the charging device and the first detection signal D1 from a sensor that is provided on the stand receiving member (4) (42) (46), charging rapid charging primary circuit part B as will be described later The second is a detecting signal D2 at the time of detecting the connected state in the secondary circuit (200) is supplied, the primary control circuit (109), when the first detection signal D1 is supplied, the drive circuit (110) the sending the pulse width modulated signal P1, when the second detection signal D2 is supplied, It sends a pulse width modulated signal P2 to the drive circuit (111).

[0033]

Meanwhile, the charging secondary circuit (200), the primary coil (104) and electromagnetically coupled to be a secondary coil of the charging primary circuit (100) (201), a current or charging primary is supplied from the secondary coil (201) circuit relay for selecting either one of the current supplied from the (100) of the isolation transformer (106) (202), the transistor for switching (203), a smoothing capacitor (204), batteries (3), a transistor (203) secondary control unit to be supplied a drive signal G3 to (206) or the like along with comprising a are connected connector (205) to the negative pole of the relay (202) and the battery (3). Connector (205) has a function of outputting a detection signal D2 by detecting a state in which the charging primary circuit (100) connected to the charging the secondary circuit (200), said detection signal D is the primary control unit (108) and is the feed to the primary control circuit (109).

[0034]

The secondary control unit in particular (206), the input voltage V2 from the connector (205), on the basis of the charging current I3 and the charge voltage V3 to the battery (3), a control signal for switching the relay (202) a secondary control circuit for creating an S and a pulse width modulation signal P3 (207), based on the pulse width modulation signal P3 obtained from the secondary control circuit (207) to create a drive signal G3, to the transistor (203) composed from the drive circuit and the (208) supplies. Here, the secondary control circuit (207), in order to control the charging current and the charging current to respective prescribed values for the battery (3), is configured to perform a pulse width modulation control.

[0035]

In the charging system shown in FIG. 3, when the normally performing simple charging with charging the primary circuit section A, as in the first embodiment, the rear wheel of the bicycle body 1 as shown in FIGS. 4 and 5 (11) It was placed on to the charging device (4) and engaging the stand leg (12) on the stand receiving member (42). This is supplied with a detection signal D1 from the sensor (46) as shown in Figure 3 to the primary control circuit (109), the primary control circuit (109) in response to this, a pulse-width modulated signal P1 to the drive circuit (110) the supplied, thereby automatically supplying the drive signal G1 is started the normal charging the primary circuit portion A of the transistor (105). The relay (202) for charging the secondary circuit (200) is switched to the secondary coil (201) side. As a result, I will be the charging of the battery (3) is carried out by normal charging the primary circuit section A.

[0036]

In contrast, when performing quick charging by rapid charging the primary circuit part B, using a connector (205), to connect the charging primary circuit (100) for charging the secondary circuit (200). Thus, the primary control unit from the connector (205) (108) is the supplied detection signal D2 into the primary control circuit (109), the primary control circuit (109) In response to this, the pulse width modulation to the drive circuit (111) It supplies the signal P2, whereby, automatically supplies a drive signal G2 to the rapid charging primary circuit part B of the transistor (107) is started. The relay (202) for charging the secondary circuit (200) is switched to the connector (205) side. As a result, I will be the charging of the battery (3) is carried out by rapid charging the primary circuit section B.

[0037]

In the case where both the normal charge the primary circuit portion A and the rapid charging primary circuit part B of the charging primary circuit (100) is connected to the charging the secondary circuit (200), a quick charge primary circuit section B preferentially activated configuration that can be employed. The primary control circuit for charging the primary circuit (100) (109) typically monitors the power obtained from the charging primary circuit section A, when is not obtained prescribed power, as it is activated by a malfunction, the drive circuit (110) it is possible to adopt the structure to stop the supply of the pulse width modulation signal for the (111).

[0038]

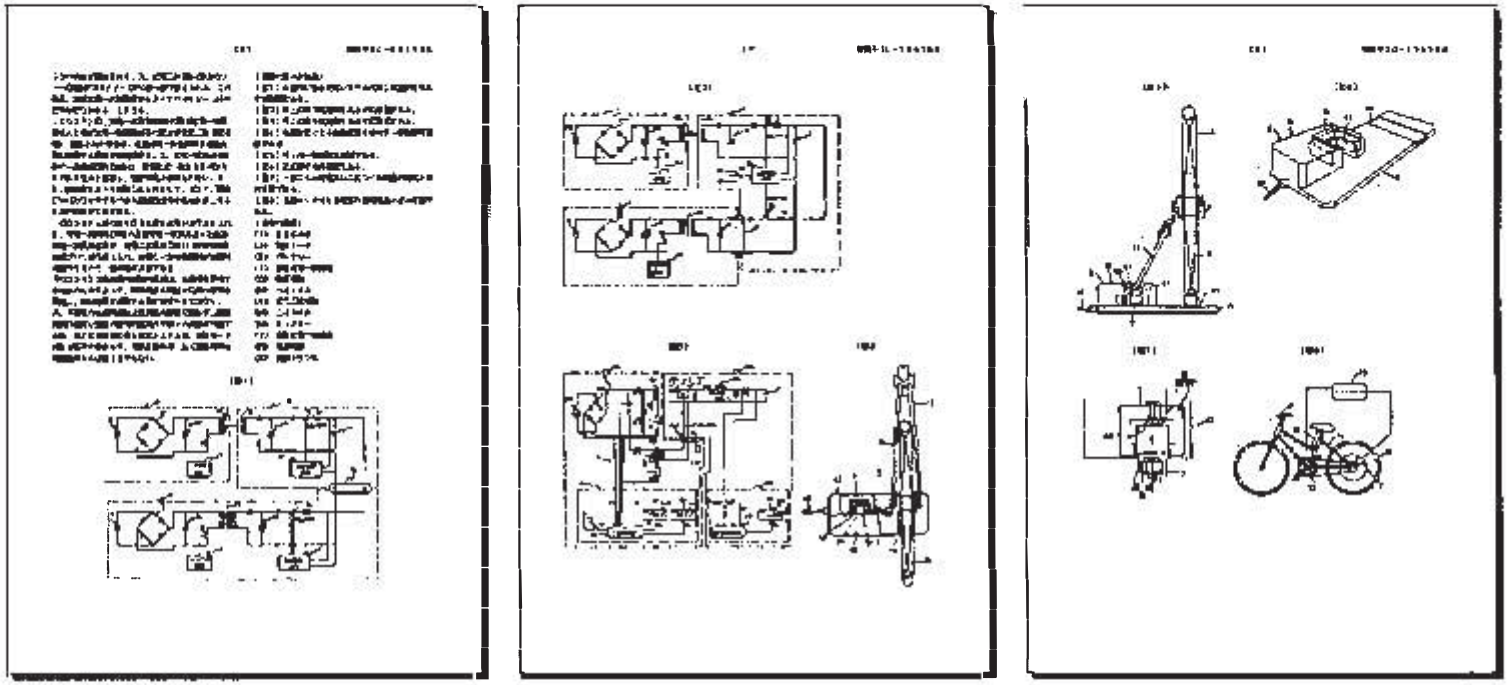
According to the charging system shown in FIG. 3 as described above, switching is based on the normal connection state of a rapid charging primary circuit section B and the charging primary circuit section A, a charging secondary circuit (200) for charging the primary circuit (100) It is, because they run automatically the circuit portion of one necessary. operability is good.

Description of the above embodiments, there is provided for the purpose of describing the present invention, limiting the invention set forth in the appended claims, or not to be construed so as to Genchijimi range. In addition, each part configuration of the present invention is not limited to the above embodiments, and various modifications may be made within the technical scope described In the claims. For example the charging system according to the present invention, not only a bicycle with an electric motor, an electric vehicle or the like, to be carried out widespread electric vehicle is a matter of course.

Notice

CLAIMS JPH10136588

A system for charging a battery serving as a power source of an electric motor mounted on an electric vehicle, a first charging the primary circuit equipped with an output portion of the magnetic energy, the second charge provided with a output of the charging current a primary circuit, is mounted in an electric vehicle, the first being magnetically coupled to the output of the charging primary circuit, the output of the first input unit, and the second charging the primary circuit which supplies a charging current to the battery electrically connected to have an electric vehicle charging system composed of a charging secondary circuit provided with a second input for supplying a charge current to the battery. The output of the first charging the primary circuit as well as constituted by the primary coil, the first input of the charging the secondary circuit is constituted by the secondary coil of the output section and the charging the secondary circuit of the second charging the primary circuit and the second input unit, the charging system of claim 1 can be connected to each other by the connector. The first input unit and the second input unit, the charging system according to claim 1 or claim 2 charging operation is controlled by a common charge control circuit for charging the secondary circuit. A first sensor means for detecting the state in which the first input of the output unit and the charging the secondary circuit of a first charging the primary circuit can be magnetically coupled to each other, the charge to the output of the second charging the primary circuit and comprising a second sensor means and a second input of the secondary circuit to detect a state of being electrically connected to each other, first charging the primary circuit is activated on the basis of a detection signal by the first sensor means The charging system according to any one of claims 1 to 3 second charging the primary circuit is activated on the basis of a detection signal by the second sensor means.



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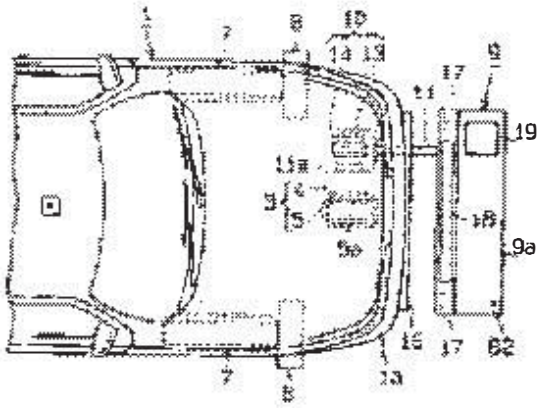
(57)【要約】
【課題】　所定の充電位置に車両を正しく停車できたか否かを車両に乗った運転者に知らせる。
【解決手段】　電気自動車１の前部底面に設けられた受電側カプラ３が、充電装置９の送電側カプラ１０の移動許容範囲内に位置するように、電気自動車１の充電停車エリアが設定されている。充電装置９の前面には電気自動車１が停車されたことを検知する２個の近接センサ１７が車幅方向に所定間隔を開けて、フロントバンパ１ａに設けられた被検知部材１６と対応する高さに設けられている。近接センサ１７の検知域は、電気自動車１が前後方向（同図左右方向）において充電可能範囲内まで進入するとオンするように設定されている。近接センサ１７が共にオンすると、ディスプレイ１８に「停止位置ＯＫ」が文字表示されて充電が開始される。近接センサ１７のうち一方しかオンしなかった場合、ディスプレイ１８に「停止位置ＮＧ」が文字表示される。



【特許請求の範囲】
【請求項１】　車両に設けられた受電部と、充電器に設けられた給電部とが充電可能な位置関係となるように前記車両が停車されたことを検知する検知手段と、
前記検知手段による検知結果に基づき前記車両が充電可能状態に停車されたと判断すると、当該車両に対する充電を開始する充電制御手段と、
前記車両が所定充電位置に正しく停車されたか否かの情報を、前記検知手段による検知結果に基づき当該車両の運転者に対して報知する報知手段とを備えている自動充電装置。
【請求項２】　前記検知手段は、前記車両の車幅方向のずれを検知する幅偏位検知手段を備えている請求項１に記載の自動充電装置。
【請求項３】　前記幅偏位検知手段は、前記車両の異なる二箇所を検知対象として前記車両が所定距離内に接近したことを検知する少なくとも２個の近接検知器を備えている請求項２に記載の自動充電装置。
【請求項４】　前記報知手段は、地上側に設けられている請求項１～請求項３のいずれか一項に記載の自動充電装置。
【請求項５】　前記報知手段は、前記車両室内に設けられている請求項１～請求項３のいずれか一項に記載の自動充電装置。
【請求項６】　前記報知手段は表示手段である請求項１～請求項５のいずれか一項に記載の自動充電装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、電気自動車が充電位置に正しく停車されたかを検知する検知手段を備えている自動充電装置に関するものである。
【０００２】
【従来の技術】この種の自動充電装置として、従来、例えば特開昭６３－８７１３６号公報、実開平１－７９３４３号公報等に開示されている。
【０００３】例えば実開平１－７９３４３号公報では、電気自動車は充電位置に至る経路に充電位置に案内する２本の溝が形成されており、タイヤを溝に落として溝に沿うように自動車を走行させれば車幅方向に位置決めされるようになっており、所定位置まで走行すると、車体下部に設けられた車載側コアコイルと地上側コアコイルとが接触する。そして、充電位置に達すると、路面側に設けられたセンサが車体下部の被検知部を検知し、充電が開始されるようになっている。
【０００４】
【発明が解決しようとする課題】ところが、特開昭６３－８７１３６号公報によれば、車止めにより車両の前後方向には位置決めされるものの、車幅方向はガレージ内中央に駐車するよう運転者の感覚に頼らざるをえなかった。また、タイヤを車止めに当てて駐車したつもりでも、車止めに当てたときの反動で車体が少し逆戻りした状態で駐車された場合には、充電に不適当な駐車位置となる場合があった。
【０００５】また、実開平１－７９３４３号公報に開示の充電装置によれば、タイヤが溝に落ちたことの確認は車体の衝撃等から判断するしかなくタイヤが溝に落ちずに停車される場合もある。また、溝が浅ければタイヤを溝の段差に乗り上げてしまっても気づかないこともある。また、車幅方向の位置決めを、地面に形成した溝内にタイヤを落として案内することにより行っているので、溝を設置するための工事費用がかかるという問題もある。
【０００６】このように運転者は充電するつもりで停車しても、実際には車両が所定充電位置に正しく停車されていなかったため、充電されないまま放置されるという問題があった。充電装置には充電状態を表示する表示機器を備えるものもあるが、もともと停止位置の良否を知らせるためのものでないため、車両の運転室内の運転者からは確認が不可能、もしくは困難である。たとえ表示機器の表示を見て充電が行われているか否を確認するにしてもいちいち降車してばならないし、充電が行われていなかったとしても、それが停車位置によるものかどうかの判断はできなかった。
【０００７】本発明は上記問題点を解決するためになされたものであって、その目的は、所定の充電位置に車両を正しく停車できたか否かを運転者に乗車したまま知らせることができる自動充電装置を提供することにある。
【０００８】
【課題を解決するための手段】上記問題点を解決するため請求項１に記載の発明では、車両に設けられた受電部と、充電器に設けられた給電部とが充電可能な位置関係となるように前記車両が停車されたことを検知する検知手段と、前記検知手段による検知結果に基づき充電可能状態であると判断すると、当該車両に対する充電を開始する充電制御手段と、前記車両が所定充電位置に正しく停車されたか否かの情報を、前記検知手段による検知結果に基づき当該車両の運転者に対して報知する報知手段とを備えている。
【０００９】請求項２に記載の発明では、請求項１に記載の自動充電装置において、前記検知手段は、前記車両の車幅方向のずれを検知する幅偏位検知手段を備えている。請求項３に記載の発明では、請求項２に記載の自動充電装置において、前記幅偏位検知手段は、前記車両の異なる二箇所を検知対象として前記車両が所定距離内に接近したことを検知する少なくとも２個の近接検知器を備えている。
【００１０】請求項４に記載の発明では、請求項１～請求項３のいずれか一項に記載の自動充電装置において、前記報知手段は、地上側に設けられている。請求項５に記載の発明では、請求項１～請求項３のいずれか一項に

記載の自動充電装置において、前記報知手段は、前記車両室内に設けられている。

【００１１】請求項６に記載の発明では、請求項１～請求項５のいずれか一項に記載の自動充電装置において、前記報知手段は表示手段である。従って、請求項１に記載の発明によれば、車両に設けられた受電部と、充電器に設けられた給電部とが充電可能な位置関係となるように車両が停車されたと検知手段により検知される。この検知結果に基づき車両が充電可能状態に正しく停車されたと充電制御手段により判断されると、車両に対する充電が開始される。このとき、検知手段の検知結果に基づき車両が所定充電位置に正しく停車されたか否かの情報が、報知手段によりこの車両の運転者に対して報知される。例えば車両の停車位置姿勢が充電にとって不適当であれば、その停車が不適当である旨の情報が報知手段により運転者に報知されるため、運転者は速やかに停車のやり直しをする。従って、充電されないまま車両が放置されることが回避される。

【００１２】請求項２に記載の発明によれば、車両の停車の際の車幅方向の位置ずれは、幅偏位検知手段により検知される，従って、車両が車幅方向にずれて停車され、その停車位置姿勢が充電にとって不適当であれば、その旨が報知手段により運転者に報知される。

【００１３】請求項３に記載の発明によれば、停車した車両の異なる二箇所を検知対象としてその車両が所定距離内に接近したことを検知する少なくとも２個の近接検知器の検知結果により、車両が車幅方向にずれなく停車されたか否かが検知される。車両の異なる二箇所を検知対象とする少なくとも２個の近接検知器を用いていることから、車両が充電不能な程に斜めに停車された場合も充電にとって不適当であるとして検知される。

【００１４】請求項４に記載の発明によれば、報知手段は地上側に設けられていることから、複数の車両に共通に使用される。請求項５に記載の発明によれば、報知手段は車両室内に設けられていることから、運転者に情報が確実に伝達される。例えば情報を表示した場合、停車時の車両の向きなどにも左右されず運転者の視界範囲に必ず表示され、例えば音声等で情報を報知しても車室内の運転者に確実に伝達される。

【００１５】請求項６に記載の発明によれば、情報は表示手段により表示されるため、例えば騒音などで情報を聞き逃すことなく確実に運転者に視認される。

【００１６】

【発明の実施の形態】以下、本発明を具体化した実施の形態を図１～図４に基づいて説明する。図１．図２及び図４に示すように、電気自動車１の前部底面には、バッテリ２（図４に図示）を充電するための受電側カプラ３が設けられている。この受電側カプラ３は受電側コア４と、その下面側に設けられた受電側電磁コイル５とから構成されている。受電側電磁コイル５の内側は略長円状の空間部５ａ（図１参照）を形成している。また、電気自動車１には車両側無線機Ｂ１が搭載されている。

【００１７】この電気自動車１を駐車するガレージ６には、電気自動車１の車輪（前輪）７を位置規制するための一対の輪止め８が設けられている。輪止め８の前方（図４における右方）には、地上側充電装置９が設置されている。

【００１８】地上側充電装置９には、受電側カプラ３との間で電力の電送を行う送電側カプラ１０が支持アーム１１の先端に支持された状態で配設されている。支持アーム１１は、図示しない移動機構を介してアクチュエータ１２（図５に示す）により車幅方向（Ｘ方向）（図１における上下方向）と、上下方向（Ｚ方向）に移動可能であるとともに、その基端を中心に９０°の範囲で回動可能となっている。支持アーム１１は、充電時以外は図４の突出状態から９０°回動した状態でケース９ａ内に収納されている。

【００１９】送電側カプラ１０は、送電側コア１３と、その上面に配設された送電側電磁コイル１４とから構成されている。この送電側電磁コイル１４は、受電側電磁コイル５の空間部５ａ内に僅かな隙間を隔てた非接触状態で収納可能な大きさを有しており、電気自動車１の充電は、支持アーム１１を突出させた充電位置にある送電側電磁コイル１４を、受電側電磁コイル５の空間部５ａ内に収納した状態で行われる。

【００２０】支持アーム１１が車幅方向（Ｘ方向）に移動可能であることから、電気自動車１の充電時の駐車エリアは多少（３００～４００ｍｍ）車幅方向へのずれを許容するように幅広く設定されており、駐車路面上に引かれた２本の車幅線１５から車輪７がはみ出ずに駐車させれば充電が可能となっている。また、輪止め８は、車輪７を輪止め８に当てて駐車したときに受電側カプラ３が、充電位置に移動配置された送電側カプラ１０の真上に対向配置されるように位置設定されており、充電時には車輪７を輪止め８に当てた状態で駐車する。

【００２１】電気自動車１のフロントバンパ１ａの前面には、車幅方向に所定長さを有する被検知部材１６が設けられており、地上側充電装置９にはこの被検知部材１６と対応する高さに２個の近接センサ１７が幅方向に所定間隔と隔てて設けられている。

【００２２】近接センサ１７は、受電側カプラ３と、突出状態とされたときの支持アーム１１の先端の送電側カプラ１０とが前後方向において一致する状態において、被検知部材１６を検知できるようにその検知域（検知距離）が設定されている。つまり、図３（ａ）に示すように車幅線１５内を真っ直ぐな姿勢で車庫入れされたときに、受電側カプラ３が前後方向において充電可能な位置に配置されれば、近接センサ１７がフロントバンパ１ａの前面に設けられた被検知部材１６を検知するようになっている。こうして電気自動車１が前後方向において充

電可能な位置に駐車されたか否かが近接センサ１７により検知される。よって、車幅線１５内を真っ直ぐ車庫入れされた電気自動車１が車輪７を輪止め８に当てた状態では、近接センサ１７がオンする。

【００２３】また、車輪７を車幅線１５からはみ出して電気自動車１が駐車された場合は、充電ができないため、たとえ真っ直ぐ車庫入れされても近接センサ１７がオンしないように、フロントバンパ１ａに固定された被検知部材１６は車幅方向に長さ調整されている，つまり、図３（ｃ）に示すように充電不可能な程に車幅方向にずれて駐車されたとき（車幅線１５からはみ出たとき）には、そのずれ方向反対側の近接センサ１７の検知域から被検知部材１６が外れるようになっている。

【００２４】こうして電気自動車１が車幅方向において充電可能な位置に駐車されたか否かが２個の近接センサ１７のうちいずれか一方がオンしないことから検知される。尚、送電側カプラ１０は、支持アーム１１の先端に僅かな角度範囲（数度）で水平面内を揺動する支持板１１ａ上に固定されており、車体姿勢が多少斜めになっても充電が可能であるため、本実施形態では、２～３°程度の姿勢の傾きがあっても充電が実施されるように、近接センサ１７の検知域が設定されている。

【００２５】地上側充電装置９には、駐車位置及び駐車姿勢の良否を電気自動車１の運転室内にいる運転者に文字表示で知らせるためのディスプレイ１８が装備されている。また、地上側充電装置９には、無線機Ｂ１と交信するための地上側無線機Ｂ２、及び充電の途中停止等の所定操作や所定条件設定をするための操作パネル１９が設けられている。尚、充電状況を表示するための図示しない表示機器（計器類を含む）が設けられている。

【００２６】予め登録された電気自動車１に対してのみガレージ６での充電が許されるように、電気自動車１にはＩＤ識別番号が与えられており、シフトレバーをパーキングレンジ（Ｐレンジ）に操作されると、ＩＤ識別信号が無線機Ｂ１から発信されるようになっている。地上側充電装置９は、登録されたＩＤ識別番号の信号を無線機Ｂ２により受信したときに限り、所定の充電作業を開始するようになっている。

【００２７】次に、この自動充電システムの電気的構成について説明する。図５に示すように、地上側充電装置９の各種駆動制御を司るコントローラ２０はメモリ２１を備えている。メモリ２１には予め充電許可登録された電気自動車１のＩＤ識別番号が記憶されており、コントローラ２０は無線機Ｂ２により受信したＩＤ識別番号がメモリ２１中のＩＤ識別番号と一致したときに限り、後述する所定の充電作業を開始するようになっている。また、メモリ２１には受電側カプラ３の真下に対向する位置に送電側カプラ１０を誘導するために後述する位置探索で求めた受電側カプラ３のＸ方向位置座標を記憶する記憶領域が備えられている。

【００２８】コントローラ２０には、アクチュエータ１２、２個の近接センサ１７，１７、地上側無線機Ｂ２、ディスプレイ１８及び操作パネル１９が接続されている。アクチュエータ１２は支持アーム１１を各方向（Ｘ方向、Ｚ方向及び回転方向）に駆動する３個のモータからなり、アクチュエータ１２にはＸ方向の駆動を司るモータにエンコーダ２２が接続されている。このエンコーダ２２の検出信号はコントローラ２０に出力されるようになっている。

【００２９】また、コントローラ２０には電源装置２３が接続されている。電源装置２３は、送電側磁気コイル１４に接続された電源回路２４と、電源回路２４から送電側磁気コイル１４に供給される電流値を検出する電流検出回路２５と、電流検出回路２５により検出した送電側磁気コイル１４を流れる電流値が予め設定された基準値I_0以上であるか否かを判定する判別回路２６とを備えている。

【００３０】電源回路２４は充電用交流電流Ｉ１を供給するための充電用電源回路２７と、受電側カプラ３の位置探索（位置検出）のための位置検出用交流電流Ｉ２（Ｉ１＞Ｉ２）を供給するための位置検出用電源回路２８とを備えている。コントローラ２０による電源回路２７，２８の選択により送電側磁気コイル１４に対しては、交流電流Ｉ１もしくは交流電流Ｉ２が選択供給されるようになっている。

【００３１】判別回路２６は、位置検出時にのみ駆動されるようになっており、電流検出回路２５が検出した電流値I_{RMS}が、基準値I_0以上である場合にＨレベルを、基準値I_0未満である場合にＬレベルを、それぞれ判定信号としてコントローラ２０に出力するようになっている。

【００３２】次に、この自動充電システムの作用を説明する。電気自動車１がガレージ６に駐車されていない状態では、支持アーム１１は収納された状態にある。電気自動車１を充電のためガレージ６に駐車するときには、２本の車幅線１５内に車輪７がはみ出ないように運転操作しながら前進し、車輪７を輪止め８に当てて停止する。このとき、電気自動車１のガレージ６への駐車の際には、電気自動車１が駐車エリア内に進入する前に予め近接センサ１７が作動される。この近接センサ１７の作動は、例えば電気自動車１の進入を検知した検知器（図示せず）から出力された、もしくは無線機Ｂ１から発信された駐車準備信号に基づいて行われる。

【００３３】例えば、図３（ａ）に示すように、電気自動車１が駐車エリア内に真っ直ぐ車庫入れされれば、２個の近接センサ１７がフロントバンパ１ａ前面の被検知部材１６を共に検知してオンする。このとき、多少車体が傾いていても充電可能な範囲内での傾きであれば、被検知部材１６は２個の近接センサ１７により検知され

【００３４】停車後、運転者がシフトレバーをパーキングレンジ（Ｐレンジ）に操作すると、無線機Ｂ１からＰレンジ信号と、電気自動車１を識別するためのＩＤ識別番号をのせたＩＤ識別信号と、バッテリ２の充電状態を知らせる充電情報信号とが発信される。

【００３５】Ｐレンジ信号を入力した時、２個の近接センサ１７から共にオン信号を入力した状態にあれば、コントローラ２０は電気自動車１が駐車エリア内に車体が充電のために許容された傾き範囲内の姿勢で駐車されたことを認知し、ディスプレイ１８に「停止位置ＯＫ」を文字表示する。そのため、運転者は充電可能状態に正しく駐車されたことを認識する。

【００３６】一方、図３（ｂ）に示すように、電気自動車１が２本の車幅線１５内であるものの、充電不能な斜め姿勢で駐車された場合、同図における左側の近接センサ１７の検知域から被検知部材１６が外れるために、左側の近接センサ１７がオンしない。

【００３７】また、図３（ｃ）に示すように、電気自動車１がほぼ真っ直ぐな姿勢で駐車されたものの、２本の車幅線１５からはみ出し駐車された場合、同図における左側の近接センサ１７の検知域から被検知部材１６が車幅方向に外れるので、左側の近接センサ１７がオンしない。

【００３８】その他、充電不能な位置状態で駐車されたときには近接センサ１７のうちいずれか一方がオンしないか、近接センサ１７が２個共オンしない。例えば、真っ直ぐな姿勢で２本の車幅線１５内に駐車したつもりでも、輪止め８に車輪７が当たった反動で少し車体がバックし、その位置で駐車された場合には、近接センサ１７が共にオフ状態となる。

【００３９】このように２個の近接センサ１７のうちいずれか一方でもオンしなかった場合、シフトレバーをＰレンジに操作したときにディスプレイ１８に「停止位置ＮＧ」が文字表示され、運転者はこの文字表示を見て停止位置が適切でなかったことを知り、駐車のやり直しをする。

【００４０】Ｐレンジ信号の入力時に２個の近接センサ１７が共にオン状態にあれば、コントローラ２０は、無線機Ｂ２を介してＰレンジ信号と共に受信したＩＤ識別信号から、駐車された電気自動車１が予め充電許可登録された指定車両であるか否かを判別する。そして、充電情報信号から充電の必要があると判断され、しかもその車両が指定車両であるときに限り、コントローラ２０は所定の充電作業を開始する。尚、駐車時に２個の近接センサ１７のうちいずれか一方でもオン信号の入力がない場合には、ディスプレイ１８に駐車やり直しの旨の表示がされるだけで、充電作業は開始されない。

【００４１】充電作業開始条件を満たせば、コントローラ２０による充電作業が開始され、まず送電側カプラ１０による受電側カプラ３の位置検索が行われる。まず収納状態にある支持アーム１１が回動されて突出状態とされ、次にコントローラ２０により電源回路２４中の位置検出用電源回路２８が選択されて送電側磁気コイル１４に位置検出用の交流電流Ｉ２が供給される。そして、支持アーム１１が突出時の位置からその反対側端部に向かってＸ方向（車幅方向）に移動し、送電側カプラ１０を流れる交流電流Ｉ２（＝I_{RMS}）による磁気誘導作用を利用した受電側カプラ３の位置探索が行われる。

【００４２】送電側磁気コイル１４がＸ方向へ移動する過程において、送電側磁気コイル１４を流れる電流値I_{RMS}は電流検出回路２５により検出される。送電側磁気コイル１４が受電側磁気コイル５に接近すると、電磁誘導作用により受電側磁気コイル５に誘導起電力が発生し、その起電力によって逆誘導された逆誘導起電力により送電側磁気コイル１４の電流値I_{RMS}が減少する。

【００４３】判別回路２６は電流値I_{RMS}が基準値I_0以上であればＨレベルを、基準値I_0未満であればＬレベルをコントローラ２０に出力する。コントローラ２０は、判別回路２６から入力した信号の立ち下がり時と立ち上がり時の支持アーム１１の各Ｘ位置座標ｘ１，ｘ２をエンコーダ２２からの検出信号に基づき演算し、各位置座標ｘ１，ｘ２の中点位置を受電側カプラ３の位置x_Aとして算出する。そして、支持アーム１１を位置x_Aまで復動させる。その結果、受電側磁気コイル５の空間部５ａの真下に送電側磁気コイル１４が対向配置される。

【００４４】次に、支持アーム１１を所定位置まで上昇させ、送電側磁気コイル１４を受電側磁気コイル５の空間部５ａ内に受電側磁気コイル５に対しては非接触に収納させた状態で、両カプラ３，１０を接続する。そして、コントローラ２０は充電用電源回路２７の選択に切り換え、送電側磁気コイル１４に充電電流Ｉ１が供給される。その結果、送電側磁気コイル１４を流れる交流電流Ｉ１による電磁誘導作用により受電側磁気コイル５に誘導起電力を発生させ、この誘導起電力によりバッテリ２の充電が行われる。

【００４５】このとき、電気自動車１側で充電電流を検出している検出器からの電流検出情報（充電情報）が地上側充電装置９に無線で送信されており、充電装置９側で充電が開始されているにも拘わらず充電電流が検出されなかった場合には、電源回路２７が切られるとともに、ディスプレイ１８に停車のやり直しの旨が文字表示される。そして、充電電流が検出されればそのまま充電が継続される。なお、受電側カプラ３とバッテリ２との間に接続された整流回路（図示せず）を介してバッテリ２には直流電流が供給され、バッテリ２への充電電流値が一定値となるように電源回路２７は電流値制御される。

【００４６】充電中、電気自動車１から無線で送信されている充電情報によりバッテリ２の充電状況はコントロ

ーラ２０に監視（モニタ）されており、バッテリ２が満充電となると、その時点で電源回路２７が切られて充電が停止される。そして、支持アーム１１が所定経路を通って元のケース９ａ内に収納されて、この電気自動車１に対する充電作業を終了する。

【００４７】以上詳述したように本実施の形態では、以下に列記する効果が得られる。

（ａ）電気自動車１の充電のため駐車の有無を検知する近接センサ１７の検知結果に基づいて、電気自動車１が所定の停車範囲内に正しく駐車されたか否かの情報を、ディスプレイ１８上の文字表示により運転者に知らせるようにしたので、例えば運転者が充電する意志をもって停車しているにも拘わらず、停車位置が不適当であるため、充電されないまま車両が放置されるという事態を回避することができる。

【００４８】（ｂ）２個の近接センサ１７を用い、各々の検知対象を電気自動車１の車体の異なる２箇所として車体の車幅方向のずれを検知するようにしたので、停車位置が充電駐車エリアから車幅方向に外れた不適当な駐車の場合も、ディスプレイ１８上の文字表示を見て運転者は速やかに車庫入れのやり直しをすることができる。従って、停車位置が車幅方向に外れた場合も、車両が充電されないまま放置されることを回避することができる。

【００４９】（ｃ）車体の車幅方向のずれを検知するのに、各々の検知対象を電気自動車１の車体の異なる２箇所とする２個の近接センサ１７を用いたので、斜め停車も車幅方向ずれと同様に停車異常として検知することができる。従って、斜め停車した場合も停車位置姿勢が不適当である旨のディスプレイ１８上の表示を見て運転者は速やかに車庫入れのやり直しをすることができる。従って、充電されないまま車両が放置されることを回避することができる。

【００５０】（ｄ）運転者に停車の位置姿勢の良否を報知するディスプレイ１８を充電装置９側に設けたので、このガレージ１１での充電許可登録が複数の車両に対してなされていても、複数の車両に共通に使用される１つのディスプレイ１８で済ませることができる。

【００５１】（ｅ）停車位置姿勢の良否に関する情報を運転者が視認できるように、その報知方法をディスプレイ１８による文字表示としたので、例えば音声等の音により情報を報知した場合のように騒音などで情報を聞き逃す心配もなく、その情報をより確実に運転者に伝達することができる。

【００５２】尚、本発明は上記実施の形態に限定されるものではなく、発明の趣旨を逸脱しない範囲で例えば次のように構成することもできる。

（１）図６に示すように、表示手段を電気自動車１の運転室内に設けてもよい。同図ではインストルメントパネル３１に表示灯３２を設け、表示灯３２の点灯により充電位置に正しく停車されたか否かの情報が運転者に伝達される。この構成によれば、報知手段は車両室内に設けられていることから、運転者に情報を確実に伝達することができる。例えば受電側カプラが車体後部に設けられており、充電時には車両をバックで車庫入れする構成の場合でも、駐車時の車体姿勢（向き）などに左右されず運転者の視界範囲内にいつも情報を表示させることができる。尚、充電状況等の充電に関する情報が他の表示灯３３の点灯に認知できるようになっている。

【００５３】また、図７に示すように運転室内にディスプレイ３４を設け、ディスプレイ３４上に文字表示させることにより運転者に停車位置姿勢の良否を報知する構成としてもよい。また、運転者が情報を区別できれば、例えば表示灯の点灯態様の変化により情報を報知してもよい（例えば表示灯の点灯色の差異、点灯態様（連続点灯・点滅等））。また、停車が不適当な場合にのみ警告灯を点灯させるようにしてもよい。

【００５４】（２）音響発生装置を設け、情報の報知を音声等の音により行ってもよい，例えば地上側充電装置９にスピーカを設け、スピーカから音声を発して停車位置姿勢の良否の情報を報知させてもよい。また、図６の表示灯３２や図７のディスプレイ３４に替えて電気自動車１の車室内にスピーカを設け、このスピーカから情報を運転者に音で報知する構成としてもよい。報知方法が音であっても運転者に情報は報知されるので、充電されないまま車両を放置する事態を回避することができる。特に、車室内のスピーカにより情報を報知する構成とした場合、車外の騒音（例えばエンジン音等）に遮られて情報が聞き取れない事態を回避することができ、より確実に情報報知を行うことができる。尚、音声に限らず、ブザーやチャイム等の報知音とする構成としてももちろんよい。この場合、情報内容の区別は、間欠音としたり、音種を変えたりすればよい。また、停車異常の場合にのみ音を発してもよい。勿論、ディスプレイや表示灯による視認させるための表示と、音による報知とを組み合わせ両者を併存させてもよい。

【００５５】（３）車幅方向のずれを検知する検知方法は前記実施の形態に限定されない。例えば図８に示すように、２個の近接センサ１７に替え、投光器と受光器からなる１つの検知器３５を設け、フロントバンパ１ａに設けた反射板３６からの反射光を検知して車幅方向のずれを検知する構成としてもよい。この構成では、反射板３６の幅方向長さは、車輪７が車幅線１５をはみ出たときには検知器３５に反射光が入射しないように車幅方向での駐車許容範囲に合わせて設定してある。この構成によれば、斜め停車されたときには反射板３５にて反射された反射光が検知器３５に入射しないので、１つの検知器３５により車幅ずれと斜め停車とを検知することができる。

【００５６】（４）停車位置姿勢の良否だけでなく、停

車位置姿勢が不適当な場合には、そのずれ方向までを報知するようにしてもよい。例えば、「前後ずれ」、「車幅ずれ」（さらに詳しく「右ずれ」と「左ずれ」）、「斜めずれ」（さらに詳しく「右斜め」、「左斜め」）などを報知してもよい。この場合、報知方法は表示と音のどちらを採用しても構わない。例えば、ディスプレイ１８にずれ方向を文字表示したり、運転者から見て左右に表示灯を配置し、左右の表示灯の点灯状態（例えばはみ出ていない側を青点灯、はみ出た側を赤点灯）によって左ずれ・右ずれを認識できるようにしてもよい。

【００５７】（５）近接センサを電気自動車１の停車エリアの車幅方向両側に配設するとともに、電気自動車１の車体側部に被検知部材を設け、電気自動車１の停車エリア内への進入（前後方向の位置ずれ）と車幅方向のずれとを、車体両側部を検知対象とする２個の近接センサにより検知させる構成としてもよい。この構成によっても、充電不能となる前後方向位置ずれ、車幅方向位置ずれ及び斜め停車を検知することができる。

【００５８】（６）近接センサ等の検知器を３個以上設けてもよい。検知器の個数を増やすことによりより細かな検出を行うことができる。

（７）前記実施の形態では車幅方向のずれまでを検知したが、単に前後方向のずれだけを検知する自動充電システムにおいて、検知器からの検知信号に基づき停車位置姿勢の良否に関する情報を運転者に報知するためのディスプレイや表示灯、さらにはスピーカ等の報知手段を設けてもよい。例えば、特開平６３－８７１３６号公報や実開平１－７９３４３号公報等に開示された自動充電システムに報知手段を設け、自動充電開始のために車両の進入を検知するために設けられていた検知器からの検知信号を利用し、その車両に乗った運転者に停車位置の前後方向における良否を報知できるようにしてもよい。この場合、図６や図７の構成を採用してもよい。

【００５９】（８）車両のずれを検知するための検知器は光学的あるいは磁気的な近接センサに限定されない。例えば超音波センサ等を用いてもよい。

（９）車両側に検知器を設け、充電器側に非検知部材を設けた構成としてもよい。例えばバンパなどに検知器を埋設すればよい。

【００６０】（１０）被検知部材をフロントバンパ１ａに埋め込んだり、バンパの塗装を被検知物質を混ぜた塗料で行うなどして被検知部材をバンパと一体としてもよい。この構成によれば、車体の見栄えをよくすることができる。

【００６１】（１１）本発明の適用はガレージ６に備えられた自動充電システムに限定されない。例えば商業ベースの充電スタンドに設けられていてもよい。

（１２）電磁誘導を利用した充電方式ではなく、車両側と充電器側との双方の電極を接触させることによる接触式の充電方式の自動充電システムに本発明を採用してもよい。

【００６２】前記実施の形態から把握され、特許請求の範囲に記載されていない発明を、その効果とともに以下に記載する。

（イ）請求項１～請求項６のいずれか一項において、前記充電器には、前記車両側の受電部を位置検出可能な位置検出手段と、前記位置検出手段により位置検出された前記受電部に前記給電部を充電可能に相対させるように、前記給電部が車幅方向に移動可能に設けられている。この構成によれば、車両が車幅方向に給電部の移動範囲外にずれた場合には、報知手段にその車幅方向に停車が不適当である旨が車両中の運転者に報知することができる。

【００６３】

【発明の効果】以上詳述したように請求項１に記載の発明によれば、充電を開始させるために車両が停車されたかを検知する検知手段の検知結果に基づき車両が所定充電位置に正しく停車されたか否かの情報を、運転者に報知する報知手段を設けたので、例えば運転者が充電する意志をもって停車しているにも拘わらず、停車位置が不適当であるため、充電されないまま車両が放置されるという事態を回避することができる。

【００６４】請求項２に記載の発明によれば、車両の停車位置の車幅方向のずれを検知する幅偏位検知手段を備えたので、車両が車幅方向にずれた不適当な停車の場合も、停車が不適当である旨を運転者に報知することができる。

【００６５】請求項３に記載の発明によれば、少なくとも２個の近接検知器を用いて車両が予め設定された所定基準位置に対して所定距離内に近接したことを、車両の異なる二箇所を検知対象として検知することにより、車両の車幅方向のずれを検知させたので、車幅方向のずれだけでなく不適当な斜め停車をも検知することができる。

【００６６】請求項４に記載の発明によれば、報知手段は地上側に設けられていることから、複数の車両に共通に使用することができる。請求項５に記載の発明によれば、報知手段は車両室内に設けられていることから、運転者に情報を確実に伝達することができる。例えば報知を表示とした場合、停車時の車両の向きなどに左右されず運転者の視界範囲に必ず情報を表示でき、報知を音声等の音としても車室内の運転者に確実に情報を伝達できる。

【００６７】請求項６に記載の発明によれば、表示手段により情報を表示するようにしたので、例えば騒音などで情報を聞き逃す心配もなく、視認により情報を確実に運転者に伝達できる。

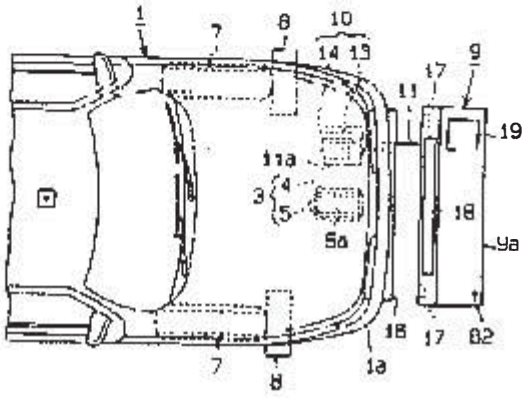
【図面の簡単な説明】

【図１】自動充電システムの平面図。

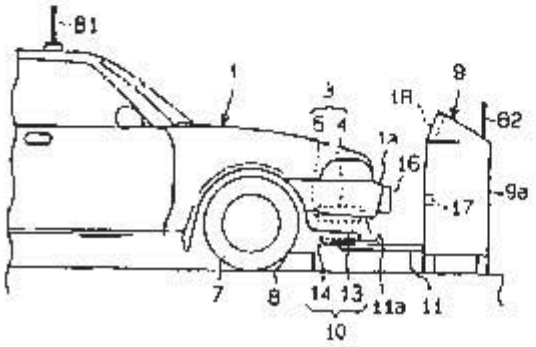
【図２】自動充電システムの側面図。

【図３】電気自動車の停車位置状態を示す模式平面図。
【図４】自動充電システムの斜視図。
【図５】自動充電システムの電気ブロック図。
【図６】別例のディスプレイの正面図。
【図７】図６と異なる別例の正面図。
【図８】別例の自動充電システムの平面図。
【符号の説明】
１…車両としての電気自動車、３…受電部としての受電側カプラ、９…充電器としての充電装置．１０…給電部としての送電側カプラ、１６…検知手段を構成する被検知部材、１７…検知手段を構成するとともに幅偏位検知手段及び近接検知器としての近接センサ、１８…報知手段及び表示手段を構成するディスプレイ、２０…充電制御手段及び報知手段を構成するコントローラ、２３…充電制御手段を構成する電源装置、３２…報知手段及び表示手段を構成する表示灯、３４…報知手段及び表示手段を構成するディスプレイ、３５…検知手段を構成する検知器、３６…検知手段を構成する反射板。

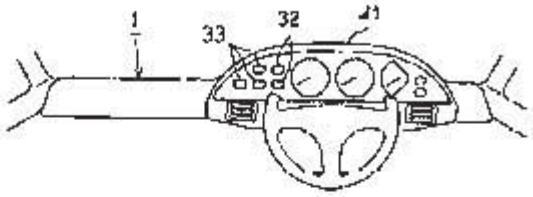
【図１】



【図２】

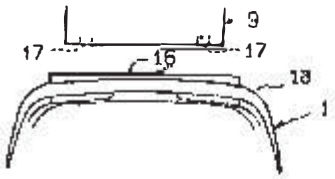


【図３】



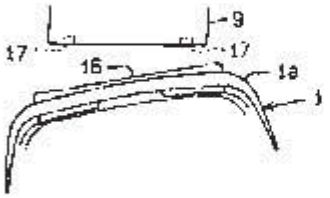
【図６】

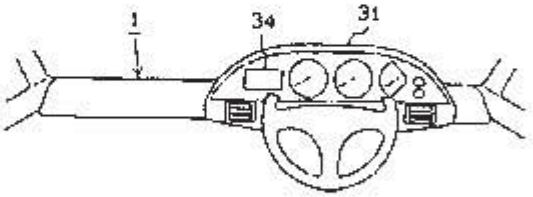
(a)



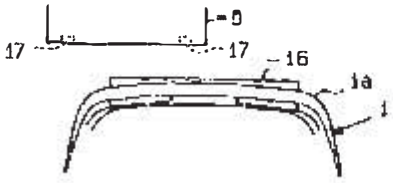
【図７】

(b)

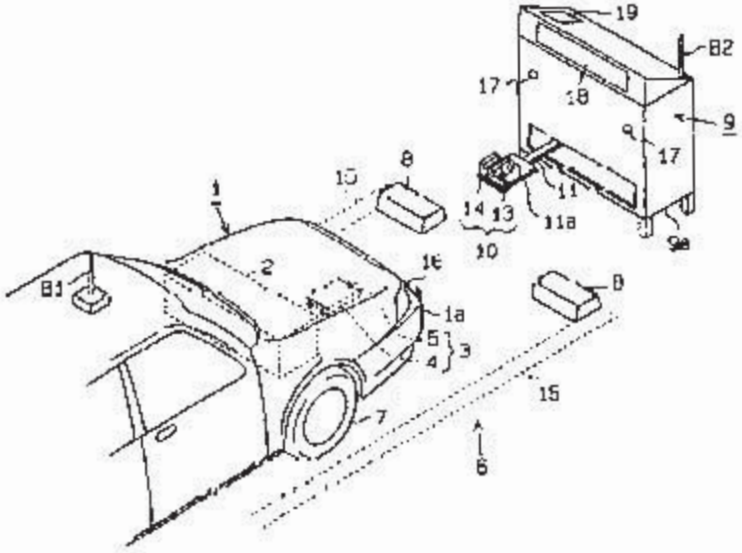




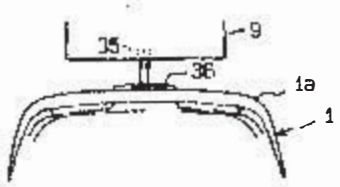
(c)



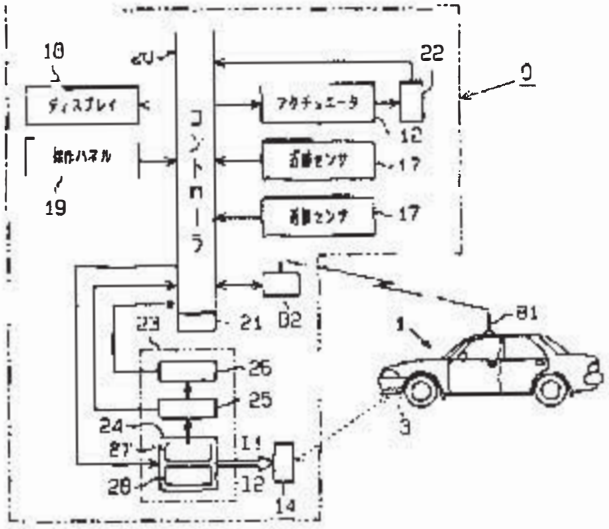
【図4】



【図8】



【図5】



Espacenet

Bibliographic data: JPH09182212 (A) — 1997-07-11

AUTOMATIC CHARGING DEVICE

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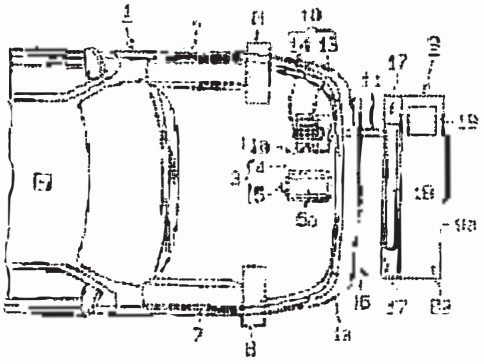
Classification: - international: ***B60L11/18; H01M10/46; H02J17/00; H02J7/00;*** (IPC1-7): B60L11/18; H01M10/46; H02J7/00
- cooperative: Y02T10/7005; Y02T90/122

Application number: JP19950337376 19951225

Priority number (s): JP19950337376 19951225

Abstract of JPH09182212 (A)

PROBLEM TO BE SOLVED: To let a driver in a vehicle know whether or not he has pulled up the vehicle at a prescribed charging position. SOLUTION: A changing stop area for an electric vehicle 1 is set up in such a manner that a receiving side couple 3 provided on the bottom of the front part of the electric vehicle 1 is located within the permissible traveling range of the feeding side coupler 10 of a charging device 9. Two proximity sensors 17 for detecting the stop of the electric vehicle 1 are provided on the front part of the charging device 9 at a given interval in the car width direction and at the height corresponding to a member 16 provided for detection on a front bumper 1a. The proximity sensors 17 is adapted to be turned on when the electric vehicle 1 proceeds up to a changeable range in front-rear direction (horizontal direction in the figure). When both proximity sensors 17 are turned on, a display unit 18 displays a message 'STOP POSITION OK' before stating to change. If only either of the proximity sensors 17 is turned on, the display unit 18 display a message 'STOP POSITION NG'.



Notice

DESCRIPTION JPH09182212

[0001]

The present invention relates, the present invention relates to automatic charging device electric vehicle is equipped with a detection means for detecting whether or not that has been properly parked in the charging position.

[0002]

2. Description of the Related Art As automatic charging device of this type, conventional, for example, Japanese Patent Publication No. 63-87136, is disclosed in real Unexamined Patent Publication No. 1-79343 Publication, and the like.

[0003]

For example, the actual A-1-79343 Patent Publication, electric cars are formed two grooves for guiding the charged position to the path leading to the charging position, and caused to travel the automobile along the groove by dropping the tire in the groove and is adapted to be positioned in place vehicle width direction and travels to a predetermined position, the contact between the vehicle-side core coil and the ground-side core coil provided on the lower body. Then, when it reaches the charging position, the sensor provided on the road side detects the detected portion of the lower body, so that the charging begins.

[0004]

[0006] However, according to the JP-A-63-87136, but is positioned in the longitudinal direction of the vehicle by the bollard, the vehicle width direction the driver like to park in the central garage We had to rely on the senses. Also intended to be parked by applying the tire to the bollard, when the vehicle body as a reaction when it is addressed to bollard was parked in a state of reversion little, there is a case where it is unsuitable parking position for charging.

[0005]

Moreover, according to JP-real-Open No. 1-79343 to the charging device disclosed, confirmation that the tire falls in the groove in some cases the tire without choice but to judge from the body of the impact or the like is stopped without falling into the groove . Also, you may not notice even gone ride if grooves shallower tires the step groove. Furthermore, the positioning of the vehicle width direction, since performed by guided down the tire in a groove formed in the ground, there is also a problem that it takes construction costs for installing a trench.

[0006]

If you stop with the intention that this driver to be charged, in fact because the vehicle has not been correctly stopped at a predetermined charging position, there is a problem that is left without being charged. Although the charging device and some including a display device for displaying the charge state, it is not intended to originally notify the quality of the stop position, not confirmed to the driver's cab of the vehicle, or it is difficult. The do not have to be each time getting off even though to watch the display of the display device to verify whether or not the charging is being performed, even the charging has not been done, or to determine if it is due to a stop position could not.

[0007]

The present invention has been made to solve the above problems, the object is an automatic charging device can be informed while riding to whether or not stop the vehicle correctly to the driver at a predetermined charging position The present invention is to provide.

[0008]

Means for Solving the Problems] In the invention according to claim 1 for solving the above problems, a receiving portion provided on the vehicle, and a feeding part provided in the charger and possible positional relationship Charge a detection means for the vehicle to be detects that it has been stopped, it is determined to be a charged state based on the detection result by the detection unit, a charging control means for starting the charging of the vehicle, the vehicle is given whether the information is correctly parked in the charge position, and I and a notifying means for notifying the driver of the vehicle based on the detection result by the dctcction means.

[0009]

In the invention described in claim 2, the automatic charging device of claim 1, wherein the detection means comprises a wide deviation detecting means for detecting a vehicle width direction of displacement of the vehicle. In the invention described in claim 3, the automatic charging device of claim 2, wherein the width of deviation detecting means detects that the vehicle different two points of the vehicle as a detection object has approached within a predetermined distance It has been provided with at least two of the proximity detector to.

[0010]

In the invention described in claim 4, the automatic charging device according to any one of claims 1 to 3, wherein the notification means it is provided on the ground side. In the invention described in claim 5, in the automatic charging device according to any one of claims 1 to 3, wherein the notification means is provided in the vehicle compartment

[0011]

In the invention described in claim 6, in the automatic charging device according to any one of claims 1 to 5, wherein the notifying means is a display means. Thus, according to the invention described in claim 1, and a receiving portion provided on the vehicle, and the detecting means and a feeding part provided in the charger has been stopped the vehicle so as to be capable of positional relationship charging is detected differentially. In the vehicle on the basis of the detection result is determined by the charging control means to have been successfully parked in the charging state, charging of the vehicle is started. In this case, the information about whether or not the vehicle based on the detection result has been correctly stopped at a predetermined charging position of the detection means, is notified to the driver of the vehicle by the notification means, For example, if the improper stop position and orientation of the vehicle for charging, since the information indicating that a stop is inappropriate is notified to the driver by reporting means, the driver is a redo of the stop promptly. Thus it is avoided that the vehicle is without being charged is left.

[0012]

According to the invention described in claim 2, positional deviation in the vehicle width direction when the stop of the vehicle is detected by the width deviation detection means. Thus, the vehicle is parked shifted in the vehicle width direction, if unsuitable for its stop position and orientation is charged, the fact is notified to the driver by reporting means.

[0013]

According to the invention described in claim 3, the at least two proximity detectors of the detection result that vehicles of different two points of stopping the vehicle as a detection object is detected that has approached within a predetermined distance, the vehicle is a car whether been parked without displacement in the width direction it is detected. Since it is used at least two proximity detectors to detect targets two different locations of the vehicle and is detected as being unsuitable for charging even when the vehicle is parked diagonally to the extent of non-charging.

[0014]

According to the invention described in claim 4, the notification means because it is provided on the ground side, and is used in common for a plurality of vehicles. According to the invention described in claim 5, the notification means because it is provided in the vehicle compartment, the information to the driver is reliably transmitted. For example, if you view the information, be sure to like the sight range of the left and right are not driver also the orientation of the vehicle display when the vehicle is stopped, it is reliably transmitted to the passenger compartment of the driver even if the notification of information, for example, voice, etc. .

[0015]

According to the invention of claim 6, the information for which is displayed by the display means, it is reliably visually recognized by the driver without fail to hear the information, for example the noise like.

[0016]

DESCRIPTION OF THE PREFERRED EMBODIMENTS Hereinafter, a description will be given of embodiments of the present invention is embodied on the basis of FIGS. Figure 1, as shown in FIGS. 2 and 4, the front bottom of the electric vehicle 1, the power receiving side coupler 3 for charging the battery 2 (shown in Figure 4) are provided. The power-receiving-side coupler 3 and the power receiving side core 4, and a power receiving side electromagnetic coil 5 which is provided on its lower surface side. Inside the power receiving electromagnetic coil 5 form a substantially oval-shaped space portion 5a (see Fig. 1). The vehicle side wireless device B1 is mounted on the electric vehicle 1.

[0017]

The garage 6 to park the electric car 1, a pair of wheels stop 8 for position regulating the wheel (front wheel) 7 of the electric vehicle 1 is provided. In front of the chock 8 (right side in FIG. 4), the ground-side charging device 9 is installed.

[0018]

The ground-side charging device 9, and is disposed in a state in which the power transmission side coupler 10 for power transmission between the power-receiving-side coupler 3 is supported on the distal end of the support arm 11. The support arm 11 includes an actuator 12 via a moving mechanism (not shown) (FIG. 5) in the vehicle width direction (X direction) by the (vertical direction in FIG. 1), together are movable in the vertical direction (Z direction), and it has a rotatable range of 90 ° about its proximal end. The support arm 11 is accommodated in the casing 9a in a state of 90 ° rotated from the projected state of Fig. 4 except during charging.

[0019]

Power transmission side coupler 10, the power-transmitting-side core 13, and a provided by a transmission-side electromagnetic coil 14. on the upper surface. The power-transmitting-side electromagnetic coil 14 has a space capable of housing size in a non-contact state across the slight gap in 5a the power-reception-side electromagnetic coil 5, the charging of the electric vehicle 1, a support arm 11 The power transmission side electromagnetic coil 14 in was projected charged position, it takes place in a state of being accommodated in the space portion 5a of the receiving-side electromagnetic coil 5.

[0020]

Since the support arm 11 is movable in the vehicle width direction (X direction), the parking area at the time of charging of the electric vehicle 1 or less (300--400mm) is widely set so as to permit a displacement in the vehicle width direction weaving, if brought into parked without protruding wheel 7 from two vehicle width lines 15 drawn on the parking track and is capable to charge. Also, chock 8 are power-receiving-side coupler 3 when it is parked and against the wheels 7 to chock 8 are positioned set so as to be opposed directly above the power transmission side coupler 10 which is moved disposed at the charging position if we, park in a state in which rely on the wheels 7 to chock 8 at the time of charging.

[0021]

On the front surface of the front bumper 1a of the electric vehicle 1, the detected member 16 with a predetermined length in the vehicle width direction are provided, two at a height corresponding with the object detection member 16 on the ground side charging device 9 number of proximity sensors 17 are provided to be spaced a predetermined distance in the width direction.

[0022]

The proximity sensor 17 includes a power receiving coupler 3, In a state where the power transmission side coupler 10 of the front end of the support arm 11 when it is a projected state coincide in the longitudinal direction, the detection zone so as to detect an object detecting member 16 (detection range) is set. That is, when the garage a vehicle width line 15 in straight position as shown in FIG. 3 (a), if the power receiving coupler 3 is arranged in the rechargeable position in the longitudinal direction, a proximity sensor 17 It is adapted to sense the object detection member 16 provided on the front surface of the front bumper 1a. Thus, whether or not the electric vehicle 1 is parked in the rechargeable position in the longitudinal direction it is detected by the proximity sensor 17. Therefore, in a state where the electric vehicle 1 that is straight garage a vehicle width line 15 is applied with the wheel 7 to the chock 8, the proximity sensor 17 is turned on.

[0023]

Further, when the electric vehicle 1 to protrude a wheel 7 from the vehicle width line 15 is parked, because they can not be charged, even though the straight garage as the proximity sensor 17 is not turned on, and secured to the front bumper 1a the detected member 16 is adjusted in length in the vehicle width direction. This means that enough charge impossible, as shown in FIG. 3 (c) and when it is parked so as to be shifted in the vehicle width direction (when it is protruding from the vehicle width line 15), and the shift direction opposite the proximity sensor 17 are adapted to the detected member 16 is disengaged from the detection zone.

[0024]

Thus the electric vehicle 1 is detected from the fact that either one of whether the two proximity sensors 17 is parked in the rechargeable position in the vehicle width direction is not turned on. Incidentally, the power transmission side coupler 10 is fixed on the supporting plate 11a to tilt the horizontal plane at a small angle range (a few degrees) to the distal end of the support arm 11, can be charged even if the body posture somewhat obliquely Since it is, in this embodiment, as the charge even if the inclination of 2~3 ° about the orientation is carried out, the detection range of the proximity sensor 17 is set.

[0025]

The ground side of the charging device 9, the display 18 to inform the character displayed on the driver who is the quality of the parking position and the parking position to the operating room of the electric vehicle 1 is equipped. In addition, the ground-side charging device 9, the ground-side radio B2 for communicating with the wireless device B1, and an operation panel 19 for a predetermined operation or a predetermined condition set in the middle stopping such charging are provided. Incidentally, (Including instruments) display device, not shown, for displaying the charge status is provided.

[0026]

As the charge in the garage 6 it is allowed only for an electric vehicle 1 which is previously registered, the electric vehicle 1 is given an ID identification number, when it is operated shift lever to the parking range (P range) , ID identification signal is to be transmitted from the wireless device B1. Ground-side charging device 9, and only a signal of the registered ID identification number when it receives a radio B2, it is adapted to initiate a predetermined charging operation.

[0027]

Then, it will be explained electrical configuration of the automatic charging system. As shown in Figure 5, a controller 20 which controls the various drive control of the ground side charging device 9 is provided with a memory 21. The memory 21 is precharged authorized registered ID identification number of the electric vehicle 1 is stored, the controller 20 only when the ID identification number received by the radio B2 matches the ID identification number in the memory 21, It is adapted to initiate a predetermined charging operation to be described later. Further, the memory 21 is provided a storage area for storing the X-direction position coordinate of the power receiving side coupler 3 obtained by the position search described below to induce the power transmission side coupler 10 in a position facing directly below the receiving side coupler 3 ing.

[0028]

The controller 20, an actuator 12, 2 pieces of the proximity sensors 17, 17, the ground-side radio B2, a display 18 and an operation panel 19 are connected. The actuator 12 is a support arm 11 in each direction (X-direction, Z-direction and rotational direction) is made of three motor for driving the encoder 22 to the motor that controls the drive of the X-direction to the actuator 12 is connected. Detection signals of the encoder 22 are outputted to the controller 20.

[0029]

The power supply unit 23 is connected to the controller 20. Power supply 23 includes a power supply circuit 24 connected to the power transmission side magnetic coil 14, a current detecting circuit 25 for detecting a current value supplied from the power supply circuit 24 on the power transmission side magnetic coils 14, detected by the current detection circuit 25 current flowing through the power transmission side magnetic coil 14 i and a determining discriminating circuit 26 whether or not the preset reference value IO or more.

[0030]

The power supply circuit 24 and the charging power supply circuit 27 for supplying a charging alternating currents I1, position detection alternating currents I2 for position location of the power receiving side coupler 3 (position detection) (I1> I2) for supplying It has a position and the detection power supply circuit 28. For the power transmission side magnetic coil 14 by the

selection of the power supply circuit 27 and 28 by the controller 20, AC current I1 or alternating current I2 is adapted to be selected supply.

[0031]

Discrimination circuit 26 is adapted to be driven only when the position detection, the current value IRMS of the current detection circuit 25 detects that the H level when the reference value is IO above, when it is less than the reference value IO the L level, it adapted to output to the controller 20 as each decision signal.

[0032]

Then, we will explain the operation of the automatic charging system. In a state where the electric vehicle 1 is not parked in the garage 6, the support arm 11 is in a state of being accommodated. When you park the electric vehicle 1 in the garage 6 for charging is advanced while driving operation so the wheels 7 is not protrude to the two vehicle width lines 15 and stop against the wheel 7 on the chock 8. In this case, when the parking in the garage six electric vehicle 1, the electric vehicle 1 in advance proximity sensor 17 is activated before entering the parking area. The operation of the proximity sensor 17, for example, detects the entry of the electric vehicle 1 detector output (not shown), or is performed based on the car ready signal transmitted from the wireless device B1.

[0033]

For example, as shown in FIG. 3 (a), the electric vehicle 1 if straight garage is in the parking area, two proximity sensors 17 is turned on by detecting both the detected member 16 of the front bumper 1a Front . In this case, if some slope in the even rechargeable ranges are inclined vehicle body, the detected member 16 is detected by the two proximity sensors 17.

[0034]

After stopping, the driver by operating the shift lever to the parking range (P-range), from the wireless device B1 and the P range signal, and the ID identification signal carrying an ID identification number for identifying the electric vehicle 1, battery 2 a charge information signal indicating the state of charge is transmitted

[0035]

When you enter the P range signal, if from two of the proximity sensor 17 to the state in which it is both enter the on-signal, the controller 20 electric vehicle 1 is within the tilt range to the vehicle body in the parking area it has been allowed for the charge and it recognizes that it has been parked in position, and character display "Stop Position OK" on the display 18. Therefore, the driver can recognize that it is correctly parked in the charging state.

[0036]

On the other hand, as shown in FIG. 3 (b), although the electric vehicle 1 is within 15 two vehicle width lines, when it is parked in the charging non-oblique posture detection range of the proximity sensor 17 on the left side in the figure In order to be detected member 16 is disengaged from, the left side of the proximity sensor 17 is not turned on.

[0037]

In addition, as shown in FIG. 3 (c), although the electric vehicle 1 is parked in a substantially straight orientation, when it is parked and extends from the two vehicle width lines 15, the proximity sensor 17 on the left side in the figure Since the detection area the detected member 16 is disengaged in the vehicle width direction, the left side of the proximity sensor 17 is not turned on.

[0038]

Others, have either one of the proximity sensors 17 do not turn on, the proximity sensor 17 is not turned on two both when it is parked in the charging non-position state. For example, also going to be parked on the two vehicle width lines 15 in a straight posture, when the little back body in reaction to the wheels 7 hits the chock 8, which is parked in this position, the proximity sensor 17 but it is turned off together.

[0039]

When such is not turned on even either one of the two proximity sensors 17, the shift lever to the display 18 when it is operated to the P range "stop position NG" is displayed characters, the driver the character display to know that the stop position was not appropriate to look at, and the redo of parking.

[0040]

If the two are both turned on the proximity sensor 17 when entering the P range signal, the controller 20, from the ID identification signal received with the P range signal via the radio B2, previously charging the electric vehicle 1 is parked To determine whether the authorized registered specified vehicle. Then, it is determined that there is a need for charging from the charging information signal, moreover, only when the vehicle is specified vehicle, the controller 20 starts a predetermined charging operation. Incidentally, when there is no input of either one even-on signal of the two proximity sensors 17 at the time of parking, only be the display of the parking again in effect to the display 18, the charging work is not started.

[0041]

If it meets the charging operation start conditions, charging operation by the controller 20 is started, position search of the power receiving side coupler 3 by the power transmission side coupler 10 is performed. First support arm 11 in the accommodated state is a projected state is rotated, then the controller 20 by the AC current for position detection is selected for position detection power source circuit 28 in the power supply circuit 24 to the power transmission side magnetic coil 14 I2 is supplied. The supporting arm 11 is moved in the X direction (vehicle width direction) towards its opposite end from the position at the time of projecting, using a magnetic induction action of the power transmission side coupler 10 to flow an AC current I2 (= IRMS) position search of the power receiving side coupler 3 is performed.

[0042]

In the course of power transmission side magnetic coil 14 is moved in the X direction, the current value IRMS through the power transmission side magnetic coil 14 is detected by the current detection circuit 25. When the power-transmitting-side magnetic coil 14 approaches the receiving side magnetic coil 5, an induced electromotive force is generated in the power receiving side magnetic coil 5 by the electromagnetic induction, and power transmission side magnetic coil 14 by a reverse induced electromotive force is reversed induced by the electromotive force of the current value IRMS is reduced.

[0043]

Discriminating circuit 26 current IRMS is the H level if the reference value IO above, if it is less than the reference value IO outputs an L-level to the controller 20. The controller 20, each of X coordinates x1, x2 falling time of the rising edge of the support arm 11 of the signal input from the discrimination circuit 26 is calculated based on the detection signal from the encoder 22, in each position coordinates X1, X2 It calculates the point position as the position xA of the power-receiving-side coupler 3. And it moved backward the support arm 11 to the position xA. As a result, the power transmission side magnetic coil 14 is opposed to below the space 5a of the power receiving side magnetic coil 5.

[0044]

Then, raise the support arm 11 to a predetermined position, with respect to the power transmission side magnetic coil 14 power receiving magnetic coil 5 in the space portion 5a of the power receiving side magnetic coil 5 which was contained in a non-contact, two couplers It connects the 3,10. Then, the controller 20 switches the selection of the charging power supply circuit 27, the charging current I1 is supplied to the power transmission side magnetic coil 14. As a result, the power transmission side by the electromagnetic induction by the AC current I1 flowing through the magnetic coil 14 to generate an induced electromotive force in the power-receiving-side magnetic coil 5, the charging of the battery 2 is performed by the induced electromotive force.

[0045]

At this time, current detection information (charge information) from the detector that detects the charging current in the electric vehicle 1 side are transmitted by radio to the ground side charging device 9, is start charging by the charging device 9 side In the case where the charging current despite there are not detected, along with the power supply circuit 27 is turned off, the effect of the redo of the stop on the display 18 displays characters. Then, continues charging as it is when it is detected that the charging current. Incidentally, a direct current is supplied to the battery 2 via the connected rectifier circuit (not shown) between the power-receiving-side coupler 3 and the battery 2, so that the charging current to the battery 2 becomes a constant value The power supply circuit 27 is a control current value.

[0046]

During charging, the charge condition of the battery 2 by the charge information is transmitted wirelessly from the electric vehicle 1 is monitored in the controller 20 (monitor), the battery 2 is fully charged, the power supply circuit 27 is turned off at that time charging is stopped Te. The supporting arm 11 is housed in the original case 9a through a predetermined path, we want to end the charging operation for the electric vehicle 1.

[0047]

In the present embodiment, as described above in detail, the effect can be obtained are listed below. (A) on the basis of a detection result of the proximity sensor 17 for detecting the presence or absence of a parked for charging the electric vehicle 1, the electric vehicle 1 is whether the information is correctly parked in a predetermined stop range, on the display 18 since as a character display informs the driver, for example, despite the driver is stopped with the intention to charge, because stop position is inappropriate, to avoid a situation where the vehicle without being charged is left can do.

[0048]

(B) 2 pieces of using a proximity sensor 17, since so as to detect a deviation in the vehicle width direction of the car body to each of the detection target as two positions with different vehicle body of the electric vehicle 1, a stop position the car from the charging parking area In the case of inadequate parking deviated in the width direction, the driver is looking at the character display on the display 18 can be a redo promptly garage. Therefore, even if the stop position is deviated in the vehicle width direction, it is possible to prevent the vehicle is left without being charged.

[0049]

And to detect the vehicle width direction of the deviation of (c) the car body, because using two proximity sensors 17, two positions of different body of the electric vehicle 1 to each of the detection target, oblique stop even in the vehicle width direction deviation it can be detected as well as stop abnormality. Therefore, the driver is looking at the display on the display 18 indicating a stop position and orientation is inappropriate even if it is oblique stop can be redone promptly garage. Therefore, it is possible to avoid that the vehicle is left without being charged.

[0050]

(D) Since a display 18 for informing the quality of the position and orientation of the stop to the driver provided in the charging device 9 side, also be made for a plurality of vehicles are charged permit registration in the garage 11, a plurality of vehicles it is possible to dispense with one of the display 18 to be used in common for.

[0051]

(E) as the information about the quality of the stop position and orientation can be visually recognized by the driver, information such as noise, as in the case since the the broadcast method and character display by the display 18, which was broadcast the information, for example, by the sound of the voice, etc. without the Listen miss concerned, it is possible to transmit the information more reliably the driver.

[0052]

The present invention is not limited to the above embodiments may also be configured such purpose in the range, for example, the following without departing from the invention. (1) As shown in Figure 6 may be provided with display means in the cab of the electric vehicle 1. The indicator lamp 32 on the instrument panel 31 in the drawing is provided, whether the information is correctly parked in the charging position is communicated to the driver by the lighting of the indicator lamp 32. With this configuration, the notification means because it is provided in the vehicle compartment, it is possible to reliably convey information to the driver. For example the power receiving side coupler is provided on the vehicle body rear portion, even when the structure is placed in the garage in the back of the vehicle at the time of charging, it is always the information within the field of view range of the left and right is not the driver, such as a parking time of the vehicle body posture (orientation) and it can be displayed. Information regarding the charging of such charging status is set to be able to recognize the lighting of the other display lights 33.

[0053]

In addition, the cab on the display 34 as shown in Figure 7 is provided, it may be configured to inform the quality of the stop position and orientation to the driver by causing the character displayed on the display 34. Also, if the driver is able to distinguish the information, for example, which may be notified of the information by a change in the lighting aspect of the indicator (for example, lighting color differences of indicator lights, lighting aspect (continuous lighting, flashing, etc.)). Moreover, it is also possible to turn on the alarm lamp only if stop is inappropriate.

[0054]

(2) sound generating device is provided, the broadcast information may be performed by the sound such as voice. For example, a speaker provided on the ground side charging device 9, it is also possible to notify the information of the quality of the stop position and orientation by emitting a sound from a speaker. In addition, the speaker in the passenger compartment of the electric vehicle 1 is provided instead of the indicator lamp 32 and 7 of the display 34 in FIG. 6 may be configured to be notified by sound information from the speaker to the driver. Since notification method information to the driver even sound is broadcast, it is possible to avoid a situation where the left vehicle without being charged. In particular, when it is configured to broadcast the information by cabin speakers, it is possible to avoid a situation where blocked by the exterior noise (eg engine sound or the like) are inaudible information, be made more reliable information report it can. It should be noted, is not limited to voice, may of course be as configuration and alarm sound such as a buzzer or chime. In this case, distinction information contents, or intermittent sound may be changing the note type. It is also possible to emit sound only when the stop abnormally. Of course, the display and tor causing visually by the display and indicator lamps, it is also possible to coexist both combining the notification by sound.

[0055]

(3) detection method of detecting a deviation in the vehicle width direction is not limited to these embodiments. For example, as shown in Figure 8, two of the place of the proximity sensor 17, a single detector 35 consisting of transmitter and receiver provided, detected by the vehicle width the reflected light from the reflection plate 36 provided on the front bumper 1a It may be configured to detect the direction of misalignment. In thls arrangement, the width direction length of the reflecting plate 36, the wheel 7 is set to match the parked tolerances in the vehicle width direction so that the reflected light is not incident on the detector 35 when the protruding in the vehicle width line 15 is there. According to this configuration, since the light reflected by the reflection plate 35 when the oblique stop does not enter the detector 35, it is possible to detect the vehicle width deviation and an obliquc stop by one of detectors 35.

[0056]

(4) Not only the quality of the stop position and orientatlon, when the stop position and orientation is inappropriate, you may be notified until the deviation direction. For example, "before and after the shift", "vehicle width deviation" (more specifically "right shift" and "left shift"), "diagonal shift" (more specifically "right slant", "left oblique") may be notified, etc. . In this case, the notification method may be adopted either of the display and sound. For example, you can text display the direction shifted to the display 18, place the indicator light to the left and right as viewed from the driver, the lighting state of the left and right indicator (Lights the side that does not protrude for example blue. the run-off side is lit red) it may be able to recognize the left shift and right shift by.

[0057]

(5) as well as disposed in the vehicle width direction on both sides of the stop areas of the electric vehicle 1 a proximity sensor, an object detecting member provided on the vehicle body side portion of the electric vehicle 1, entry into the electric vehicle 1 in stop area (front-rear direction misalignment) and the vehicle width direction of the deviation, it may be configured to be detected by the two proximity sensors that detect the subject vehicle body side portions. With this arrangement, shift the front-rear direction position becomes impossible charging, it is possible to detect the vehicle width-direction displacement and a diagonal stop.

[0058]

(6) may be provided three or more detectors, such as a proximity sensor. The number of detectors can be performed more finely detected by increasing the. (7) Although the above embodiment has been detected until the vehicle width direction of the deviation, just in the automatic charging system for detecting only the longitudinal displacement, driving information about the quality of the stop position and orientation based on the detection signal from the detector displays and indicator lamp for informing the user, and even may be provided with informing means such as a speaker. For example, the notification unit to an automatic charging system disclosed in JP-A-63-87136 JP and real Hei 1-79343 JP, etc. are provided, detection that is provided to detect the entry of the vehicle for automatic charging start By using the detection signal from the vessel, it may be possible to notify the quality in the longitudinal direction of the stop position to a driver riding on the vehicle. In this case, it is possible to employ the configuration in Figure 6 and Figure 7.

[0059]

(8) detector for detecting the displacement of the vehicle is not limited to optical or magnetic proximity sensors. For example it is possible to use an ultrasonic sensor or the like. (9) the detectors on the vehicle side is provided, it may be configured in which a non-sensing member on the charger side. For example, it may be buried in the detector such as the bumper.

[0060]

(10) or embedded in the detected member of the front bumper 1a, may be integral with the bumper to the detected member by, for example perform painting bumper with paint mixed with the detection material. With this configuration, it is possible to improve the vehicle appearance.

[0061]

(11) application of the present invention is not limited to an automatic charging system provided in the garage 6. For example it may be provided on commercial charging station. (12) rather than charging method using electromagnetic induction may be employed the present invention to an automatic charging system of the contact type charging method by contacting both the electrodes of the vehicle and the charger side.

[0062]

Is grasped from the above embodiments, the invention that are not described in the claims, described below along with their effect. (B) in any one of claims 1 to 6, wherein the battery charger includes a locatable position detecting means for receiving part of said vehicle, said position by the detecting means and the position detected to the power receiving so as to be chargeable to the relative said feed section to section, the feed section is provided to be movable in the vehicle width direction. According to this configuration, when the vehicle is shifted to the outside the movement range of the power supply portion in the vehicle width direction, the effect is stopped in its vehicle width direction informing means is inappropriate is that informs the driver of the vehicle I can.

[0063]

According to the invention described in claim 1, as described above in detail, according to the present invention, correct the detection result on the basis of the vehicle is a predetermined charging position of the detection means for detecting whether the vehicle is stopped in order to start charging The stop has been whether information, since a notifying means for notifying the driver, for example, despite the driver is stopped with the intention to charge, because stop position is inappropriate, while not charged it is possible to avoid a situation that the vehicle is standing.

[0064]

According to the invention of claim 2, since with width deviation detecting means for detecting a vehicle width direction of the shift of the stop position of the vehicle, even when the vehicle is inappropriate stop offset in the vehicle width direction, and it can be notified to the effect stops are inadequate to the driver.

[0065]

According to the invention described in claim 3. that is close to a predetermined distance with respect to a predetermined reference position where the vehicle is set In advance with at least two proximity detectors, the detected target two different locations of the vehicle By detecting a, since then detects the vehicle width direction of the deviation of the vehicle, it is possible to detect also inappropriate oblique stop not only the deviation in the vehicle width direction.

[0066]

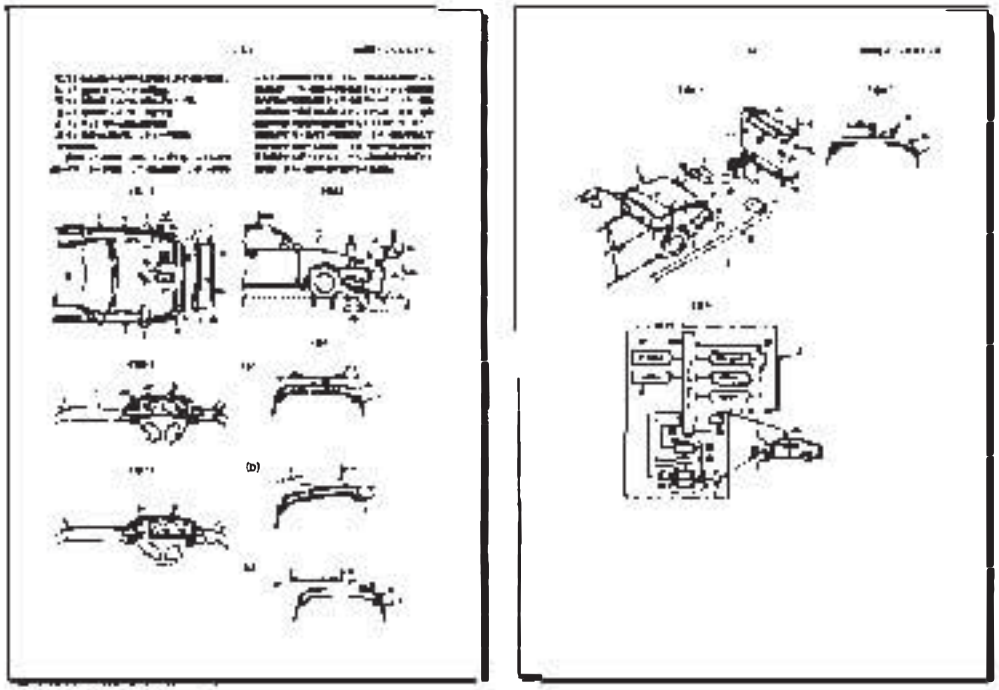
According to the invention described in claim 4, the notification means because it is provided on the ground side, it can be used in common for a plurality of vehicles. According to the invention described in claim 5, the notification means because it is provided in the vehicle compartment, it is possible to reliably convey information to the driver. For example, if you display the notification to be displayed always information on vision range of the left and right is not the driver, such as the orientation of the standstill of the vehicle, reliably transmit information to inform the driver of the vehicle interior as a sound such as voice it can.

According to the invention described in claim 6, may be transmitted. Thus to display information by the display means, for example, without fear miss listening to such the information noise, it ensures the driver information by viewing.

Notice

CLAIMS JPH09182212

A power receiving portion provided on the vehicle, a detecting means for detecting that a power supply portion provided on the charger the vehicle so as to be capable of positional relationship charging is stopped, on the basis of the detection result by said detecting means If it is determined that the vehicle is parked in the charging state, the charging control means for starting the charging of the vehicle, or whether or not information the vehicle is correctly parked at a predetermined charging position, on the basis of the detection result by said detecting means Automatic charging apparatus and a notifying means for notifying the driver of the vehicle. The sensing means is an automatic charging device of claim 1, has a width deviation detecting means for detecting a vehicle width direction of displacement of the vehicle. The width deviation detection means, automatic charging of claim 2, wherein the vehicle for two different positions of the vehicle as a detection object is provided with at least two proximity detectors detects that the approaching within a predetermined distance apparatus. The notification means is an automatic charging device according to any one of claims 1 to 3 provided on the ground side. The notification means is an automatic charging device according to any one of claims 1 to 3 provided in the vehicle compartment. Automatic charging device according to any one of claims 1 to 3 wherein the notifying means is a display means.



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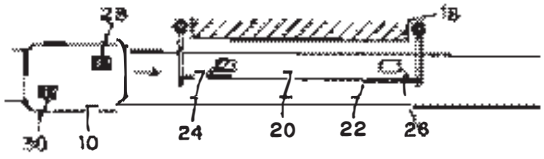
最終頁に続く

(54)【発明の名称】　路面電車を利用した都市交通システム

(57)【要約】
【課題】　路面電車普及のための方策を考える。
【解決手段】　路面電車１０が蓄電池及び地上の架線から集電するパンタグラフを備えており、路面電車の軌道２２が架線のない区間と架線２０を設置した区間とを有し、架線２０を設置した区間でパンタグラフにより架線から集電して路面電車１０に搭載した蓄電池を充電し、架線のない区間で蓄電池を電源として路面電車１０の走行を行う。この場合、電車停留所１８の軌道部分に架線２０を設置した区間を配し、電車停留所１８で路面電車１０に電力補給を行うことで、他の走行区間に架線を設置する必要がなくなる。



【特許請求の範囲】
【請求項１】　電気で駆動する路面電車が蓄電池及び地上の架線から集電するパンタグラフを備えており、路面電車の軌道が架線のない区間と架線を設置した区間とを有し、架線を設置した区間でパンタグラフにより架線から集電して路面電車に搭載した蓄電池を充電し、架線のない区間で蓄電池を電源として路面電車の走行を行うようにしたことを特徴とする路面電車を利用した都市交通システム。
【請求項２】　電車停留所の軌道部分に架線を設置した区間を配して、路面電車が停車している間に電力を補給できるようにし、路面電車が走行する他の軌道部分に架線を設けないようにした請求項１記載の路面電車を利用した都市交通システム。
【請求項３】　電気で駆動する路面電車が蓄電池及び地上の架線から集電するパンタグラフを備えており、路面電車の軌道が架線のない区間と架線を設置した区間とを有し、架線を設置した区間でパンタグラフにより架線から集電して路面電車の走行を行うとともに路面電車に搭載した蓄電池を充電し、架線のない区間では蓄電池を電源として路面電車の走行を行うようにしたことを特徴とする路面電車を利用した都市交通システム。
【請求項４】　路面電車及びその軌道にセンサを設けて、架線を設置した区間での架線からの集電による走行と、架線のない区間での蓄電池による走行とを自動的に切り換えるようにした請求項３記載の路面電車を利用した都市交通システム。
【請求項５】　電気で駆動する路面電車の電源として、路面電車に燃料電池が搭載されており、架線を使わないで路面電車に電力を供給できるようにしたことを特徴とする路面電車を利用した都市交通システム。
【請求項６】　路面電車にキャパシタが搭載されており、架線のない区間で蓄電池又は燃料電池を電源とする際の必要時に高出力の電力が発生できるようにした請求項１～５のいずれかに記載の路面電車を利用した都市交通システム。
【請求項７】　電気で駆動する路面電車の電源を路面に敷設し、路面電車の軌道上で電磁誘導により路面電車に電力を供給し、架線を使わないで路面電車に電力を供給できるようにしたことを特徴とする路面電車を利用した都市交通システム。
【請求項８】　路面電車の軌道における架線を設置した区間を、架線を設ける代わりに、電源を路面に敷設して軌道上で電磁誘導により路面電車のインダクティブ充電を行う区間とし、架線を使わないで路面電車に電力を供給できるようにした請求項１～４のいずれかに記載の路面電車を利用した都市交通システム。
【請求項９】　路面電車の軌道と同一又は平行な道路を通行する電気自動車が駆動電源として、路面電車の軌道に設置された架線から電力の補給及び充電を受けることができるようにした請求項１～４のいずれかに記載の路面電車を利用した都市交通システム。
【請求項１０】　路面電車の軌道と同一又は平行な道路を通行する電気自動車が駆動電源として、路面電車の軌道上の路面に敷設された電源から電力の補給及び充電を受けることができるようにした請求項７又は８記載の路面電車を利用した都市交通システム。
【請求項１１】　路面電車の車両として自動車を搭載するための車両を導入し、この路面電車車両に都市部に流入した電気自動車を搭載して運搬・輸送し、その間に電気自動車への電力補給を行うようにした請求項１～８のいずれかに記載の路面電車を利用した都市交通システム。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、路面電車による交通システムを核とした都市交通をエネルギーインフラ等と関連させ、都市交通・車社会の将来ビジョンをシステム技術として具体的提案にまとめた都市交通システムに関するものである。
【０００２】
【従来の技術】日本では、戦後の自動車の爆発的普及によって、また、都市での交通渋滞の原因になるとして、それまで普及し、市民の足として都市交通を支えてきた路面電車が廃止されていった。しかし、近年は、地球環境に優しい都市交通手段として路面電車（ＬＲＴ）が見直されており、各都市での導入が検討されている。また、自動車についても、従来のガソリン車、ディーゼル車以外に、低公害車・無公害車として、ＥＣＶ（電気自動車）、ＦＣＶ（燃料電池自動車）、ハイブリッド車などが注目されている。
【０００３】なお、車両の電源部の構造に関する従来技術として、特開昭４８　３６８７６号公報には、バッテリーの搭載後に端子とリード線とを人為的に接続したり、バッテリーの取り外し前にその接続を人為的に離脱させる作業が不要となる構造が開示されている。
【０００４】
【発明が解決しようとする課題】路面電車を新たに都市に導入するにあたっては、インフラへの投資を抑え、現在の都市景観にもマッチし、自動車交通とも調和した形で導入することが望まれる。そのためには、これまでの架線を使った電力供給方法を見直し、都市景観、インフラ投資に配慮する必要がある。また、電気自動車（ＥＣＶ）の普及のためには、都市内に充電施設の整備が必要であるが、これについても上記の路面電車への電力供給のための施設との統合を図り、都市全体として整合の取れた無駄の無いインフラを整備することが望まれる。
【０００５】本発明は上記の諸点に鑑みなされたもので、本発明の目的は、路面電車への電力供給方法として、架線と充電可能な電池とを併用したり、燃料電池を

利用したり、インダクティブ充電（トランス原理）を応用した無架電充電を採用することにより、一部又は全部の区間で架線を使わずに走行可能な路面電車を実現することができる都市交通システムを提供することにある。また、本発明の目的は、路面電車の架線や路面に敷設された電源等を電気自動車と共有したり、あるいは、車搬送型の路面電車車両に都市部（市街地）を通行する電気自動車を搭載して運搬し、その間に電気自動車が電力補給を受けられる運行システムとすることにより、車社会での路面電車の共存共栄が可能となる都市交通システムを提供することにある。

【０００６】

【課題を解決するための手段】上記の目的を達成するために、本発明の路面電車を利用した都市交通システムは、電気で駆動する路面電車が蓄電池及び地上の架線から集電するパンタグラフを備えており、路面電車の軌道が架線のない区間と架線を設置した区間とを有し、架線を設置した区間でパンタグラフにより架線から集電して路面電車に搭載した蓄電池を充電し、架線のない区間で蓄電池を電源として路面電車の走行を行うように構成されている（図１、図２参照）。この場合、電車停留所の軌道部分に架線を設置した区間を配して、路面電車が停車している間に電力を補給できるようにし、路面電車が走行する他の軌道部分に架線を設けないようにすることができる（図２参照）。

【０００７】また、本発明の路面電車を利用した都市交通システムは、電気で駆動する路面電車が蓄電池及び地上の架線から集電するパンタグラフを備えており、路面電車の軌道が架線のない区間と架線を設置した区間とを有し、架線を設置した区間でパンタグラフにより架線から集電して路面電車の走行を行うとともに路面電車に搭載した蓄電池を充電し、架線のない区間では蓄電池を電源として路面電車の走行を行うようにしたことを特徴としている（図１、図３参照）。この場合、路面電車及びその軌道にセンサを設けて、架線を設置した区間での架線からの集電による走行と、架線のない区間での蓄電池による走行とを自動的に切り換えるようにすることが好ましい（図３参照）。

【０００８】また、本発明の路面電車を利用した都市交通システムは、電気で駆動する路面電車の電源として、路面電車に燃料電池が搭載されており、架線を使わないで路面電車に電力を供給できるようにしたことを特徴としている。これらの蓄電池又は燃料電池を搭載した路面電車においては、キャパシタを搭載することで、架線のない区間で蓄電池又は燃料電池を電源とする際の必要時（例えば、発車時、登坂時、混雑時など）に高出力の電力を発生させることができる。

【０００９】また、本発明の路面電車を利用した都市交通システムは、電気で駆動する路面電車の電源を路面に敷設し、路面電車の軌道上で電磁誘導により路面電車に電力を供給し、架線を使わないで路面電車に電力を供給できるようにしたことを特徴としている（図４、図５参照）。また、上記の架線と蓄電池による電力供給を併用した路面電車のシステムにおいて、路面電車の軌道における架線を設置した区間を、架線を設ける代わりに、電源を路面に敷設して軌道上で電磁誘導により路面電車のインダクティブ充電を行う区間とし、架線を使わないで路面電車に電力を供給できるようにすることも可能である。

【００１０】上記の架線と蓄電池による電力供給を併用した路面電車のシステムにおいては、路面電車の軌道と同一又は平行な道路を通行する電気自動車が駆動電源として、路面電車の軌道に設置された架線から電力の補給及び充電を受けることができるようにすることが可能である。また、上記の路面に敷設された電源から電力供給を行う路面電車のシステムにおいては、路面電車の軌道と同一又は平行な道路を通行する電気自動車が駆動電源として、路面電車の軌道上の路面に敷設された電源から電力の補給及び充電を受けることができるようにすることが可能である。

【００１１】さらに、上記の路面電車を利用した都市交通システムの別の形態としては、路面電車の車両として自動車を搭載するための車両を導入し、この路面電車車両に都市部（又は市街地）に流入した電気自動車を搭載して運搬・輸送し、その間に電気自動車への電力補給を行うようにすることが考えられる。

【００１２】

【発明の実施の形態】以下、本発明の実施の形態について説明するが、本発明は下記の実施の形態に何ら限定されるものではなく、適宜変更して実施することが可能なものである。図１は、本発明の実施の第１、第２形態等において用いられる路面電車の車両の一例を示している。路面電車１０は、地上に設置された架線から集電するパンタグラフ１２、充電可能な蓄電池１４を備えている。１６はモータである。なお、路面電車１０に燃料電池を搭載して電源とすることも可能である。この場合、蓄電池や燃料電池の出力が、発車時、登坂時、混雑時などに不足することも考えられるので、路面電車１０にキャパシタを搭載してもよい。

【００１３】図２は、本発明の実施の第１形態による路面電車を利用した都市交通システムの要部を上から見た図である。本実施の形態は、電車停留所で路面電車への電力補給を行うことで、架線を設置した電車停留所以外では架線を使わずに充電された蓄電池を電源として路面電車を運行するようにしたものである。図２に示すように、電車停留所１８が位置する軌道部分の上に充電用の架線２０を設置する。架線２０の両端部近傍の軌道２２上には、送信アンテナの役割をするパンタグラフ上昇地上子２４、パンタグラフ下降地上子２６がそれぞれ設けられており、図２の矢印で示す方向に走行してくる路面

電車１０の底部には、受信アンテナの役割をする車上子２８、３０が設けられている。路面電車１０が矢印の方向に走行する場合は車上子２８が使用される。車上子３０は反対方向に走行するときに使用される。なお、送信側を電車停留所１８の段差部分に設け、受信側を路面電車１０の側面に設ける構成とすることも可能である。

【００１４】図１、図２に示すように、路面電車１０が電車停留所１８に向かって矢印の方向に走行してくると、架線２０を設置した区域に入り、軌道２２上のパンタグラフ上昇地上子２４の上を車上子２８が通過することで路面電車１０の上部に折り畳まれていたパンタグラフ１２が上昇して架線２０と接触する。このようにして、電車停留所１８で路面電車１０に搭載された蓄電池１４の充電が行われる。そして、路面電車１０が発車してパンタグラフ下降地上子２６の上を通過すると、パンタグラフ１２が下降して再び折り畳まれる。路面電車１０は、次の充電用架線が設置された電車停留所まで、蓄電池１４を電源として走行する。なお、充電用の架線は、すべての電車停留所に設置する必要はなく、例えば、主要な電車停留所や終着駅などに設置すればよい。また、電車停留所以外に車庫などにも充電用架線を設置することが可能である。本実施形態の構成とすることにより、架線を設置した区域が電力補給を行う電車停留所だけとなり、通常の走行区間では架線を使わないので景観上好ましい。

【００１５】図３は、本発明の実施の第２形態による路面電車を利用した都市交通システムの要部を上から見た図である。本実施の形態は、路面電車が走行する地域や状況等に応じて、架線から集電して走行する区間と蓄電池で走行する区間とを使い分け、両区間を自動的に切り換えるようにしたものである。図３に示す上側の軌道３２は、架線のない区間から架線３４を設置した区間に移行する軌道部分であり、下側の軌道３６は、架線３８を設置した区間から架線のない区間に移行する軌道部分である。

【００１６】図１、図３に示すように、軌道３２において、架線のない区間では、路面電車１０はパンタグラフ１２が下降した状態で蓄電池１４で走行しており、路面電車１０が架線３４を設置した区間に入ると、パンタグラフ上昇地上子４０の上を通過してパンタグラフ１２が上昇し、路面電車１０は架線３４から集電して走行するようになる。また、軌道３６において、架線３８を設置した区間では、路面電車１０はパンタグラフ１２が上昇した状態で架線３８から集電して走行しており、パンタグラフ下降地上子４２の上を通過するとパンタグラフ１２が下降し、路面電車１０は架線のない区間に入って蓄電池１４で走行するようになる。なお、架線を設置した架線集電走行区間は、大きな電力を必要とする都心部や運行本数の多い区間などに設けることが好ましく、架線のない蓄電池走行区間は、過疎地や運行本数の少ない区間などに設けることが好ましい。また、架線を設置した架線集電走行区間は路面電車の専用軌道とし、架線のない蓄電池走行区間は自動車の道路との併用軌道とすることも可能である。他の構成及び作用は、実施の第１形態の場合と同様である。

【００１７】図４、図５は、本発明の実施の第３形態による路面電車を利用した都市交通システムの要部を示している。本実施の形態は、路面電車の電源を路面に敷設し、インダクティブ充電（トランス原理）を応用した無架電充電を行うようにしたものである。図４は、本実施の形態の概念構成を上から見た図を示しており、一例として、電車停留所４４の位置となる軌道４６上の路面に、電源４８から電磁誘導によりエネルギー伝達を行うための誘導コイル５０を敷設する。そして、前述の図１に示すような車両の底部に誘導コイル５２を設けた路面電車５４が、電車停留所４４にやって来て所定の位置に到達すると、軌道４６上で電磁誘導により路面電車５４に電力が供給される。図５は本実施形態の概念構成の側面図を示しており、トランスの原理を応用した電磁誘導によりエネルギー伝達を行う方式であるので、地上の架線及びパンタグラフ、その他の接続端子等を使わないで路面電車に電力を供給することができる。また、本実施の形態の構成を、実施の第１、第２形態における架線による集電方式の代わりに採用することができる，その場合の他の構成及び作用は、実施の第１、第２形態の場合と同様である。

【００１８】つぎに、本発明の実施の第４形態による路面電車を利用した都市交通システムについて説明する。本実施の形態は、路面電車（ＬＲＴ）との電源共有により電気自動車に電力を供給するものである。図６に示すような電気自動車５６において、電気自動車の電源は通常は電気スタンドが想定されている。しかし、路面電車（ＬＲＴ）の電源ケーブルを路面に敷設しておき、その敷設されたＬＲＴの電源ケーブルに、電気自動車５６の充電プラグ５８を固定式ではなく設置型の開放型として、ＬＲＴ電源から走りながら電力を供給することが可能となる。電気自動車５６がＬＲＴ電源から受電した電力は充電器６０に設置したメーターによりアクセスカウンター方式で計量して、路面電車（ＬＲＴ）の運営団体に通信して別途課金する。このようにすれば、市街地全域をＬＲＴ専用路線とした場合でも、電気自動車利用車にとってもメリットがあるので共存共栄が可能となる。また、本実施の形態における路面電車の電源を電気自動車の電源として共有できるシステムは、上述した実施の第１、第２、第３形態の構成に適用することができる。

【００１９】つぎに、本発明の実施の第５形態による路面電車を利用した都市交通システムについて説明する。本実施の形態は、自動車搭載型の路面電車（ＬＲＴ）を導入して、この路面電車に市街地（又は都市部）に流入した電気自動車を搭載して運搬・輸送し、その間に電気

自動車への電力補給を行う運行システムである。市街地等において、電気自動車がそこを通過するには、洋上のフェリーボートのように、路面電車（ＬＲＴ）に電気自動車を搭載した状態で、充電しながら通行するようないわば、"関所"のような課金システムにする。市街地等の通行料金の代わりに、路面電車（ＬＲＴ）搭乗時に受電することを可能とした専用ＬＲＴを作り、移動しながらにして電気自動車を充電して課金し、さらに、電気自動車の運行航続距離を延ばすことで、電気自動車の利用車の便宜も図る。このようなシステムとすれば、従来、電気自動車の短所とされてきた「短い航続距離故にＥＶは夜間充電し、昼間に使用することを原則とした『くるま』です」という概念とは異なった「昼間充電しながらの長距離利用」も可能となる。

【００２０】

【発明の効果】本発明は上記のように構成されているので、つぎのような効果を奏する。

（１）　路面電車への電力供給方法として、架線と充電可能な電池とを併用したり、燃料電池を利用したり、インダクティブ充電（トランス原理）を応用した無架電充電を採用することにより、一部又は全部の区間で架線を使わずに走行可能な路面電車を実現でき、都市景観の保全にも寄与することができる。

（２）　路面電車の電源を電気自動車の電源として共有できるシステムとすることができるので、車社会での路面電車の共存共栄の道が開かれる。

【図面の簡単な説明】

【図１】本発明の実施の第１、第２形態等において用いられる路面電車の車両の一例を示す概略構成側面図である。

【図２】本発明の実施の第１形態による路面電車を利用した都市交通システムの要部を上から見た図を示す概略構成説明図である。

【図３】本発明の実施の第２形態による路面電車を利用した都市交通システムの要部を上から見た図を示す概略構成説明図である。

【図４】本発明の実施の第３形態による路面電車を利用した都市交通システムの要部を上から見た図を示す概念構成説明図である。

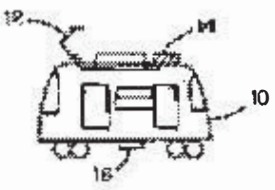
【図５】本発明の実施の第３形態による路面電車を利用した都市交通システムの要部を示す概念構成側面説明図である。

【図６】電気自動車の構成の一例を示す概略構成説明図である。

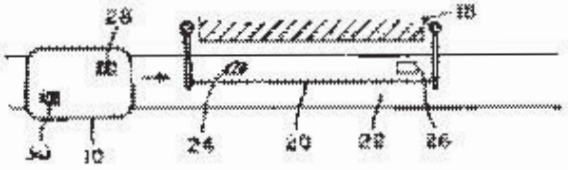
【符号の説明】

１０、５４　路面電車
１２　パンタグラフ
１４　蓄電池
１６　モータ
１８、４４　電車停留所
２０、３４、３８　架線
２２、３２、３６、４６　軌道
２４、４０　パンタグラフ上昇地上子
２６、４２　パンタグラフ下降地上子
２８、３０　車上子
４８　電源
５０、５２　誘導コイル
５６　電気自動車
５８　充電プラグ
６０　充電器

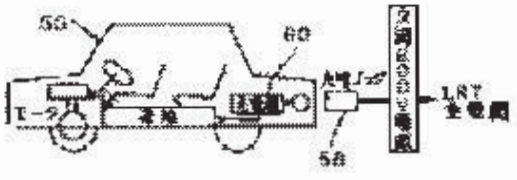
【図１】



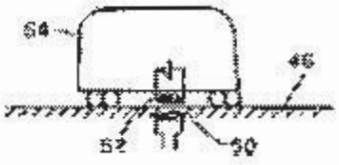
【図２】



【図４】



【図５】



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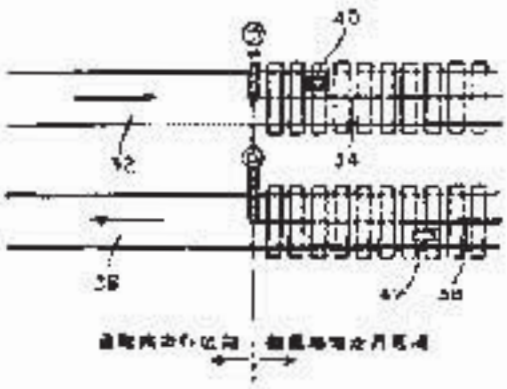
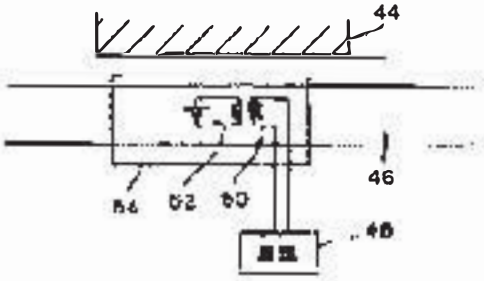


【図4】



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URBAN TRAFFIC SYSTEM USING STREETCAR

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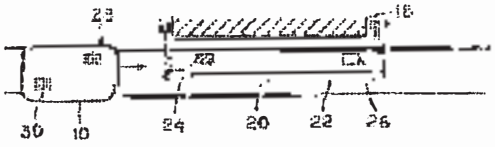
Application number: JP20010084288 20010323

Priority number(s): JP20010084288 20010323

Abstract of JP2002281610 (A)

PROBLEM TO BE SOLVED: To provide a means of spreading streetcars.
SOLUTION: This traffic system is provided with a pantograph for the streetcar 10, to collect electricity from a storage battery and ground stringing, and streetcar railways having sections, without stringing and sections with stringing 20. The traffic system charges the storage battery mounted on the streetcar 10, by collecting electricity from the stringing through the pantograph at the sections with the stringing 20 and run the streetcar 10, using the storage battery as a power supply at the sections without the stringing. The sections with the stringing 20 are disposed at the railways of streetcar stops 18, and the streetcar 10 is powered at the streetcar stops 18, thereby eliminating use of the stringing at other traveling sections.



Notice

DESCRIPTION JP2002281610

[0001]

TECHNICAL FIELD The present invention relates to, the urban transport of the transportation system by the streetcar and nuclei in connection with the energy infrastructure, etc., urban transportation that summarizes the future vision of urban transportation and car society specifically proposed as a system technology and more particularly to a system.

[0002]

Background of the Invention In Japan, by explosive spread of post-war car, also, as a cause of traffic congestion in the city, spread up to it, tram that has supported the city traffic was abolished as a foot of citizen I went. However, in recent years, tram (LRT) has been reviewed and introduced in each city has been studied as a friendly urban transportation means to the global environment. As for the car, conventional gasoline vehicles, in addition to diesel vehicles, as a low-pollution vehicles and non-polluting cars, ECV (electric vehicles), FCFV (fuel cell vehicles), such as hybrid cars have been attracting attention.

[0003]

Incidentally, the human as prior art relating to the structure of the power supply of the vehicle, JP Sho 48-36876, or by artificially connecting the terminal and the lead wire after mounting the battery, the connection before removal of the battery basis work to be detached are disclosed become structure unnecessary.

[0004]

In carrying introduced into a new city the tram [0006] is, it is possible to suppress the investment in infrastructure, also matches the current urban landscape, to be introduced in the form that is in harmony with automobile traffic is desired . To do so, review the power supply method using the overhead wire so far, it is necessary to consider urban landscape, the infrastructure investment. In addition, because of the widespread use of electric vehicles (ECV), although there is a need for the development of charging facilities in the city, we aim to integrate with facilities for power supply of about to be above the tram this, the entire city it is desirable to develop a waste-free infrastructure that is harmonized as.

[0005]

The present invention has been made in view of the various points of the above, an object of the present invention, as a power supply method to the tram, and or a combination of the rechargeable battery with the overhead line, or using a fuel cell, inductive charging (By adopting the non the call charge which applies the transformer principle), it is to provide an urban transport system which can realize a tram that can travel without the overhead wires in some or all sections. In addition, it is an object of the present invention, or to share with electric vehicle power supply or the like that has been laid on the overhead wires and road of the tram, or, equipped with electric vehicle traffic urban areas (the city) to the tram vehicle of car transport type and to be transported, by the operating system for the electric vehicle can receive electric power supplied to the meantime, it is to provide urban transportation system mutually beneficial for tram car society becomes possible.

[0006]

To achieve the above object [Means for Solving the Problems], urban transport system using tram according to the present invention includes a pantograph tram driven by electricity collecting electricity from the battery and ground contact wire It has,

and a section in which the orbit of tram was installed section and overhead line without overhead wires, the pantograph in a section that was installed overhead line to charge the storage battery that was mounted in the collector to the tram from the overhead line, there is no overhead wires It is configured to perform the running of the tram a battery as a power supply section (see FIGS. 1 and 2). In this case, by arranging a section was installed overhead lines to track part of the train stop, and to be able to supply power while the tram is stopped, it is not provided the overhead lines in addition to the orbital part of tram is traveling It can be (see Figure 2).

[0007]

In addition, urban transport system using the tram of the present invention, tram driven by electricity is equipped with a pantograph to the current collector from the battery and the ground of the overhead line, to set up a section and overhead lines with no overhead line is the trajectory of the tram it was and a section, to charge the storage battery which is mounted on the tram as well as carry out the running of the tram by a collector from the overhead line by the pantograph in a section that was installed overhead line, with no section overhead line of the tram a storage battery as a power source It is characterized that it has to perform a travel (see Fig. 1, Fig. 3). In this case, by providing a sensor on the tram and the track, the running and with the current collector from the overhead wire in the section was installed overhead line, be to switch automatically and running by battery in the overhead line without interval preferred (see Figure 3).

[0008]

In addition, urban transport system using the tram of the present invention, as the power supply of tram which is driven by an electric, fuel cell to the tram is mounted, to be able to supply power to the tram without the overhead wire and it is characterized in that it was. In the tram equipped with these battery or fuel cell, and by mounting a capacitor, when necessary at the time of a power supply storage battery or fuel cell overhead line without intervals (eg, at departure, when climbing and when busy The power of the high output can be generated on).

[0009]

In addition, urban transport system using the tram of the present invention, the power of the tram which is driven by electricity laid on the road surface, electric power is supplied to the tram by electromagnetic induction in orbit of the tram, do not use the overhead lines in is characterized in that it has to be able to supply power to the tram (see FIGS. 4 and 5). In addition, in the above-mentioned overhead line and combined with tram power supply by the storage battery system, a section that was installed overhead lines in the trajectory of the tram, instead of providing the overhead lines, by electromagnetic induction in orbit by laying the power to the road surface is a section for carrying out an inductive charging tram, it is possible to allow power the tram without the overhead wires.

[0010]

In the above overhead line and combined with tram power supply by the storage battery system, electric vehicle to pass the orbit and the same or parallel road of the road train as a driving power source, from the overhead line that has been installed in the track of the tram power of it is possible to be able to receive a refill and charging. In addition, in the system of the tram to perform the power supply from the power supply that has been laid on the road surface, as electric vehicle drive power to pass the same or parallel road and the tram track, and the road surface on the track of the tram It is possible to from a laid the power to be able to receive power replenishment and charge.

[0011]

Furthermore, as another form of urban transport system using the tram, introducing the vehicle for mounting a motor vehicle as a vehicle tram, it flowed into the tram vehicles in urban areas (or urban) and electrical The transported and transport by mounting a motor vehicle, it is conceivable to make perform power supplement to the electric vehicle in the meantime.

[0012]

BEST MODE FOR CARRYING OUT THE INVENTION Hereinafter, will be described embodiments of the present invention, the invention is not in any way limited to the embodiments described below, are those that can be implemented by being appropriately modified . Figure 1 shows a first, an example of a vehicle of a road train used in the second embodiment or the like of the present invention. Tram 10 is a pantograph 12 for collecting electricity from the overhead line which is installed on the ground, provided with a storage battery 14 can be charged. 16 is a motor. It is also possible to use a power source to tram 10 by mounting the fuel cell. In this case, the output of the battery or fuel cell, when departure when climbing, since it is conceivable that insufficient, such as during congested, it may be mounted a capacitor tram 10.

[0013]

Figure 2 is a view seen a main portion of the urban transport system using tramway according to the first embodiment of the present invention from above. This embodiment, performing the power supplement to the tram in the train stop, those other than the train stop which is installed overhead line was adapted to travel the tram a battery as a power source, which is charged without the overhead wire is there. As shown in Figure 2, placing the overhead line 20 for charging on the track portion where the train stop 18 is located. On both end portions near the track 22 of the overhead line 20, the pantograph raised ground element 24 that acts as a transmission antenna, and pantograph lowering ground element 26 are provided, respectively, come travels in the direction indicated by the arrow in Figure 2 the road At the bottom of the train 10, pickup coil 28, 30 is provided that serves as the receiving antenna. pickup coil 28 is used if the tram 10 travels in the direction of the arrow. Pickup coil 30 is used to traveling in the opposite direction. Incidentally, providing the sender to the step portion of the train stop 18, it is also possible that the receiving side a structure provided on the side of the tram 10.

[0014]

Figure 1, as shown in Figure 2, when the tram 10 comes to travel in the direction of the arrow towards the train station 18, enters into the installed area of the overhead line 20, on the pantograph raised ground element 24 on track 22 the pickup coil 28 that pantograph 12, which has been folded into the top of the tram 10 it will be in contact with the overhead line 20 elevated in passing. Thus, charging of the battery 14 mounted in the tram 10 in the train stop 18 is performed. Then, when you depart tram 10 passes over the pantograph lowering ground unit 26, pantograph 12 is again folded lowered. Tram 10, until the train stop to the overhead line for the next charge is installed, run the storage battery 14 as a power source. Incidentally, overhead lines for the charge need not be installed in all the trains stop, for example, it may be installed in a main train station and terminal station. In addition, it is possible also to install the overhead lines for charging in like garage in addition to a train stop. By the structure of this embodiment, only and will train stop that area was installed overhead line carries power replenishment, it is preferred on the landscape, since without the overhead wire under normal travel section.

[0015]

Figure 3 is a view seen a main portion of the urban transport system using tramway according to the second embodiment of the present invention from above. This embodiment, according to the region and conditions such as tram is traveling, it is selectively used and the section which runs in the section and the battery to travel in the current collector from the overhead wire, which has to switch the two sections automatically is there. Upper track 32 shown in Figure 3 is a track portion that transitions from the overhead line without interval to the interval of installing the overhead line 34, the track 36 of the bottom shifts the overhead line 38 from the installed interval in overhead line without interval is a track portion.

[0016]

As shown in FIGS. 1 and 3, the track 32, with no section overhead line, tram 10 is traveling at battery 14 in a state where the pantograph 12 is lowered, the section of tram 10 is installed overhead line 34 entering and, pantograph 12 is raised through the top of the pantograph rising ground unit 40, so that tram 10 runs by the collector from the overhead line 34. Furthermore, the track 36, in a section which was installed overhead line 38, tram 10 is traveling to the current collector from the overhead wire 38 in a state where the pantograph 12 rises, the pantograph 12 when passing over the pantograph lowering ground unit 42 The lowered, tram 10 would like to run at the storage battery 14 enters the overhead wire with no interval. Incidentally, overhead wires collector running section which was installed overhead line, it is preferably provided in such urban areas or service number-rich segment that requires large power, overhead line without battery running section is sparsely populated areas and service number less sections It is preferably provided like. In addition, overhead wires collector running section which was installed overhead line is a dedicated track for trams, battery running section without overhead wires it is also possible to use a combination trajectory of the road for automobiles. Other configurations and operations are the same as in the first embodiment.

[0017]

4, FIG. 5 shows an essential part of the urban transport system using tramway according to a third embodiment of the present invention. This embodiment, the power supply of the tram is laid on the road surface is obtained to perform the free the call charge that applies inductive charging (trans Principle). Figure 4 shows a view of a conceptual configuration of the present embodiment from above, as an example, the road surface on the track 46 to be the location of the train station 44, for carrying out an energy transfer by electromagnetic induction from the power supply 48 Laying of the induction coil 50. Then, the tram 54 provided with the induction coil 52 in the bottom of the vehicle, as shown in FIG. 1 described above, when it came to the train station 44 reaches a predetermined position, by electromagnetic induction on the track 46 in the tram 54 Power There is supplied. Figure 5 shows a side view of a conceptual configuration of the present embodiment, since the method of performing energy transfer by electromagnetic induction which applies the principles of the transformer and without ground contact wire and the pantograph, and other connection terminals, etc. It is possible to supply power to the tram. In addition, the configuration of this embodiment can be employed in place of the current collecting method by the overhead line in the first, second embodiment. Its other construction and operation in this case is the same as in the first, second embodiment.

[0018]

Then, we describe urban transport system using a tramway according to a fourth embodiment of the present invention. This embodiment is intended to supply power to the electric car by the power sharing between the tram (LRT). In the electric vehicle 56 as shown in Figure 6, the power supply of the electric car is usually is assumed lamp. However, the power cable of the tram (LRT) is previously laid on the road surface, the power cable of the laid down by LRT, as the installation type of open-type rather than a fixed charge plug 58 of the electric vehicle 56, and from LRT power it is possible to supply electric power while running. power electric vehicle 56 is receiving power from the LRT supply weighed on the access counter method by meter that was installed in the charger 60, will be charged separately by communicating to the governing body of the tram (LRT). In this way, even when the urban whole and LRT dedicated lines, also it is possible to mutually beneficial because there is an advantage for electric vehicles use vehicle. Also, the system can be shared on the power of the tram in the embodiment as a power source for electric vehicles can be applied to the first, second, third embodiment configuration of embodiment described above.

[0019]

Then, it will be explained urban transport system using a tram according to a fifth embodiment of the present invention. This embodiment, by introducing a motor vehicle on-board tram (LRT), the tram is equipped with an electric vehicle which has flowed into the city (or cities) and transported and transport. to the electric vehicle in the meantime It is a navigation system for power replenishment. In urban areas, the electric car is passing through it, like a ferry boat offshore, in the state equipped with the electric car to tram (LRT), so to speak, such as traffic while charging, such as "barrier" It wants to Na billing system. Instead of a toll for urban areas, it creates a dedicated LRT which enables it to be powered during the tram (LRT) boarding, and to while moving and charging by charging the electric vehicle, further, operating range of the electric vehicle By extending the also achieved utilizing car convenience of an electric vehicle. With such a system, conventionally, it has been a disadvantage of the electric vehicle is different from the concept of "short range because EV at night charge," the car ", which was in principle to be used in the daytime." " Long-distance use with daytime charging "also becomes possible.

The present invention because it is constructed as described above. it is an effect, such as the following. As a power supply method to (1) tram, or in combination with rechargeable batteries and overhead wires, or using a fuel cell, by employing the free the call charge that applies inductive charging (trans Principle) Some or can be realized capable of driving tram without the overhead line in all of the sections, it is also possible to contribute to the conservation of the urban landscape. (2) it is possible to be a system that can share the power of the tram as a power source for electric vehicles, the road of co-existence and co-prosperity of the tram in the car society is opened.

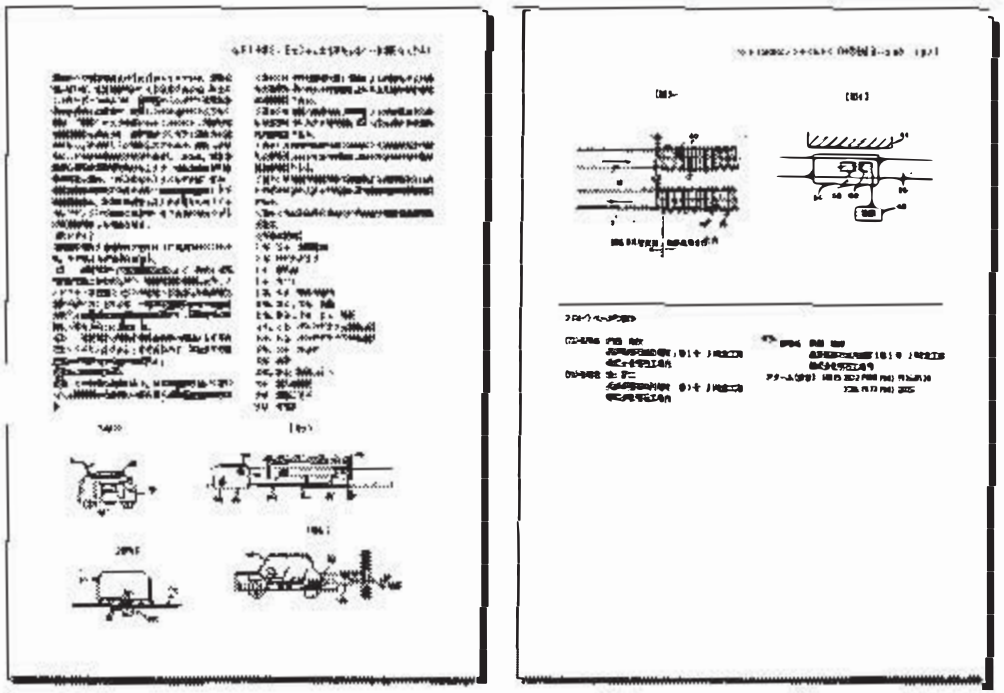
Notice

CLAIMS JP2002281610

[0009]

Equipped with a pantograph tram which is driven by electricity to the current collector from the battery and the ground of the overhead line, and a section in which the trajectory of the tram was installed section and overhead lines without overhead wires, the pantograph in a section that was installed overhead lines Urban transportation system charges the storage battery is mounted to the collector to the tram from the overhead line, utilizing a tram, characterized in that it has to perform the driving tram the storage battery as a power source in the overhead wire free interval. By arranging a section was installed overhead lines to track part of the train stop, and to be able to supply power while the tram is stopped, tram has not be provided the overhead lines in addition to the track portion that travels claim urban transport system using the tram of claim 1. Equipped with a pantograph tram which is driven by electricity to the current collector from the battery and the ground of the overhead line, and a section in which the trajectory of the tram was installed section and overhead lines without overhead wires, the pantograph in a section that was Installed overhead lines to charge the storage battery which is mounted on the tram as well as carry out the current collector traveling tram is from the overhead line, and use the tram which is characterized in that it has to carry out the running of the tram a storage battery as a power supply in the overhead wire with no interval urban transport system that was. Tramway and the sensor is provided on the orbit of the overhead wire in a section in which installed overhead wires and running by the current collector, and claim 3, wherein it is to switch automatically and running by battery in the overhead line without interval urban transport system using the tram. As the power of the tram, which is driven by electricity, a fuel cell is mounted in the tram, urban transport system using trams, characterized in that it has to be able to supply power to the tram without the overhead wires. Trams are capacitors mounted on and tram according to any one of claims 1 to 5, the power of the high power required at the time of a power supply storage battery or fuel cell is to be generated by the overhead line without interval urban transport system using the. The power of the tram which is driven by electricity laid on the road surface, and characterized in that by electromagnetic induction in orbit of the tram electric power is supplied to the tram, it was to be able to supply power to the tram without the overhead wire urban transport system using the tram to. The power section was installed overhead lines in the orbit of the tram, instead of providing the overhead wires, power is defined as the interval to perform the inductive charging of the tram by electromagnetic induction an in orbit by laying in the road surface, the tram without the overhead wire urban transport system using tram according to any one of claims 1 to 4 which is to be able to supply. As electric vehicle drive power source for passing the same or parallel roads and tram track any of the preceding claims in which the overhead line installed in the track of the tram was to be able to receive power replenishment and charging the urban transport system using the tram of claim described.

As the track is the same or the electric vehicle drive power source for passing the parallel road tram and claim 7 in which the road surface has been laid power orbit tram has to be able to receive power replenishment and charging the or 8 urban transport system using the tram described.] Introduced the vehicle for mounting the car as the vehicle of the tram, this tram vehicle is is equipped to transport and transport the electric car that has flowed into the urban areas, so as to perform the power supply to the electric car in the meantime urban transport system using the tram according to any one of claims 1 to 8 you.



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Examiner Initial		Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate
	AA						
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		Document Number	Date	Country	Class	Subclass	Translation Yes	Translation No
	AQ	10 1 3 6 5 8 8	May 22, 1998	Japan			Yes	
	AR	9 1 8 2 2 1 2	July 11, 1997	Japan			Yes	
	AS	20 02 28 1 6 1 0	Sept. 27, 2002	Japan			Yes	
	AT	20 02 24 6 2 4 8	Aug. 30, 2002	Japan			Yes	

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

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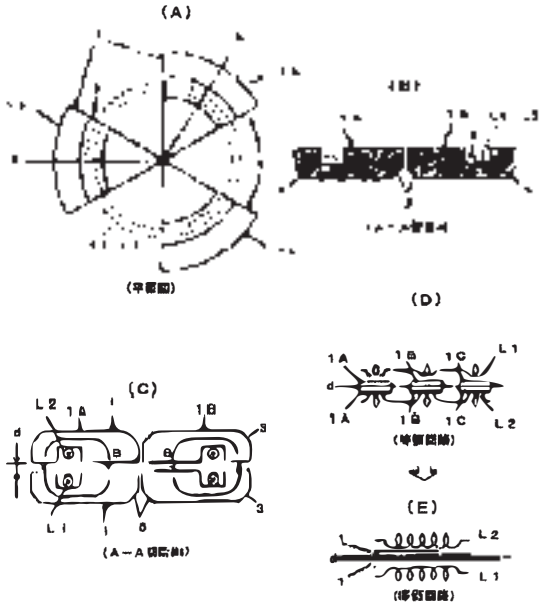
最終頁に続く

(54)【発明の名称】　非接触カプラ

(57)【要約】
【課題】　一次側と二次側間に磁気結合による電力伝達を行わせる非接触カプラを、その性能を確保しつつ軽量化し、さらに一次側と二次側の位置合わせに余裕を持たせて使い勝手を向上させる。
【解決手段】　一次側と二次側の各磁気コア１，１の少なくとも互いに対向する側の部分を分割形成するとともに、各分割形成部分の間に空間磁路ｇを形成する隙間を介在させる。



【特許請求の範囲】

【請求項１】 それぞれにＵ字状の開磁路を形成する一対の磁気コアに一次コイルと二次コイルを振り分けて巻回するとともに、両コアを開磁面側同士で近接対向させて環状の閉磁路を形成することにより、一次コイルと二次コイル間で交流の電力伝達を行わせる非接触カプラにおいて、一次側と二次側の各磁気コアの少なくとも互いに対向する側の部分を分割形成するとともに、各分割形成部分の間に空間磁路を形成する隙間を介在させたことを特徴とする非接触カプラ。

【請求項２】 請求項１の発明において、一次側と二次側の各磁気コアをそれぞれ複数のコア部材で形成するとともに、各コア部材の間に前記隙間を介在させたことを特徴とする非接触カプラ。

【請求項３】 請求項１または２の発明において、一次側と二次側の各磁気コアをそれぞれ扇状のコア部材で形成するとともに、各コア部材の間にそのコア部材と同形の扇状隙間を介在させたことを特徴とする非接触カプラ。

【請求項４】 請求項１から３のいずれかの発明において、一次側と二次側の磁気コアをそれぞれ放射状に円陣配置された複数の長形コア部材で形成したことを特徴とする非接触カプラ。

【請求項５】 請求項４の発明において、前記長形コア部材は全体が一様な厚みを有する板状であることを特徴とする非接触カプラ。

【請求項６】 請求項１から５のいずれかの発明において、一次側と二次側の各磁気コアをそれぞれ等角間隔で円陣配置された同じ奇数のコア部材で形成するとともに、一次側と二次側の各コア部材をそれぞれ対向する側のコア部材の間隙に重なるように配置し、この配置状態で一次側と二次側間の磁気結合を形成させるようにしたことを特徴とする非接触カプラ。

【請求項７】 それぞれにＵ字状の開磁路を形成する一対の磁気コアに一次コイルと二次コイルを振り分けて巻回するとともに、両コアを開磁面側同士で近接対向させて環状の閉磁路を形成することにより、一次コイルと二次コイル間で交流の電力伝達を行わせる非接触カプラにおいて、一次側と二次側の各磁気コアをそれぞれ、環状の外周側コア部材、円盤状の内周側コア部材、および両コア部材間を架橋しながら放射状に円陣配置された多数の中間コア部材とで形成したことを特徴とする非接触カプラ。

【請求項８】 請求項７の発明において、各中間コア部材の内周側端部をそれぞれテーパ状に形成したことを特徴とする非接触カプラ。

【請求項９】 請求項７または８の発明において、各中間コア部材の外周側端部を拡幅したことを特徴とする非接触カプラ。

【請求項１０】 それぞれにＵ字状の開磁路を形成する一対の磁気コアに一次コイルと二次コイルを振り分けて巻回するとともに、両コアを開磁面側同士で近接対向させて環状の閉磁路を形成することにより、一次コイルと二次コイル間で交流の電力伝達を行わせる非接触カプラにおいて、一次側と二次側の各磁気コアの非対向側コーナ部を面取り形成したことを特徴とする非接触カプラ。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】この発明は磁気結合方式の非接触カプラに関し、たとえば電気自動車等の電気機器への給電もしくは充電を非接触で行うのに利用して有効な技術に関する。

【０００２】

【従来の技術】電気自動車や電気自転車、あるいはその他の電気機器への給電や充電を非接触で行う手段として、磁気結合方式の非接触カプラが提供されている。

【０００３】図１２は従来の非接触カプラの構成例であって、（Ａ）は磁気コア１’の破断斜視図、（Ｂ）はその平面図、（Ｃ）は上記コア１’を用いた非接触カプラの断面図、（Ｄ）はその等価回路図をそれぞれ示す。同図に示す非接触カプラは、Ｕ字状の開磁路を形成する一対の円盤状磁気コア１’，１’に一次コイルＬ１と二次コイルＬ２を振り分けて巻回するとともに、両コア１’，１’を開磁面側同士で近接対向（間隙ｄ）させて環状の閉磁路Ｂを形成することにより、一次コイルＬ１と二次コイルＬ２間で交流（高周波）の電力伝達を行わせる。この場合、一次コイルＬ１が巻回されたコア１’はトランスの一次側に相当し、二次コイルＬ２が巻回されたコア１’はトランスのそのトランスの二次側に相当する。一次側と二次側は間隙ｄを置いて近接対向させられることにより、あたかも一つのトランスとして動作する。

【０００４】各磁気コア１’，１’はそれぞれ、一次側と二次側間の磁気的結合を密に行わせるために、つまり一次側と二次側間に高い結合係数を確保するために、全体を隙間の無い充実一体構造（いわゆる無垢構造）とすることが行なわれていた。これにより、一次側と二次側間の磁路Ｂは、上記間隙ｄの部分を除いて、すべて、磁気コア１’，１’の内部に閉じこめられた状態で形成される（以上、特開昭２０００－１５０２７３参照）。

【０００５】

【発明が解決しようとする課題】しかしながら、上述した技術には、次のような問題のあることが本発明者らによってあきらかとされた。すなわち、一次側と二次側間の磁路Ｂを充実一体形状の磁気コア１’，１’内に完全に閉じこめる上述した構成は、両磁気コア１’，１’が互いに同一で対向させられたときには高い結合係数を得ることができるが、図１３の（Ａ）（Ｂ）に示すように、両磁気コア１’，１’間に横方向の位置ズレ（横ズレ）ｈが生じると、上記結合係数はその横ズレによって

大きく低下する。この横ズレによる結合係数の変化度合が大きいと、一次側と二次側間の位置合わせがきわどくなるため、非接触カプラの使い勝手が悪くなる。

【０００６】また、非接触カプラの重量の大半は磁気コアが占めるが、上述した磁気コア１'，１'は全体が隙間の無い充実一体形状であるために高重量となるのを避けることができず、このことが非接触カプラの軽量化をはかる上で大きな阻害要因となっていた。

【０００７】この発明は、以上のような問題に鑑みてなされたもので、第１の目的は、非接触カプラをその性能を確保しつつ軽量化させることにある。第２の目的は、上記第１の目的に加えて、非接触カプラの一次側と二次側の位置合わせに余裕を持たせて使い勝手を向上させることにある。そのほか、本発明の上記以外の目的と特徴は、本明細書の記述および添付図面からあきらかになるであろう。

【０００８】

【課題を解決するための手段】前記目的を達成するため、本発明では次のような手段を提供する。すなわち、本発明の第１の手段は、それぞれにU字状の開磁路を形成する一対の磁気コアに一次コイルと二次コイルを振り分けて巻回するとともに、両コアを開磁面側同士で近接対向させて環状の閉磁路を形成することにより、一次コイルと二次コイル間で交流の電力伝達を行わせる非接触カプラにおいて、一次側と二次側の各磁気コアの少なくとも互いに対向する側の部分を分割形成するとともに、各分割形成部分の間に空間磁路（空間に形成される磁路）を形成する隙間を介在させたことを特徴とする。

【０００９】上記第１の手段によれば、一次側コアと二次側コア間の磁気結合が、各分割形成部分の先端面だけではなく、その側面に跨った広い範囲で行われるようになる。つまり、一次側と二次側間でのコアの対向面積が実効的に拡大されるとともに、本来の磁路と垂直方向（巻線と同じ方向）への磁気回路が遮断されるようになり、この結果、両コアが互いに横ズレしても、一次側と二次側の磁気的結合を維持することができる。同時に、コアを分割形成したことによってコア全体が軽量化される。これにより、非接触カプラをその性能を確保しつつ軽量化させるという前記第１の目的と、非接触カプラの一次側と二次側の位置合わせに余裕を持たせて使い勝手を向上させるという前記第２の目的を共に達成することができる。

【００１０】第２の手段は、上記第１の手段の手段において、一次側と二次側の各磁気コアをそれぞれ複数のコア部材で形成するとともに、各コア部材の間に前記隙間を介在させたことを特徴とする。これにより、上記目的を達成するための磁気コアを生産性を向上させることができる。

【００１１】第３の手段は、上記第１または２の手段において、一次側と二次側の各磁気コアをそれぞれ扇状のコア部材で形成するとともに、各コア部材の間にそのコア部材と同形の扇状隙間を介在させたことを特徴とする。これにより、同一形状のコア部材を使うことによる生産の合理化をはかりつつ、上記第２の手段の場合と同様の効果を得ることができる。

【００１２】第４の手段は、上記第１から３のいずれかの手段において、一次側と二次側の磁気コアをそれぞれ放射状に円陣配置された複数の長形コア部材で形成したことを特徴とする。この手段の場合も、第２または３の手段の場合と同様、上記目的を達成するための磁気コアの生産性を高めることができるという効果を得ることができる。

【００１３】第５の手段は、上記第４の手段において、前記長形コア部材は全体が一様な厚みを有する板状であることを特徴とする。これにより、コア部材を加圧成型および焼成によって形成する際に、成型および焼成時の条件等を最適化してコア部材の均質性および特性の安定性を向上させることができる。

【００１４】第６の手段は、上記第１から５の手段において、一次側と二次側の各磁気コアをそれぞれ等角間隔で円陣配置された同じ奇数のコア部材で形成するとともに、一次側と二次側の各コア部材をそれぞれ対向する側のコア部材の間隙に重なるように配置し、この配置状態で一次側と二次側間の磁気結合を形成させるようにしたことを特徴とする。これにより、特定方向への横ズレに対する結合係数の低下度合をさらに緩和させることができるようになる。

【００１５】第７の手段は、それぞれにU字状の開磁路を形成する一対の磁気コアに一次コイルと二次コイルを振り分けて巻回するとともに、両コアを開磁面側同士で近接対向させて環状の閉磁路を形成することにより、一次コイルと二次コイル間で交流の電力伝達を行わせる非接触カプラにおいて、一次側と二次側の各磁気コアをそれぞれ、環状の外周側コア部材、円盤状の内周側コア部材、および両コア部材間を架橋しながら放射状に円陣配置された多数の中間コア部材とで形成したことを特徴とする。

【００１６】上記第７の手段によれば、コアを軽量化しながら磁路方向での断面積のバラツキを小さくすること、すなわち磁路バランスを改善してコア損失を低減させることができる。これにより、前記第１の目的を効果的に達成することができる。

【００１７】第８の手段は、上記第７の手段において、各中間コア部材の内周側端部をそれぞれテーパ状に形成したことを特徴とする。これにより、コアの軽量化と磁路バランスの最適化をはかることができる。

【００１８】第９の手段は、上記第７または８の手段において、各中間コア部材の外周側端部を拡幅したことを特徴とする。この場合も、第８の手段と同様、コアの軽量化と磁路バランスの最適化をはかることができる。

【００１９】第１０の手段は、それぞれにU字状の開磁路を形成する一対の磁気コアに一次コイルと二次コイルを振り分けて巻回するとともに、両コアを開磁面側同士で近接対向させて環状の閉磁路を形成することにより、一次コイルと二次コイル間で交流の電力伝達を行わせる非接触カプラにおいて、一次側と二次側の各磁気コアの非対向側コーナ部を面取り形成したことを特徴とする。

【００２０】上記第１０の手段によれば、磁束密度が疎となる部分を除去することによってコアの軽量化すなわち非接触カプラの軽量化をはかることができるとともに、磁路バランス改善によるコア損失の軽減をはかることができる。これにより、前記第１の目的を達成することができる。

【００２１】

【発明の実施の形態】図１は本発明による非接触カプラの第１実施例を示す。この実施例の非接触カプラは、同図の（Ａ）（Ｂ）（Ｃ）に示すように、一次側と二次側の各磁気コア１，１をそれぞれ扇状（開度＝４５度）のコア部材１Ａ，１Ｂ，１Ｃで形成するとともに、各コア部材１Ａ，１Ｂ，１Ｃの間にそのコア部材と同形の扇状隙間（ｇ＝７５度）を介在させてある。各コア部材１Ａ，１Ｂ，１Ｃはそれぞれ U字状の開磁路を形成すべく、片側面にU字切欠部２が形成されている。

【００２２】一次側のコア部材１Ａ，１Ｂ，１Ｃと二次側のコア部材１Ａ，１Ｂ，１Ｃはそれぞれ、開磁面側同士で近接対向させられて環状の閉磁路Ｂを形成することにより、一次コイルＬ１と二次コイルＬ２間で交流（高周波）の電力伝達を行わせる非接触カプラを形成する。この場合、一次側と二次側の両コア部材１Ａ－１Ａ，１Ｂ－１Ｂ，１Ｃ－１Ｃはそれぞれに対をなして磁気結合されることにより、同図の（Ｄ）または（Ｅ）に示すようなトランス等価回路を形成する。

【００２３】このようにして、一次側と二次側の各磁気コア１，１の少なくとも互いに対向する側の部分を分割形成するとともに、各分割形成部分の間に空間磁路（空間に形成される磁路）を形成する隙間（ｇ）を介在させた非接触カプラが形成されている。この非接触カプラは、上記扇状隙間（ｇ－７５度）の分だけ、コア１，１の重量が減量されている。

【００２４】各コア部材１Ａ，１Ｂ，１Ｃの非対向側コーナ部はあらかじめ面取り形成されている。符合３はその面取り部を示す。この面取り部３を形成したことにより、コア１，１はさらに軽量化されるとともに、コア縁端部での折損が生じにくくなっている。コア部材は加圧成型および焼成によって製造されるフェライト磁性体が主に使用されるが、このフェライト磁性体は概して脆いため、その製造や運搬あるいは組立時等に縁端部が折損しやすいという難点があるが、上記面取り部３はその折損の予防にも有効である。さらに、大型のフェライトコアは、加圧成型時の加圧を均一に行うことが難しいとともに、焼成時に亀裂が生じやすいといった製造上の困難があるが、これらの困難は、上述のようにコアを分割形成することによって解消することができる。

【００２５】図２は、図１に示した非接触カプラの横ズレに対する特性の変化状態を示す。同図において、実線は図１に示した本発明による非接触カプラの特性曲線、破線は図１２に示した従来の非接触カプラの特性曲線をそれぞれ示す。同図に示すように、図１に示した非接触カプラは、従来のものに比べて、コイルＬ１，Ｌ２の自己インダクタンスと相互インダクタンスはそれぞれ全体的に低くなっているが、一次側コアと二次側コアの位置が横方向へずれたときのインダクタンス低下度合は、従来のものよりも大幅に小さくなっている。また、一次コイルＬ１と二次コイルＬ２間の結合係数について、平均的には従来のものに比べてそれほど違わないが、横ズレ（横方向への位置ズレ）に対する変化が大幅に緩和されることが判明した。

【００２６】図３は、図１に示した非接触カプラに上記横ズレ（ｈ）が生じた場合の空間磁路の状態を模式的に示す。同図に示すように、一次側と二次側の各磁気コア１，１が分割形成されていると、一次側コア１と二次側コア１間の磁気結合が、各分割コア部材１Ａ，１Ｂ，１Ｃの先端面だけではなく、その先端面と側面の両方に跨った広い範囲で行われるようになる。これによって、一次側と二次側間でのコア１，１の実効的な対向面積が拡大されるとともに、その実効対向面積が横ズレ（ｈ）の場合でも維持されるようになる。また、本来の磁路と垂直方向（巻線と同じ方向）への磁気回路が遮断されるようになり、この結果、両コアが互いに横ズレしても、一次側と二次側の磁気的結合を維持することができる。同時に、コアを分割形成したことによってコア全体が軽量化される。

【００２７】これにより、非接触カプラをその性能を確保しつつ軽量化させることができるとともに、非接触カプラの一次側と二次側の位置合わせに余裕を持たせてその使い勝手を向上させることができるようになる。

【００２８】図４の（Ａ）および（Ｂ）はそれぞれ、図１に示した磁気コア１，１による非接触カプラの形成例を示す。同図において、一次側と二次側の各磁気コア１，１はいずれも、等角間隔で円陣配置された同じ奇数（３個）のコア部材１Ａ，１Ｂ，１Ｃで形成されている。この場合、一次側すなわち上コア１をなすコア部材１Ａ，１Ｂ，１Ｃと、二次側すなわち下コア１をなすコア部材Ａ，１Ｂ，１Ｃと間の位置関係は、同図の（Ａ）または（Ｂ）に示すように、２通りの方式が可能である。

【００２９】すなわち、（Ａ）に示す方式では、上コア１を形成するコア部材１Ａ，１Ｂ，１Ｃと、下コア１を形成するコア部材１Ａ，１Ｂ，１Ｃとが、上下方向で重なり合うように配置され、この配置状態で一次側と二次

側間を磁気結合させる非接触カプラを形成するようにしている。

【0030】また、(B)に示す方式では、上コア1を形成するコア部材1A，1B，1Cと、下コア1を形成するコア部材1A，1B，1Cとがそれぞれ、対向する側のコア部材の間隙に重なるように配置され、この配置状態で一次側と二次側間の磁気結合させる非接触カプラを形成するようにしている。

【0031】ここで、(B)に示す方式では、上下のコア1，1が矢印方向(h)にずれたときのコア部分の対向面積の減少率を小さく、これにより、その矢印方法(h)への横ズレに対する結合係数の低下度合をさらに緩和することができるという特徴がある。したがって、矢印方向(h)に大きな横ズレが予想される用途では、(B)に示すような配置方式で非接触カプラを形成するとよい。

【0032】図5は本発明による非接触カプラの第2実施例を示す。前記第1の実施例との相違に着目して説明すると、この第2実施例の非接触カプラは、同図の(A)(B)に示すように、一次側と二次側の磁気コア1，1がそれぞれ放射状に円陣配置された複数の長形コア部材11で形成されている。各長形コア部材11は、図6に示すように、全体(A，B，D部)が一様な厚みを有する板状に形成されている(t1＝t2＝t3)。このような形状のコア部材11は、加圧成型を均一に行うのに有利であり、したがって、成型および焼成時の条件等を最適化してコア部材の均質性および特性の安定性を向上させることができる。また、各コア部材11はそれぞれにU字状の開磁路を形成するが、そのU字状開磁路の両端面での面積(t1×A，t2×B，t3×C)を同じに揃える(t1×A＝t2×B＝t3×C)ことにより、コア部材11内での磁路バランスを最適化してコア損失を低減させることができる。

【0033】図7は本発明による非接触カプラの第3実施例を示す。この実施例の非接触カプラは、同図(A)に示す3種類のコア部材12，13，14を用いて、同図(B)(C)のように組立てられた磁気コア1を使用する。この磁気コア1は、環状の外周側コア部材12、円盤状の内周側コア部材13、および両コア部材12と13間を架橋しながら放射状に円陣配置された多数の中間コア部材14とで形成されている。これにより、コア1を軽量化しながら磁路方向での断面積のバラツキを小さくすること、すなわち磁路バランスを改善してコア損失を低減させることができる。

【0034】図8は、図7に示したコア1の磁路断面積の状態を示す。図7に示したコア1は、外周側コア部材12、内周側コア部材13、中間コア部材14とによってU字状の開磁路を形成する。このU字状開磁路は、図8の(A)に示すように、区間a1～a5に分けることができるが、各区間a1～a5での磁路断面積は、同図(B)の実線グラフのようになる。同図(B)において、破線のグラフは図11に示した従来の一体型コアの対応部分における磁路断面積の状態を示す。両グラフの比較からわかるように、図7に示したコア1は、外周側コア部材12、内周側コア部材13、中間コア部材14のそれぞれの形状やサイズ等を選ぶことによって磁路断面積の変化(段差)を小さくすることができ、これにより、良好な磁路バランスを得てコア損失を低減させることができる。

【0035】図9は、上記中間コア部材14の好ましい実施例を示す。同図(A)に斜視図で示す中間コア部材14はその内周側端部(部材14側)にテーパ部41が形成されている。また、同図(A)に横断面図で示す中間コア部材14は、上記テーパ部41に加えて、その外周側端部(部材12側)に拡幅部42が形成されている。図8に示した実線グラフでは、区間a1とa2の境で磁路断面積が不連続に変化しているが、この不連続変化は、図9の(A)(B)にそれぞれ示した形状の中間コア部材14を使用することによって軽減させることができる。

【0036】図10は本発明による非接触カプラの第4実施例を示す，この実施例は、同図(A)(B)に示すように、磁気コア1，1の対向側部分だけを分割形成したものであって、コア1全体は連続一体形状となっている。このような構成でも、前記第1および第2の目的を達成することが可能である。

【0037】図11の(A)(B)は本発明による非接触カプラの第5実施例を示す。この実施例は、同図(A)(B)に示すように、従来の円盤状磁性磁気コア(図12)の非対向側コーナ部を面取りしただけであるが、その面取り部3を設けるだけでも、非接触カプラの軽量化、および磁路バランス改善によるコア損失の軽減をはかることができる。

【0038】

【発明の効果】以上説明したように、本発明による非接触カプラによれば、一次側と二次側の各磁気コアの少なくとも互いに対向する側の部分を分割形成するとともに、各分割形成部分の間に空間磁路を形成する隙間を介在させることにより、非接触カプラをその性能を確保しつつ軽量化させることができ、さらに、非接触カプラの一次側と二次側の位置合わせに余裕を持たせて使い勝手を向上させることができる。

【0039】また、一次側と二次側の各磁気コアをそれぞれ、環状の外周側コア部材、円盤状の内周側コア部材、および両コア部材間を架橋しながら放射状に円陣配置された多数の中間コア部材とで形成することにより、磁路バランスを改善してコア損失を低減させることができる。

【0040】さらに、一次側と二次側の各磁気コアの非対向側コーナ部を面取り形成することにより、コアの軽

量化すなわち非接触カプラの軽量化をはかることができるとともに、磁路バランス改善によるコア損失の軽減をはかることができる。

【図面の簡単な説明】

【図１】本発明による非接触カプラの第１実施例を示す図である。

【図２】図１に示した非接触カプラの横ズレに対する結合係数の変化状態を示すグラフである。

【図３】図１に示した非接触カプラにおける空間磁路の状態を模式的に示す図である。

【図４】図１に示した非接触カプラおけるコア部材の配置例を示す図である。

【図５】本発明による非接触カプラの第２実施例を示す図である。

【図６】図５に示した磁気コアの一部を示す斜視図である。

【図７】本発明による非接触カプラの第３実施例を示す図である。

【図８】図７に示したコアの磁路断面積の状態を示すグラフである。

【図９】図７に示したコアの一部をなす中間コア部材の実施例を示す図である。

【図１０】本発明による非接触カプラの第４実施例を示す図である。

【図１１】本発明による非接触カプラの第５実施例を示す図である。

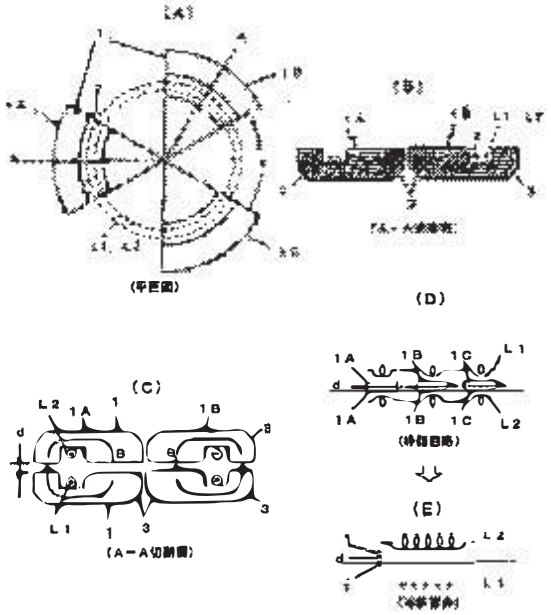
【図１２】従来の非接触カプラの構成例を示す図である。

【図１３】従来の非接触カプラの横ズレに対する結合係数の変化状態を示すグラフである。

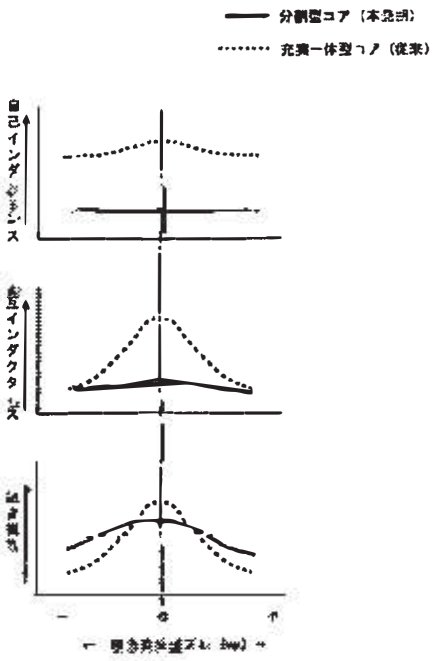
【符号の説明】

１　磁気コア（本発明）
１′　磁気コア（従来）
１Ａ，１Ｂ，１Ｃ　扇状コア部材
１１～１４　コア部材
２　U字切欠部
３　面取り部
４１　テーパ部
４２　拡幅部
Ｂ　磁路
ｄ　一次側コアと二次側コア間の間隙
ｇ　コア部材間の隙間
ｈ　横ズレ（横方向への位置ズレ）
Ｌ１　一次コイル
Ｌ２　二次コイル

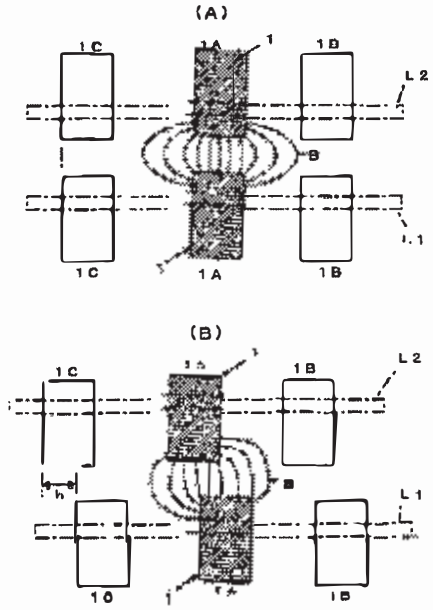
【図１】



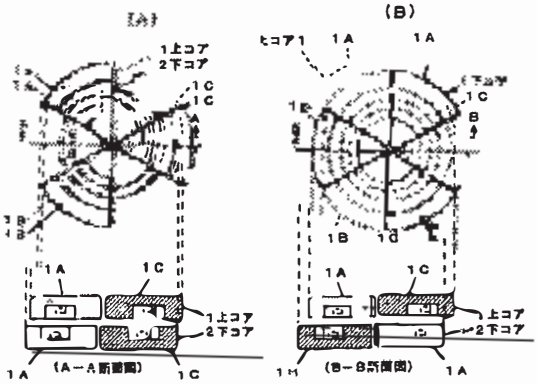
【図２】



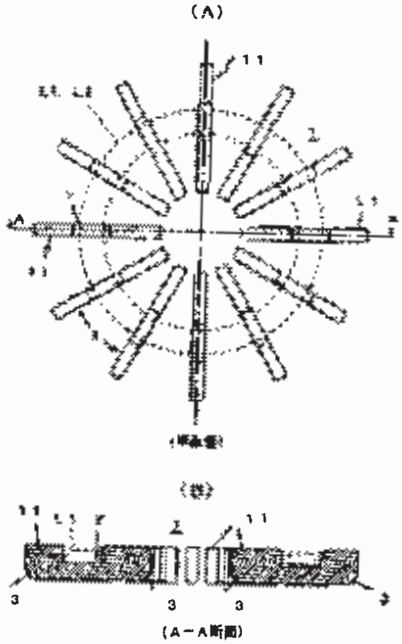
【図3】



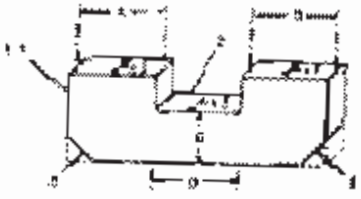
【図4】



【図5】

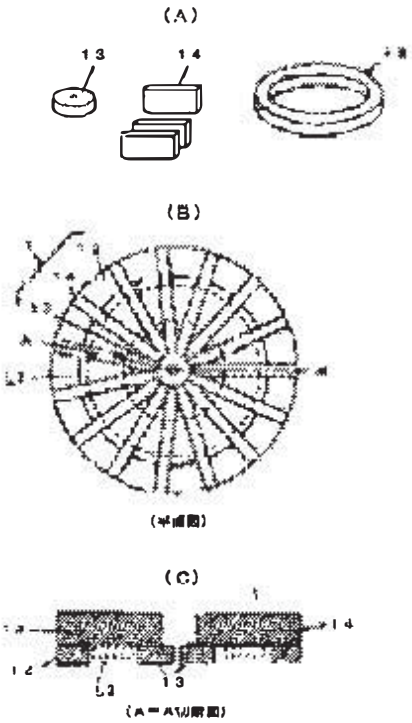


【図6】

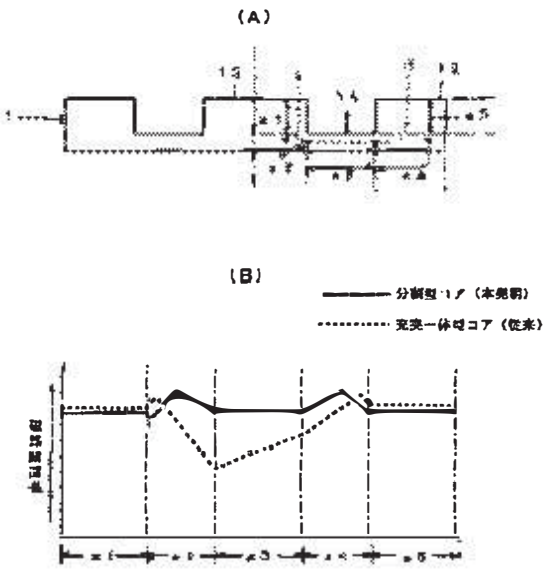


t1：Aでの平均厚
t2：Bでの平均厚
t3：Dでの平均厚

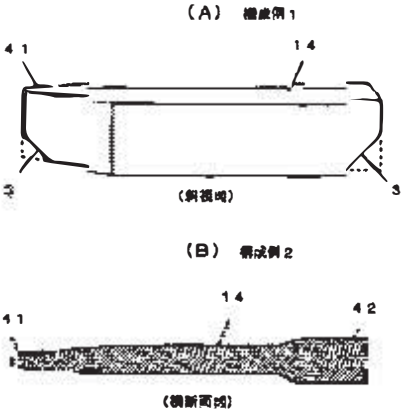
【図7】


(A)
13
14
(B)
(平面図)
(C)
12
13
(A-A'断面図)

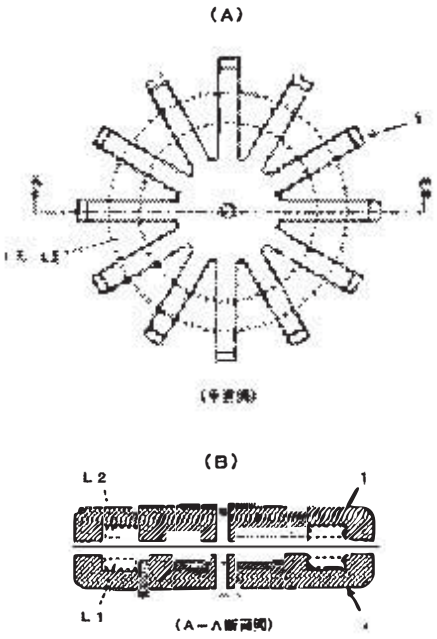
【図8】


(A)
13
14
(B)
分割型コア（本発明）
充実一体型コア（従来）

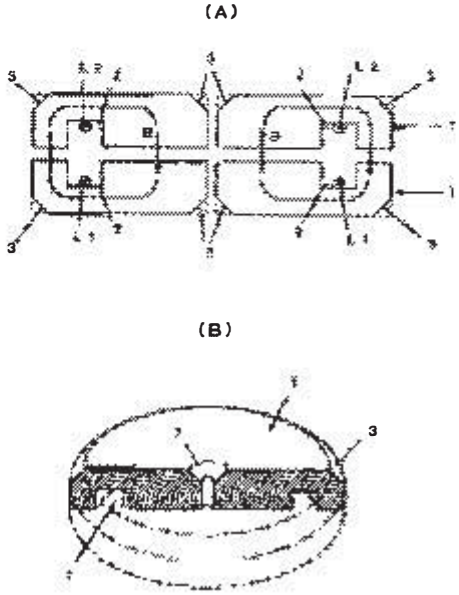
【図9】


(A) 構成例1
41
14
3
(斜視図)
(B) 構成例2
41
14
42
(横断面図)

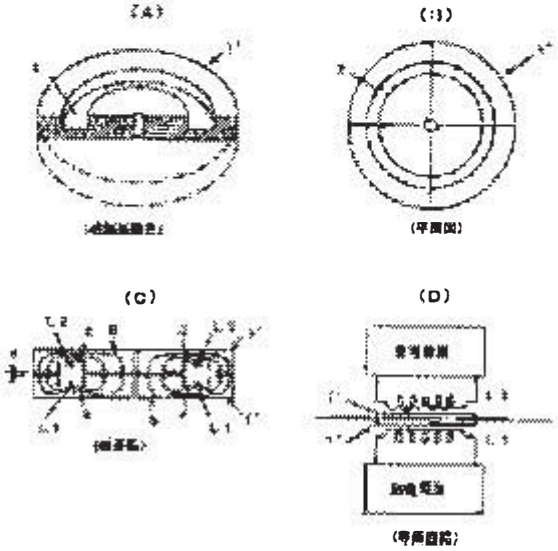
【図10】


(A)
(平面図)
(B)
L2
1
L1
(A-A断面図)

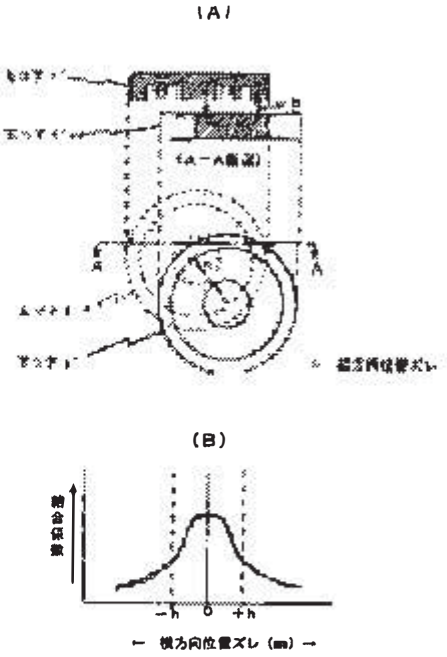
【図11】



【図12】



【図13】



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NON-CONTACT COUPLER

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Applicant(s): FDK CORP ± (FDK CORP)

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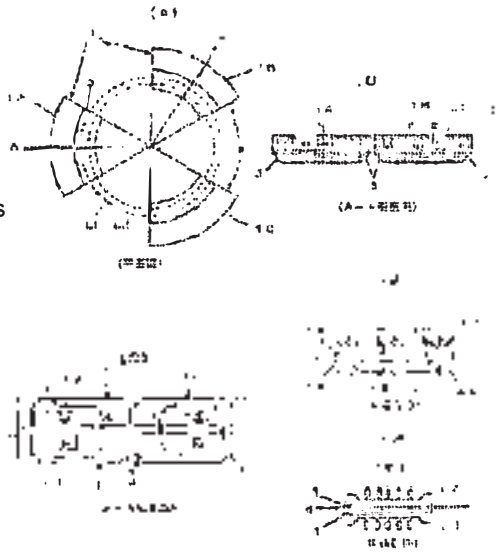
Abstract of JP2002246248 (A)

PROBLEM TO BE SOLVED: To secure performance, at the same time, to reduce weight, and to give room to the alignment of primary and secondary sides for improving ease of use in a non-contact coupler for transmitting power by magnetic coupling between the primary and secondary sides. SOLUTION: A portion at least at mutually opposing sides of primary- and secondary-side magnetic cores 1 and 1 is divided for forming, and at the same time clearance for forming a spatial magnetic circuit (g) is included between division formation portions.



Notice

DESCRIPTION JP2002246248

[0001]

[Field of the Invention] relates to a non-contact coupler of the present invention is a magnetic coupling system, for example, a technique which is effectively utilized to do the feeding or charging of the electric equipment such as an electric car in a non-contact.

[0002]

As a means for performing [ART] electric vehicles and electric bicycle, or a feeding or charging of the other electrical equipment in a non-contact, non-contact coupler magnetic coupling system is provided.

[0003]

Figure 12 is a configuration example of a conventional non-contact coupler, (A) a magnetic core 1 'cutaway perspective view of a, (B) is its plan view, (C) is the core 1' a non-contact coupler with sectional view of, (D) shows an equivalent circuit diagram thereof, respectively. Contactless coupler shown in the figure, a pair of disc-shaped magnetic core 1 forming a U-shaped open magnetic circuit '. 1' as well as wound in distributed to the primary coil L1 and the secondary coil L2, both cores 1 ', 1' by the back close opposed to the open magnetized surface side between (gap d) to form an annular closed magnetic path B, and causes the power transmission of alternating current (high frequency) between the primary coil L1 and the secondary coil L2 . In this case, the core primary coil L1 is wound 1 'corresponds to the primary side of the transformer, the core secondary coil L2 is wound one' corresponds to the secondary side of the transformer the transformer. By the primary side and the secondary side, which is brought close opposite place the gap d, though operating as a single transformer.

[0004]

Each magnetic core 1 ', 1' in order to respectively closely perform magnetic coupling between the primary side and the secondary side, ie in order to ensure a high coupling coefficient between the primary side and the secondary side, the entire it has been done for the non enhancement integral structure of the gap (so-called solid structure). Thus, the magnetic path B between the primary side and the secondary side, with the exception of the portion of the gap d, and all the magnetic core 1 ', 1' are formed in a state of being confined to the interior of the (above, JP- See Akira 2000-150273).

[0005]

The present invention is, however, in the above-described techniques, to be in the following problems have been clarified by the present inventors. In other words, the primary side and the magnetic core 1 of enhancement integral shape the magnetic path B between the secondary side ', 1' is completely confine the configuration described above in both the magnetic core 1 ', 1' forced to face is the same each other it is possible to obtain a high coupling coefficient when the, as shown in (A) (B) in Fig. 13, both the magnetic core 1 ', 1' when the horizontal position displacement (lateral displacement) h is generated between, the coupling coefficient is greatly reduced by the lateral deviation. When the degree of change in the coupling coefficient due to the lateral deviation is large, the alignment between the primary side and the secondary side becomes critically, usability of the contactless coupler is deteriorated.

[0006]

Moreover, the majority by weight of the non-contact coupler occupies magnetic core, but the magnetic core 1 described above ', 1' can not avoid from becoming heavy because the whole is substantial integral form without clearance, This has been a major obstacle in reducing the weight of the non-contact couplers.

[0007]

This invention has been made in view of the problems described above, the first object is a non-contact coupler to be lightweight while maintaining its performance. Second object, in addition to the above first object, the alignment of the primary and secondary sides of the non-contact coupler by a margin is to improve the usability. In addition, objects and features other than the above-mentioned present invention will become apparent from the description and the accompanying drawings.

[0008]

To achieve the above object [Means for Solving the Problems], the present invention provides the following means. That is, the first aspect of the present invention, as well as wound by distributing the primary and secondary coils in the pair of magnetic cores which form a U-shaped open magnetic circuit respectively, both the core opening magnetized surface side to each other in by closely oppoded by forming an annular closed magnetic path, in a non-contact coupler for causing the power transfer exchange between primary and secondary coils, and at least facing each other of the magnetic cores of the primary side and the secondary side as well as split form part of the side, and is characterized in that it is interposed a gap that forms a spatial magnetic path (magnetic path formed in a space) between the divided forming parts.

[0009]

According to the first means, the magnetic coupling between the primary core and a secondary core, not only the leading end surface of each divided portion formed, so that takes place in a wide range across its side. In other words, now facing area of the core in between the primary and secondary sides with be expanded effectively, the magnetic circuit of the (same direction as the winding) the original or the magnetic path and the vertical direction is blocked, As a result, even if the lateral deviation both cores to each other, it is possible to maintain the magnetic coupling of the primary and secondary sides. At the same time, the entire core is lighter by divided form the core. Thus, the in that a non-contact coupler and the first objective of is lightweight while maintaining its performance, the alignment of the primary and secondary sides of the non-contact coupler by a margin improves usability No. it is possible to achieve two objectives together.

[0010]

Second means, the means of the first means, as well as formed by a plurality of core members each magnetic core of the primary side and the secondary side, respectively, that it is interposed the gap between the core member I characterized. This makes it possible to improve the productivity of the magnetic core in order to achieve the above object.

[0011]

Third means, in the first or cooond means. thereby forming a respective magnetic core of the primary side and the secondary side in the fan-shaped core member, respectively, the fan-shaped gap of the core member the same shape between each core member and characterized in that it is interposed. Thus, while achieving the rationalization of the production due to the use of core members having the same shape, it is possible to obtain the same effect as in the case of the second means.

[0012]

Fourth means is characterized In that in any one of the means of the first 1 to 3, is formed by a plurality of elongated core member disposed engine magnetic core of the primary side and the secondary side radially, respectively. Also in this section, as in the second or third means, it is possible to obtain an effect that can increase the productivity of the magnetic core in order to achieve the above object.

[0013]

Fifth means, in said fourth means, wherein the elongated core member is a plate shape having a whole uniform thickness, Thus, the core member when formed by press-molding and sintering, it is possible to improve the stability of the homogeneity and properties of the core member by optimizing the conditions during molding and firing.

[0014]

The sixth means is the means of the first 1 to 5, so as to form the same odd core members engine-arranged respectively isometric intervals each magnetic core of the primary side and the secondary side, the primary side and the secondary side of

each core member is disposed so as to overlap the gap between the opposing sides of the core member, respectively, it is characterized in that it has so as to form a magnetic coupling between the primary side and the secondary side in this arrangement. This makes it possible to further alleviate the deterioration degree of the coupling coefficient with respect to the lateral displacement in a specific direction.

[0015]

Seventh means, as well as wound by distributing the U-shaped primary coil to the pair of magnetic cores which form an open magnetic circuit and secondary coil, respectively, by closely opposed to both cores in the open magnetized surface side to each other By forming the annular closed magnetic path, in a non-contact coupler for causing the power transfer exchange between primary and secondary coils, respectively, the magnetic core of the primary side and the secondary side, an annular outer peripheral side core member, and it is characterized in that it is formed by a disk-like inner circumference side core member, and a number of intermediate core members which are circle radially disposed while bridging between the two core members.

[0010]

According to the measure of the seventh, reducing the variation in the cross-sectional area in the magnetic path direction while the core lighter, that is, to reduce the core loss by improving the magnetic path balance. This makes it possible to effectively achieve the first object.

[0017]

Eighth means, in the seventh means, characterized by forming the inner circumferential end of each of the intermediate core member in a tapered shape. Thus, it is possible to optimize the weight and the magnetic path balance of the core.

[0018]

Means ninth, the means of the seventh or 8, characterized in that it has widened the outer peripheral end of the intermediate core member. In this case also, similarly to the eighth means, it can be optimized for weight reduction and the magnetic path balance of the core.

[0019]

The tenth means, as well as wound by distributing the U-shaped primary coil to the pair of magnetic cores which form an open magnetic circuit and secondary coil, respectively, by closely opposed to both cores in the open magnetized surface side to each other By forming the annular closed magnetic path, in a non-contact coupler for causing the power transfer exchange between primary and secondary coils, and chamfer forming a non-facing side corner portions of the magnetic cores of the primary side and the secondary side It is characterized in that.

[0020]

According to the tenth means, it is possible to achieve a core weight ie the weight of the non-contact coupler by removing the portion where the magnetic flux density is sparse, to achieve a reduction in the core loss by magnetic path balance improvement be able to. This makes it possible to achieve the first object.

[0021]

DETAILED DESCRIPTION OF THE INVENTION FIG. 1 shows a first embodiment of a non-contact coupler according to the present invention. Contactless coupler in this embodiment, the same figure (A) (B) as shown in (C), primary and secondary, respectively fan each magnetic core 1, 1 (the opening = 45 °) core member 1A, 1B, so as to form at 1C, each core member 1A, 1B, and are the core member and the same shape of the fan-shaped gap (g = 75 degrees) is interposed between 1C, Each core member 1A, 1B, 1C in order to form a U-shaped open magnetic circuit, respectively, U-shaped cutout portion 2 is formed on one side.

[0022]

The primary side of the core member 1A, 1B, 1C and the secondary side of the core member 1A, 1B, 1C respectively, are brought close opposed open magnetized surface side to each other by forming an annular closed magnetic path B, the primary coil L1 It will form a non-contact coupler for causing the power transmission of alternating current between the secondary coil L2 (high frequency) and. In this case, both the core member 1A-1A of the primary side and the secondary side, 1B-1B, by being magnetically coupled to form a 1C-1C are paired respectively, shown in the same figure (D) or (E) I form a transformer equivalent circuit as.

[0023]

In this way, the magnetic path as well as dividing forms a side portion of at least facing each other on the primary side and the secondary side of each magnetic core 1, 1, which is formed in a space magnetic path (space between the split forming part) contactless coupler is interposed a gap (g) forming a is formed. This non-contact coupler, by the amount of the fan-shaped gap (g = 75 degrees), the weight of the core 1,1 has been weight loss.

[0024]

Each core member 1A, 1B, non-facing side corner of the 1C are pre chamfered. Sign 3 shows the chamfered portion. By forming the chamfer portion 3, with the core 1, 1 is further lighter, breakage of the core edges are less likely to occur. Although the ferrite magnetic core member produced by pressure molding and sintering is mainly used drawback Therefore ferrite magnetic material is generally brittle, edge end portion is easily broken in their production and transport, or assembling or the like Although there is said chamfer 3 is also effective for the prevention of the breakage. In addition, a large ferrite core, as well it is difficult to perform pressurization at pressure molding uniformly, there are difficulties in manufacturing such a crack tends to occur during firing, these difficulties, a core as described above and it can be solved by dividing form.

[0025]

Figure 2 shows the change in status of the characteristic with respect to the lateral displacement of the non-contact coupler shown in FIG, In the figure, the solid line characteristic curve of a non-contact coupler according to the invention shown in Figure 1, the broken line indicates respectively the characteristic curve of a conventional non-contact coupler shown in Figure 12. As shown in the figure, the contactless coupler shown in Figure 1, as compared with the prior art, the self-inductance and mutual inductance of the coils L1, L2 has become generally low, respectively, but the primary core and two Inductance decrease the degree at which the position of the next-side core is deviated in the lateral direction is significantly smaller than that of the prior art, In addition, the coupling coefficient between the primary coil L1 and the secondary coil L2, but are not so different in average as compared with the prior art, a change with respect to the lateral displacement (position shift in the transverse direction) can be greatly reduced There it was found.

[0026]

Figure 3 shows the state of the spatial magnetic path In the case where the above-mentioned lateral displacement (h) in a non-contact coupler shown in Figure 1 caused schematically. What As shown, when the magnetic core 1, 1 of the primary and secondary sides are dividedly formed, the magnetic coupling between the primary side core 1 and the secondary side core 1, the split core members 1A, 1B, not only the front end face of 1C, it is to be performed in a wide range across both the distal end surface and side. This, along with the effective opposing area of the core 1, 1 between the primary side and the secondary side is enlarged, and the effective opposing area is to be maintained even if the lateral deviation of (h). Moreover, now that the magnetic circuit of the (same direction as the winding) inherent magnetic path in the vertical direction is blocked, as a result, even if the lateral deviation both cores to each other, the magnetic of the primary side and the secondary side it is possible to maintain binding. At the same time, the entire core is lighter by divided form the core.

[0027]

Thus, along with the non-contact couplers can be lightweight while maintaining its performance, the alignment of the primary and secondary sides of the non-contact coupler by a margin to be able to improve the usability Become.

[0028]

Each of (A) and (B) Fig. 4 illustrates an example of formation of the non-contact couplers with magnetic cores 1 and 1 shown in FIG. In the figure, the magnetic core 1, 1 on the primary side and the secondary side are both the core member 1A of the same odd that engine-arranged at equiangular intervals (3), 1B, which is formed by 1C. In this case, the core member 1A constituting the primary side, that is on the core 1, 1B, 1C and the secondary-side or core member A, which forms the lower core 1, 1B, the positional relationship between and 1C, in the same figure (A) or As shown in (B), it is possible in two ways schemes.

[0029]

That is, in the method shown in (A), the core member 1A that forms the upper core 1, 1B, and 1C, the core member 1A that forms the lower core 1, 1B, and the 1C, are arranged so as to overlap in the vertical direction, I'm sure that the distance between the primary side and the secondary side so as to form a non-contact coupler to be magnetically coupled with this arrangement.

[0030]

In the system shown in (B), the core member 1A that forms the upper core 1, 1B, 1C and a core member 1A that forms the lower core 1, 1B, respectively and 1C, a gap opposite sides of the core member are arranged so as to overlap, it has to form a non-contact coupler to magnetic coupling between the primary side and the secondary side in this arrangement.

[0031]

Here, in the method shown in (B), the rate of decrease in facing area of the core portion when the upper and lower cores 1 and 1 is shifted in the direction (h) an arrow small, whereby the arrow Method (h) It is characterized in that it is possible to further alleviate the deterioration degree of the coupling coefficient with respect to the lateral displacement. Thus, in applications where large lateral displacement is expected in the direction of the arrow (h), it is preferable to form a non-contact coupler in place method as shown in (B).

[0032]

Figure 5 shows a second embodiment of a non-contact coupler according to the present invention. To explain by focusing on differences from the first embodiment, the non-contact coupler of the second embodiment, as shown in Fig (A) (B), the magnetic core of the primary side and the secondary side 1,1 are formed by a plurality of elongated core member 11 which is circle arranged radially, respectively. Each elongate core member 11, as shown in Figure 6, the overall (A, B, D section) plate and is formed in a shape (t1 = t2 = t3) having a uniform thickness. The core member 11 having such a shape is advantageous to carry out pressure molding uniformly, therefore, to improve the stability of the homogeneity and properties of the core member by optimizing the conditions during molding and firing I can. Further, each core member 11 forms an open magnetic path of the U-shape respectively, the area at the both end faces of the U-shaped open magnetic circuit (t1 × A, t2 × B, t3 × C) are the same Align the (t1 × A = t2 × D = t3 × C) it is possible to reduce optimized to core loss magnetic path balance in the core member 11.

[0033]

Figure 7 shows a third embodiment of a non-contact coupler according to the present invention. Contactless coupler in this embodiment, by using three kinds of core members 12, 13, 14 shown in the drawing (A), to use a magnetic core 1 assembled as shown in Fig. (B) (C) . In the magnetic core 1, an annular outer periphery the core member 12, a disk-like Inner circumference side core member 13 a number of intermediate core member 14 disposed engine radial and while bridging between two core members 12 and 13, It is formed. Thus, reducing the variation in the cross-sectional area of the core 1 in a magnetic path direction while lighter, that it is possible to reduce the core loss by improving the magnetic path balance.

[0034]

8 shows a state of the magnetic path cross-sectional area of the core 1 shown in FIG. The core 1 shown in FIG. 7, the outer circumferential-side core member 12, the inner circumferential-side core member 13, the intermediate core member 14 to form a U-shaped open magnetic circuit. The U-shaped open magnetic circuit, as shown in (A) of FIG. 8, but can be divided into sections a1~a5. the magnetic path cross-sectional area of each section a1~a5 is, in Fig. (B) It is as solid line graph. In FIG. (B), the broken line in the graph indicates the state of the magnetic path cross-sectional area of the corresponding portion of the conventional integrated core shown in Figure 11. As can be seen from comparison of both graphs, the core 1 shown in FIG. 7, the magnetic path cross-sectional area by selecting the outer peripheral-side core member 12, the inner peripheral side core member 13, each of the intermediate core member 14 shapes and sizes change (step) can be made small, which makes it possible to reduce the core loss to obtain a good magnetic path balance.

[0035]

Figure 9 shows a preferred embodiment of the intermediate core member 14. The intermediate core member 14 shown in perspective in Figure (A) of the inner peripheral end (the member 14 side) of the tapered portion 41 is formed thereon. The intermediate core member 14 shown in cross-sectional view in Fig (A), in addition to the tapered portion 41, the widening section 42 is formed on the outer peripheral side end (member 12 side). Shape in the solid line of FIG. 8, but is changing discontinuously the magnetic path cross-sectional area at the boundary of the section a1 and a2, the discontinuous change is shown respectively in (A) (B) in FIG. 9 The intermediate core member 14 can be mitigated by the use.

[0036]

Figure 10 shows a fourth embodiment of a non-contact coupler according to the present invention. This embodiment, as shown in Fig. (A) (B), there is provided in which divided form only opposite side portions of the magnetic core 1, 1, and the entire core 1 a continuous integrated shape. In this configuration, it is possible to achieve the first and second object.

[0037]

(A) (B) of FIG. 11 shows a fifth embodiment of a contactless coupler in accordance with the present invention. This embodiment, as shown in Fig. (A) (B), and only there is only chamfered the non-facing side corner portions of a conventional disc-shaped magnetic core (12), providing the chamfer 3 But, it is possible to measure the weight of the non-contact coupler, and a reduction in core loss by the magnetic path balance improvement.

[0038]

As has been described, according to the present invention, according to the contactless coupler according to the present invention, as well as separately formed at least opposite side portions to one another of each magnetic core of the primary side and the secondary side of the divided forming part By interposing the clearance to form a space magnetic path therebetween, while the non-contact coupler to ensure its performance and can be lighter, further, a margin for alignment of the primary and secondary sides of the non-contact couplers it is possible to improve the usability is imparted.

[0039]

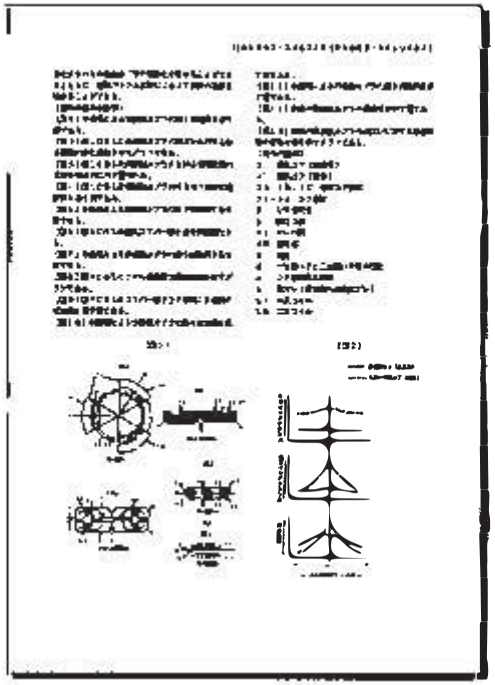
In addition, each of the respective magnetic cores of the primary side and the secondary side, a number of intermediate cores radially to the placement engine with bridged ring outer-side core member, a disc-shaped inner circumference side core member, and between the core members By forming in a member, it is possible to reduce the core loss by improving the magnetic path balance.

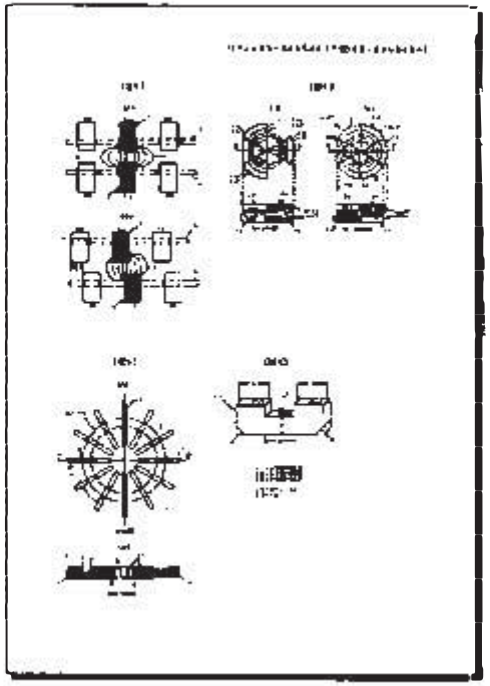
Further, by chamfering forming a non-facing side corner portions of the magnetic cores of the primary side and the secondary side, it is possible to reduce the weight ie the weight of the non-contact coupler core, the core loss by magnetic path balance improvement it is possible to measure the reduction.

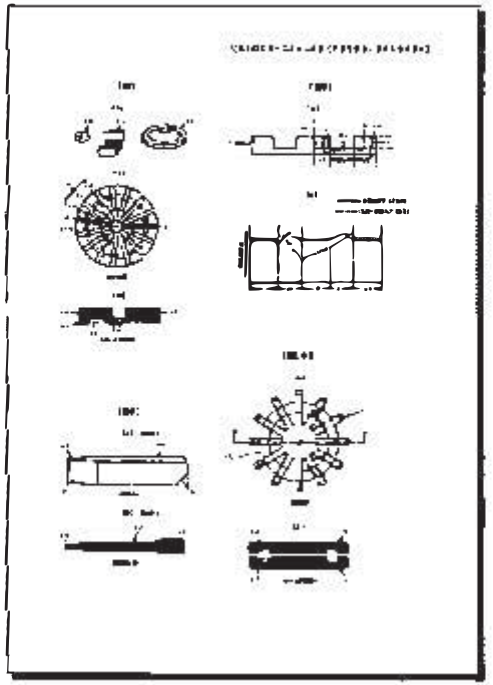
Notice

CLAIMS JP2002246248

In addition to wound distributes the U-shaped primary coil to the pair of magnetic cores which form an open magnetic circuit and secondary coil, respectively, the both cores is closer opposite the open magnetized surface side to each other to to form an annular closed magnetic path By, in a non-contact coupler for causing the power transfer exchange between primary and secondary coils, as well as split forming at least opposite side portions with each other in the magnetic core of the primary side and the secondary side, and each of the divided contactless coupler, characterized in that it is interposed a gap that forms a spatial magnetic path between the formation part. In the invention of claim 1, a non-contact coupler, characterized in that as well as formed by a plurality of core members each magnetic core of the primary side and the secondary side, respectively, and it is interposed with the gap between the core member. In the invention of claim 1 or 2, so as to form with the fan-shaped core member and the magnetic core of the primary side and the secondary side, respectively, that it is interposed a fan-shaped gap of the core member the same shape between each core member non-contact coupler characterized. Contactless coupler, wherein in any one invention of claims 1 to 3, that is formed by a plurality of elongated core member disposed engine magnetic core of the primary side and the secondary side radially, respectively. Contactless coupler in the invention of claim 4, wherein said elongated core member is a plate shape having a whole uniform thickness. In one aspect of claims 1 to 5, so as to form the same odd core member which is circle arranged at each equiangular intervals each magnetic core of the primary side and the secondary side, the primary side and the secondary side contactless coupler core members each are arranged so as to overlap the gap between the opposing sides of the core member, characterized in that it has so as to form a magnetic coupling between the primary side and the secondary side In this arrangement. In addition to wound distributes the U-shaped primary coil to the pair of magnetic cores which form an open magnetic circuit and secondary coil, respectively, the both cores is closer opposite the open magnetized surface side to each other to to form an annular closed magnetic path By, in a non-contact coupler to carry out the power transfer exchange between primary and secondary coils, respectively, the magnetic core of the primary side and the secondary side, an annular outer peripheral side core member, the inner circumference side disc-like contactless coupler, characterized in that the core member, and between the core members is formed of a crosslinked with a number of intermediate core members disposed engine radially while. In the invention of claim 7, the non-contact couplers, characterized in that the inner peripheral end of each of the intermediate core member is formed in a tapered shape. In the invention of claim 7 or 8, the non-contact couplers, characterized in that it has widened the outer peripheral end of each of the intermediate core member. Along with the wound and distributes a U-shaped primary coil to a pair of magnetic core to form an open magnetic path and a secondary coil in each, both core is closely opposed in the open magnetized surface side between annular of a closed magnetic circuit By forming the is characterized in that in a non-contact coupler for causing the power transfer exchange between primary and secondary coils, and chamfer forming a non-facing side corner portions of the magnetic cores of the primary side and the secondary side non-contact coupler.







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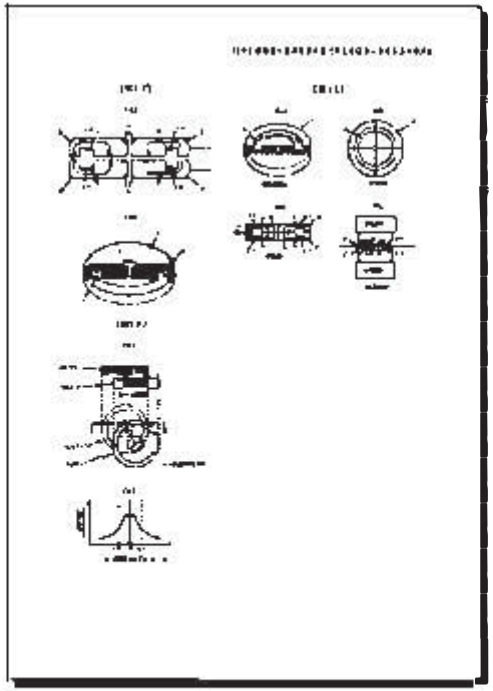

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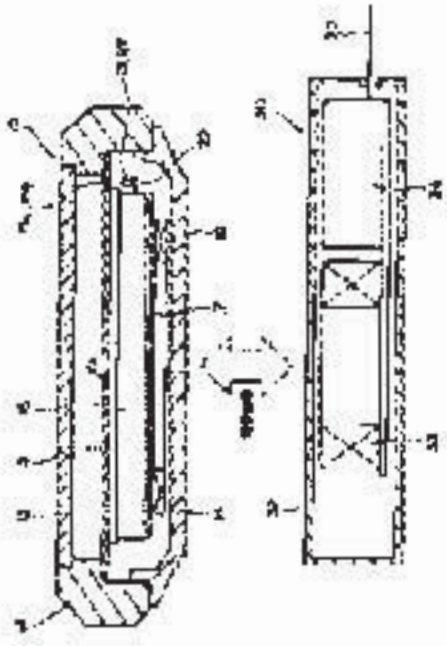
最終頁に続く

(54)【発明の名称】　電磁誘導充電式携帯時計

(57)【要約】
【課題】　電磁誘導充電式の携帯時計において、外部磁界の影響を受けないようにするとともに、時計ケース内の二次電池の充電を可能とする。
【解決手段】　時計ケース１２内に設けるムーブメント１６の裏蓋１４側に、円板状の磁気シールド板１７を介して環状の二次コイル１８を配置する。そして、充電時には、充電器３０上に載せ、その充電器内の一次コイル３３の磁束で電磁誘導により二次コイル１８に電流を発生し、時計ケース１２内の二次電池を充電する。



【特許請求の範囲】
【請求項１】　時計ケース内に設けるムーブメントの裏蓋側に二次コイルを配置し、充電時に充電器上に載せ、その充電器内の一次コイルの磁束で電磁誘導により前記二次コイルに電流を発生し、時計ケース内の二次電池を充電する電磁誘導充電式携帯時計において、前記ムーブメントと前記二次コイルとの間に磁気シールド板を配置してなる、電磁誘導充電式携帯時計。
【請求項２】　前記磁気シールド板の外周を、前記ムーブメントを囲むように設けてなる、請求項１に記載の電磁誘導充電式携帯時計。
【請求項３】　前記磁気シールド板の外周を、前記二次コイルを囲むように設けてなる、請求項１に記載の電磁誘導充電式携帯時計。
【請求項４】　前記磁気シールド板を前記時計ケース内の中枠で直に固定してなる、請求項１、２または３に記載の電磁誘導充電式携帯時計。
【請求項５】　前記磁気シールド板を前記ムーブメントで直に固定してなる、請求項１、２または３に記載の電磁誘導充電式携帯時計。
【請求項６】　前記磁気シールド板を前記時計ケースで直に固定してなる、請求項１、２または３に記載の電磁誘導充電式携帯時計。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】この発明は、時計ケース内に設けるムーブメントの裏蓋側に二次コイルを配置し、充電時に充電器上に載せ、その充電器内の一次コイルの磁束で電磁誘導により二次コイルに電流を発生し、時計ケース内の二次電池を充電する電磁誘導充電式腕時計などの電磁誘導充電式の携帯時計に関する。
【０００２】
【従来の技術】従来、例えばアナログ式の電子腕時計では、それを磁界中に置くと、ステップモータに外部磁束が加わり、止まりを生じたり進みや遅れを生じたりしてステップモータが誤動作し、運針が正常に行われないことがあった。このため、裏蓋自体を磁性材でつくったり、裏蓋に磁性材を貼り付けたりして、耐磁性を高めていた。
【０００３】一方、時計ケース内に設けるムーブメントの裏蓋側に二次コイルを配置し、充電時に充電器上に載せ、その充電器内の一次コイルの磁束で電磁誘導により二次コイルに電流を発生し、時計ケース内の二次電池を充電する電磁誘導充電式腕時計が提案されている。
【０００４】
【発明が解決しようとする課題】しかしながら、このような電磁誘導充電式腕時計にあっては、耐磁性を高めるべく、裏蓋自体を磁性材でつくったり、裏蓋に磁性材を貼り付けたりすると、一次コイルの磁束が二次コイルに達しなくなり、二次電池を充電することができなくなる問題があった。
【０００５】そこで、この発明は、電磁誘導充電式腕時計などの電磁誘導充電式の携帯時計において、外部磁界の影響を受けないようにするとともに、時計ケース内の二次電池の充電を可能とすることにある。
【０００６】
【課題を解決するための手段】そのため、請求項１に記載の発明は、時計ケース内に設けるムーブメントの裏蓋側に二次コイルを配置し、充電時に充電器上に載せて電磁誘導により該二次コイルに電流を発生し、時計ケース内の二次電池を充電する電磁誘導充電式携帯時計において、ムーブメントと二次コイルとの間に磁気シールド板を配置してなる、ことを特徴とする。
【０００７】請求項２に記載の発明は、そのような請求項１に記載の電磁誘導充電式携帯時計において、磁気シールド板の外周を、ムーブメントを囲むように設けてなる、ことを特徴とする。
【０００８】請求項３に記載の発明は、上述した請求項１に記載の電磁誘導充電式携帯時計において、磁気シールド板の外周を、二次コイルを囲むように設けてなる、ことを特徴とする。
【０００９】請求項４に記載の発明は、上述した請求項１、２または３に記載の電磁誘導充電式携帯時計において、磁気シールド板を時計ケース内の中枠で直に固定してなる、ことを特徴とする。
【００１０】請求項５に記載の発明は、上述した請求項１、２または３に記載の電磁誘導充電式携帯時計において、磁気シールド板をムーブメントで直に固定してなる、ことを特徴とする。
【００１１】請求項６に記載の発明は、上述した請求項１、２または３に記載の電磁誘導充電式携帯時計において、磁気シールド板を時計ケースで直に固定してなる、ことを特徴とする。
【００１２】
【発明の実施の形態】以下、図面を参照しつつ、この発明の実施の形態につき説明する。図１には、この発明による電磁誘導充電式腕時計の概略構成とその腕時計の充電を行う充電器の概略構成を示す。図中符号１０は電磁誘導充電式腕時計であり、３０は充電器である。
【００１３】腕時計１０は、通常のように、時計ケース１２の表側にガラス１３を固着し、裏側に裏蓋１４をねじ付けてなる。裏蓋１４は、非磁性材で、つまりプラスチックや、強磁性体でない金属を用いてつくる。
【００１４】時計ケース１２内には、文字板１５を取り付けたムーブメント１６を収納するとともに、ムーブメント１６の裏蓋１４側に円板状の磁気シールド板１７を挟んで環状の二次コイル１８を配置する。すなわち、ムーブメント１６と二次コイル１８との間に磁気シールド板１７を配置してなる。
【００１５】この例では、ムーブメント１６に、回路基

板２０を設ける。■路基板２０上には、赤色のＬＥＤ２１と緑色のＬＥＤ２２とを各々この腕時計１０の時刻表示側に向け直付けして取り付ける。図２に示すように、文字板１５の６時側には、小さな間隙を隔てて表示孔１５ａ・１５ｂを並べてあける。そして、それらの表示孔１５ａ・１５ｂを通して両ＬＥＤ２１・２２の点灯状態をそれぞれ外から容易に確認できるようにしてなる。図２中符号２４は時針、２５は分針、２６は秒針であり、２７は日付窓である。

【００１６】図３には、図示腕時計１０の充電回路を示す。この図３から判るとおり、ムーブメント１６には、赤色のＬＥＤ２１と直列で、緑色のＬＥＤ２２とは並列に二次電池２８を設ける。

【００１７】一方、充電器３０には、図１に示すとおり、偏平な箱型ケース３２内に環状の一次コイル３３と充電器回路３４を備える。充電器回路３４からは、電源コード３５を引き出してなる。

【００１８】そして、いまこの充電器３０を用いて腕時計１０の充電を行うときは、図１に示すように、裏蓋１４側を下にして腕時計１０を充電器３０上に載せ、何かを基準として位置決めしてともに環状の一次コイル３３と二次コイル１８の軸心を一致させる。

【００１９】そして、通電することにより生ずる一次コイル３３の磁束で、電磁誘導により二次コイル１８に電流を発生する。これにより、図３に示すように、赤色のＬＥＤ２１と二次電池２８にＩｂの電流が流れ、緑色のＬＥＤ２２にＩｃの電流が流れる。

【００２０】図４に示すとおり、電流Ｉｂは時間ｔの経過とともに小さくなるが、電流Ｉｃは時間ｔの経過とともに大きくなる。そして、二次電池２８の充電が不十分なときは、赤色のＬＥＤ２１は点灯するが、電流Ｉｂがａ以下となって十分に充電されたときは非点灯となる。逆に、はじめ非点灯であった緑色のＬＥＤ２２は、電流Ｉｃがａ以上となると、点灯するようになっている。

【００２１】ところで、上述した図示例では、磁気シールド板１７を円板状に形成したが、折り曲げたり取り付けたりして図５に示すように磁気シールド板１７の外周に鍔部１７ａをつくり、その鍔部１７ａでムーブメント１６を囲むように設けるとよい。このようにすると、磁気シールド板１７でムーブメント１６を囲むことにより、ムーブメント１６に対する磁気シールド効果を一層高めることができる。

【００２２】また、同じく折り曲げたり取り付けたりして、図６に示すように、磁気シールド板１７の外周に鍔部１７ｂをつくり、その鍔部１７ｂで二次コイル１８を囲むように設けるとよい。このようにすると、磁束が磁気シールド板１７の外周を通って充電器３０側に戻る磁気回路を形成し、ムーブメント１６側に漏れる磁束を少なくすることができる。

【００２３】さて、図７には、この発明による電磁誘導充電式腕時計で用いる磁気シールド板１７の保持構造の一例を示す。磁気シールド板１７は、この図７に示すように、時計ケース１２内の中枠４０で周縁を保持して直に固定する。中枠４０は、例えば時計ケース１２内でムーブメント１６を固定するものである。

【００２４】なお、上述した例では、磁気シールド板１７は、時計ケース１２内の中枠４０で直に固定したが、中枠４０に限らず、ムーブメント１６や時計ケース１２で直に固定するようにしてもよい。また、直に固定しなくても、他部材を介してそれらで固定するようにしてもよい。

【００２５】

【発明の効果】以上説明したとおり、この発明によれば、電磁誘導により充電して使用する電磁誘導充電式携帯時計において、ムーブメントと二次コイルとの間に磁気シールド板を配置するから、非磁性材を用いて裏蓋をつくっても、磁気シールド板でムーブメントが外部磁界の影響を受けないようにすることができ、また外部より電磁誘導により充電を行うことができる。

【００２６】請求項２に係る発明によれば、磁気シールド板の外周を、ムーブメントを囲むように設けるから、ムーブメントに対する磁気シールド効果を一層高めることができる。

【００２７】請求項３に係る発明によれば、磁気シールド板の外周を、二次コイルを囲むように設けるから、磁束が磁気シールド板の外周を通って充電器側に戻る磁気回路を形成し、ムーブメント側に漏れる磁束を少なくすることができる。

【００２８】請求項４ないし６に係る発明によれば、磁気シールド板を中枠やムーブメントや時計ケースで直に固定するから、部品点数を増やすことなく、磁気シールド板を固定することができ、また組立も容易とすることができる。

【図面の簡単な説明】

【図１】この発明による電磁誘導充電式腕時計の概略構成とその腕時計の充電を行う充電器の概略構成を示す説明図である。

【図２】その腕時計で用いる文字板を針とともに示す平面図である。

【図３】その腕時計で用いる充電回路図である。

【図４】その充電回路を流れる電流と充電時間の関係曲線図と、ＬＥＤの点灯状態説明図である。

【図５】この発明による他の電磁誘導充電式腕時計の概略構成とその腕時計の充電を行う充電器の概略構成を示す説明図である。

【図６】この発明によるさらに他の電磁誘導充電式腕時計の概略構成とその腕時計の充電を行う充電器の概略構成を示す説明図である。

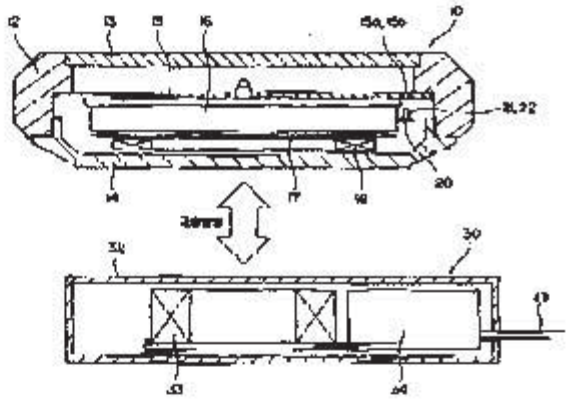
【図７】この発明によるまたさらに他の電磁誘導充電式腕時計の概略構成とその腕時計の充電を行う充電器の概

略構成を示す説明図である。

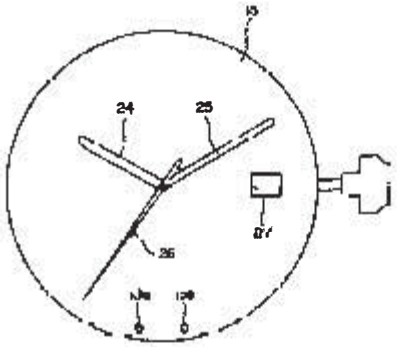
【符号の説明】

１０	腕時計
１２	時計ケース
１３	ガラス
１４	裏蓋
１５	文字板
１５ａ	表示孔
１５ｂ	表示孔
１６	ムーブメント
１７	磁気シールド板
１７ａ	鍔部
１７ｂ	鍔部
１８	二次コイル
２０	回路基板
２１	赤色のＬＥＤ
２２	緑色のＬＥＤ
２８	二次電池
３０	充電器
３２	ケース
３３	一次コイル
３４	充電器回路
３５	電源コード
４０	中枠

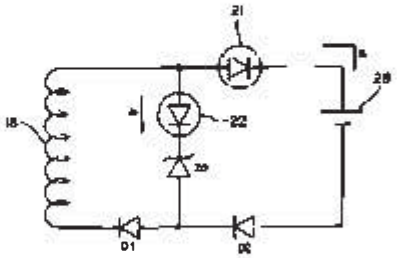
【図１】



【図２】



【図３】



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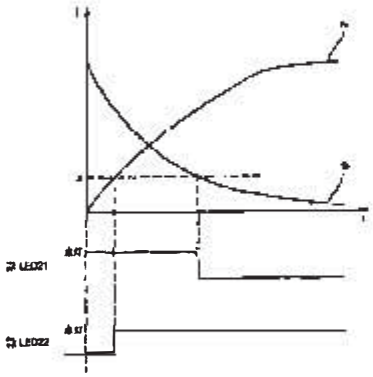

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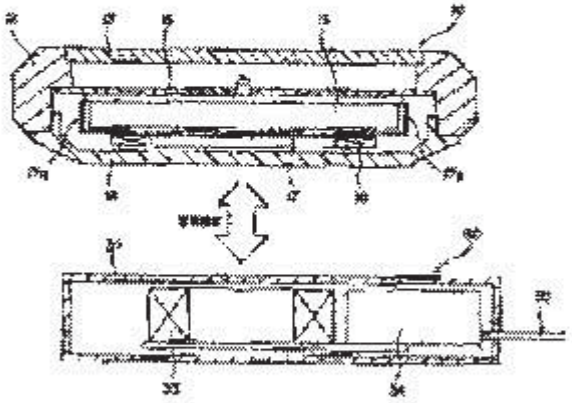

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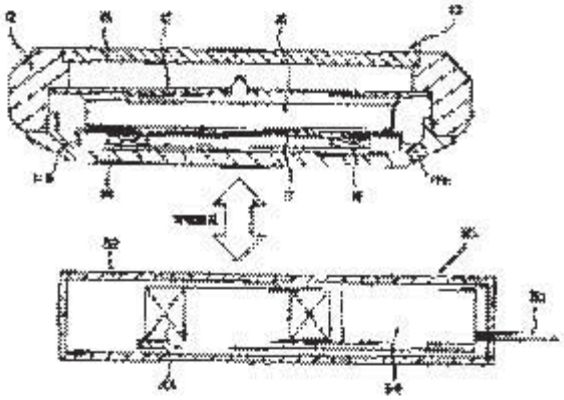
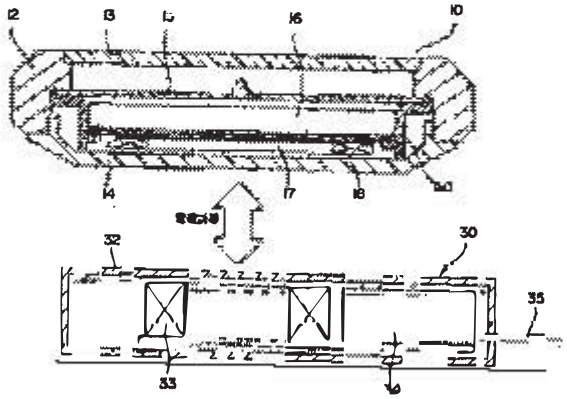


【図7】



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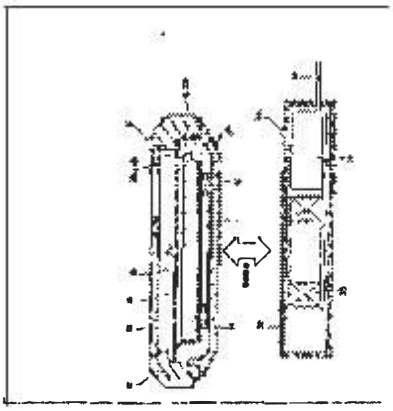

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(54)ELECTROMAGNETIC INDUCTION CHARGE TYPE WATCH

(57)Abstract
PROBLEM TO BE SOLVED: To eliminate an influence affected by an external magnetic field, and to allow the charge for a secondary battery in a watch case.
SOLUTION: An annular secondary coil 18 is arranged on the backcover 14 side of a movement 16 provided in the watch case 12 via a disklike magnetic shield plate 17. When charged, the case with the secondary coil 18 is mounted on a battery charger 30 to generate a current in the secondary coil 18 by electromagnetic induction by a magnetic flux of a primary coil 33 inside the charger, and the secondary battery inside the case 12 is charged thereby.

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CLAIMS

[Claim(s)]

[Claim 1]A secondary coil is arranged to the rear lid side of a movement provided in a watch case, In electromagnetic induction rechargeable watch which carries on a battery charger at the time of charge, generates current in the aforementioned secondary coil by electromagnetic induction in magnetic flux of a primary coil in the battery charger, and charges a rechargeable battery within a watch case, Electromagnetic induction rechargeable watch which arranges a magnetic shield plates between the aforementioned movement and the aforementioned secondary coil.

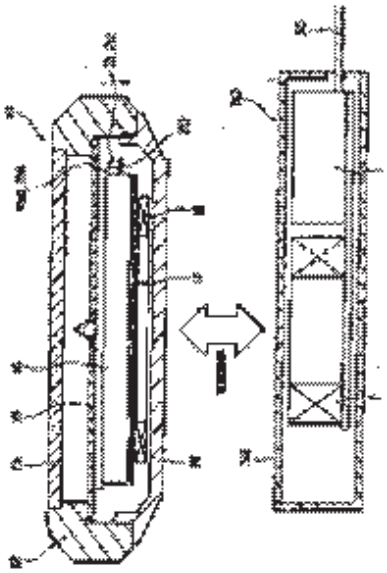
[Claim 2]The electromagnetic induction rechargeable watch according to claim 1 which provides a periphery of the aforementioned magnetic shield plates so that the aforementioned movement may be surrounded.

[Claim 3]The electromagnetic induction rechargeable watch according to claim 1 which provides a periphery of the aforementioned magnetic shield plates so that the aforementioned secondary coil may be surrounded.

[Claim 4]The electromagnetic induction rechargeable watch according to claim 1, 2, or 3 which fixes the aforementioned magnetic shield plates soon with a cheek middle flask within the aforementioned watch case.

[Claim 5]The electromagnetic induction rechargeable watch according to claim 1, 2, or 3 which fixes the aforementioned magnetic shield plates soon by the aforementioned movement.

[Claim 6]The electromagnetic induction rechargeable watch according to claim 1, 2, or 3 which fixes the aforementioned magnetic shield plates soon with the aforementioned watch case.



Representative drawing

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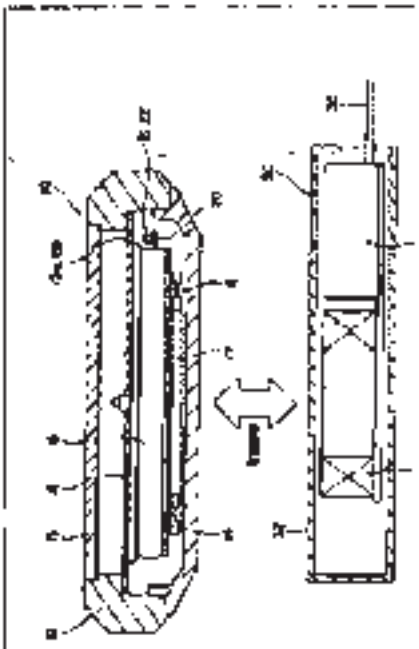
DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention arranges a secondary coil to the rear lid side of the movement provided in a watch case, it carries on a battery charger at the time of charge, current is generated in a secondary coil by electromagnetic induction in the magnetic flux of the primary coil in the battery charger, and it is related with electromagnetic induction rechargeable watch, such as an electromagnetic induction rechargeable wrist watch which charges the rechargeable battery within a watch case.
[0002]
[Description of the Prior Art]In a conventional, for example, analog,-type electronic wrist watch, when it was placed into the magnetic field, external magnetic flux was added to the step motor, the stop was produced, or progress and delay were produced, the step motor malfunctioned, and movement might not be performed normally. For this reason, the rear lid itself was built with the magnetic material, or the magnetic material was stuck on the rear lid, and it was improving antimagnetic.
[0003]On the other hand, a secondary coil is arranged to the rear lid side of the movement provided in a watch case, it carries on a battery charger at the time of charge, current is generated in a secondary coil by electromagnetic induction in the magnetic flux of the primary coil in the battery charger, and the electromagnetic induction rechargeable wrist watch which charges the rechargeable battery within a watch case is proposed.
[0004]
[Problem to be solved by the invention]However, when the rear lid itself was built with the magnetic material or the magnetic material was stuck on the rear lid in order to improve antimagnetic if it was in such an electromagnetic induction rechargeable wrist watch, the magnetic flux of a primary coil stops having reached the secondary coil, and there was a problem it becomes impossible to charge a rechargeable battery.
[0005]Then, in electromagnetic induction rechargeable watch, such as an electromagnetic induction rechargeable wrist watch, there is this invention in enabling charge of the rechargeable battery within a watch case while keeping it from being subject to the influence of an external magnetic field.
[0006]
[Means for solving problem]Therefore, the invention according to claim 1 arranges a secondary coil to the rear lid side of the movement provided in a watch case, it carries on a battery charger at the time of charge, current is generated in the secondary coil by electromagnetic induction, and magnetic shield plates are arranged between a movement and a secondary coil in the electromagnetic induction rechargeable watch which charges the rechargeable battery within a watch case.
[0007]In such electromagnetic induction rechargeable watch according to claim 1, the invention according to claim 2 provides the periphery of magnetic shield plates so that a movement may be surrounded.
[0008]In the electromagnetic induction rechargeable watch according to claim 1 mentioned above, the invention according to claim 3 provides the periphery of magnetic shield plates so that a secondary coil may be surrounded.
[0009]In the electromagnetic induction rechargeable watch according to claim 1, 2, or 3 mentioned above, the invention according to claim 4 fixes magnetic shield plates soon with the cheek middle flask within a watch case.



Representative drawing

[0010]In the electromagnetic induction rechargeable watch according to claim 1, 2, or 3 mentioned above, the invention according to claim 5 fixes magnetic shield plates soon by a movement.

[0011]In the electromagnetic induction rechargeable watch according to claim 1, 2, or 3 mentioned above, the invention according to claim 6 fixes magnetic shield plates soon with a watch case.

[0012]

[Mode for carrying out the invention]Hereinafter, it describes per this embodiment of the invention, referring to Drawings. The schematic structure of the electromagnetic induction rechargeable wrist watch by this invention and the schematic structure of a battery charger which performs charge of that wrist watch are shown in Fig.1. The code 10 in the figure is an electromagnetic induction rechargeable wrist watch, and 30 is a battery charger.

[0013]Like usual, the wrist watch 10 fixes the glass 13 to the side front of the watch case 12, and comes to **** the rear lid 14 on the back side. The rear lid 14 is a nonmagnetic material, that is, it builds it using a plastic and the metal which is not ferromagnetics.

[0014]In the watch case 12, while storing the movement 16 which attached the dial window 15, on both sides of the disc-like magnetic shield plates 17, the annular secondary coil 18 is arranged at the rear lid 14 side of the movement 16. That is, the magnetic shield plates 17 are arranged between the movement 16 and the secondary coil 18.

[0015]In this example, the circuit board 20 is provided to the movement 16. On the circuit board 20, LED21 [red] and LED22 [green] are respectively turned to the time stamp side of this wrist watch 10, and direct attachment is carried out, and they are attached. As shown in Fig.2, a small gap is separated, and the display holes 15a and 15b are put in order, and it opens in the 6:00 side of the dial window 15. It becomes impossible and to check the lighting status of both LED21 and 22 easily from outside through those display holes 15a and 15b, respectively. The code 24 in Fig.2 is a hour hand, 25 is the minute hand, 26 is a second pointer, and 27 is the date window.

[0016]The charge circuit of the graphic display wrist watch 10 is shown in Fig.3. To the movement 16, it is as in-series as LED21 [red], and LED22 [green] provides the rechargeable battery 28 in parallel to it as this Fig.3 shows.

[0017]On the other hand, the battery charger 30 is equipped with the primary coil 33 annular in the flat core box case 32, and the battery-charger circuit 34 as shown in Fig.1. The power cord 35 is pulled out from the battery-charger circuit 34.

[0018]And when charging the wrist watch 10 using this battery charger 30 now, the rear lid 14 side is turned down, the wrist watch 10 is carried on the battery charger 30, and it positions on the basis of something, and makes the axis line of the annular primary coil 33 and the secondary coil 18 both correspond, as shown in Fig.1.

[0019]And current is generated in the secondary coil 18 by electromagnetic induction by energizing in the magnetic flux of the arising primary coil 33. Thereby, as shown in Fig.3, the current of Ib flows into LED21 [red] and the rechargeable battery 28, and the current of Ic flows into LED22 [green].

[0020]The current Ib becomes small with a lapse of the time t as shown in Fig.4, but the current Ic is enlarged with a lapse of the time t. And when charge of the rechargeable battery 20 is insufficient, LED21 [red] is turned on, but it becomes astigmatism light, when the current Ib becomes below in a and is charged sufficiently. On the contrary, LED22 [green] which was astigmatism until at first will be turned on if the current Ic becomes more than a.

[0021]By the way, in the illustrated example mentioned above, although the magnetic shield plates 17 were formed in disc-like, it is good to provide so that the flange 17a may be built on the periphery of the magnetic shield plates 17 as it bends or attaches and is shown in Fig.5, and the movement 16 may be surrounded by the flange 17a. If it does in this way, the magnetic shield effect over the movement 16 can be further heightened by surrounding the movement 16 with the magnetic shield plates 17.

[0022]As it similarly bends, or it attaches and it is shown in Fig.6, it is good to provide so that the flange 17b may be built on the periphery of the magnetic shield plates 17 and the secondary coil 18 may be surrounded by the flange 17b. If it does in this way, the magnetic circuit from which magnetic flux returns to the battery-charger 30 side through the periphery of the magnetic shield plates 17 can be formed, and magnetic flux which leaks to the movement 16 side can be lessened.

[0023]Now, an example of the holding structure of the magnetic shield plates 17 used with the electromagnetic induction rechargeable wrist watch by this invention is shown in Fig.7. As shown in this Fig.7, with the cheek middle flask 40 within the watch case 12, the magnetic shield plates 17 hold a periphery and fix it soon. The cheek middle flask 40 fixes the movement 16, for example within the watch case 12.

[0024]Although the magnetic shield plates 17 were soon fixed with the cheek middle flask 40 within the watch case 12, it may be made to fix them soon in the example mentioned above with not only the cheek middle flask 40 but the movement 16, or the watch case 12. Even if it does not fix soon, it may be made to fix them with other components.

[0025]

[Effect of the invention]In the electromagnetic induction rechargeable watch which is used according to this invention charging by electromagnetic induction as described above, Since magnetic shield plates are arranged between a movement and a secondary coil, even if it builds a rear lid using a nonmagnetic material, a movement can be prevented from being subject to the influence of an external magnetic field with magnetic shield plates, and it can charge by electromagnetic induction from outside.

[0026]According to invention concerning Claim 2, since the periphery of magnetic shield plates is provided so that a movement may be surrounded, the magnetic shield effect over a movement can be heightened further.

[0027]According to invention concerning Claim 3, since the periphery of magnetic shield plates

is provided so that a secondary coil may be surrounded, the magnetic circuit from which magnetic flux returns to the battery-charger side through the periphery of magnetic shield plates can be formed, and magnetic flux which leaks to the movement side can be lessened. [0028]According to invention concerning Claims 4-6, without increasing the number of parts, since magnetic shield plates are soon fixed with a cheek middle flask, a movement, or a watch case, magnetic shield plates can be fixed and an assembly can also be made easy.

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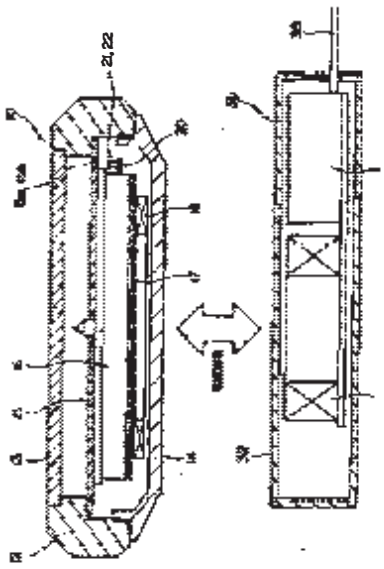
TECHNICAL FIELD

[Field of the Invention]This invention arranges a secondary coil to the rear lid side of the movement provided in a watch case, It carries on a battery charger at the time of charge, current is generated in a secondary coil by electromagnetic induction in the magnetic flux of the primary coil in the battery charger, and it is related with electromagnetic induction rechargeable watch, such as an electromagnetic induction rechargeable wrist watch which charges the rechargeable battery within a watch case.



Representative drawing

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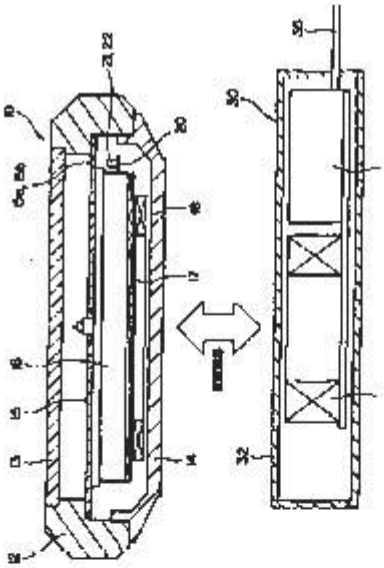
PRIOR ART

[Description of the Prior Art]In a conventional, for example, analog-type electronic wrist watch, when it was placed into the magnetic field, external magnetic flux was added to the step motor, the stop was produced, or progress and delay were produced, the step motor malfunctioned, and movement might not be performed normally. For this reason, the rear lid itself was built with the magnetic material, or the magnetic material was stuck on the rear lid, and it was improving antimagnetic.

[0003]On the other hand, a secondary coil is arranged to the rear lid side of the movement provided in a watch case, it carries on a battery charger at the time of charge, current is generated in a secondary coil by electromagnetic induction in the magnetic flux of the primary coil in the battery charger, and the electromagnetic induction rechargeable wrist watch which charges the rechargeable battery within a watch case is proposed.



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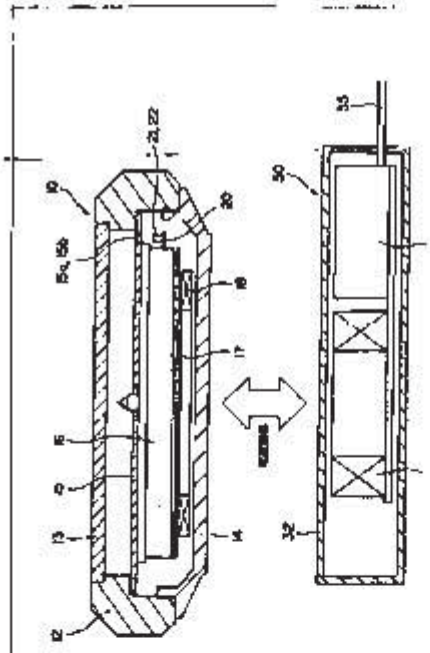
EFFECT OF THE INVENTION

[Effect of the Invention]In the electromagnetic induction rechargeable watch which is used according to this invention charging by electromagnetic induction as described above, Since magnetic shield plates are arranged between a movement and a secondary coil, even if it builds a rear lid using a nonmagnetic material, a movement can be prevented from being subject to the influence of an external magnetic field with magnetic shield plates, and it can charge by electromagnetic induction from outside.

[0026]According to invention concerning Claim 2, since the periphery of magnetic shield plates is provided so that a movement may be surrounded, the magnetic shield effect over a movement can be heightened further.

[0027]According to invention concerning Claim 3, since the periphery of magnetic shield plates is provided so that a secondary coil may be surrounded, the magnetic circuit from which magnetic flux returns to the battery-charger side through the periphery of magnetic shield plates can be formed, and magnetic flux which leaks to the movement side can be lessened.

[0028]According to invention concerning Claims 4-6, without increasing the number of parts, since magnetic shield plates are soon fixed with a check middle flask, a movement, or a watch case, magnetic shield plates can be fixed and an assembly can also be made easy.



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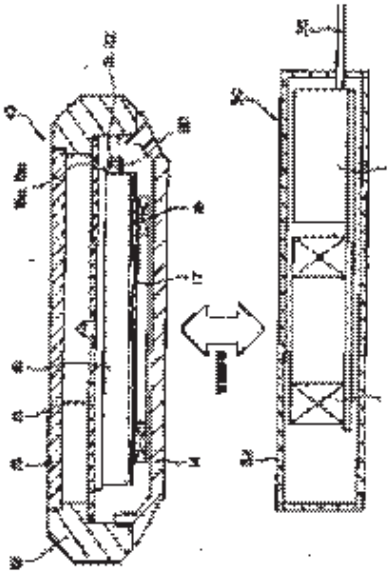
TECHNICAL PROBLEM

[Problem to be solved by the invention]However, when the rear lid itself was built with the magnetic material or the magnetic material was stuck on the rear lid in order to improve antimagnetic if it was in such an electromagnetic induction rechargeable wrist watch, the magnetic flux of a primary coil stops having reached the secondary coil, and there was a problem it becomes impossible to charge a rechargeable battery.

[0005]Then, in electromagnetic induction rechargeable watch, such as an electromagnetic induction rechargeable wrist watch, there is this invention in enabling charge of the rechargeable battery within a watch case while keeping it from being subject to the influence of an external magnetic field.



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MEANS OPERATION

[Means for solving problem]Therefore, the invention according to claim 1 arranges a secondary coil to the rear lid side of the movement provided in a watch case, it carries on a battery charger at the time of charge, current is generated in the secondary coil by electromagnetic induction, and magnetic shield plates are arranged between a movement and a secondary coil in the electromagnetic induction rechargeable watch which charges the rechargeable battery within a watch case.

[0007]In such electromagnetic induction rechargeable watch according to claim 1, the invention according to claim 2 provides the periphery of magnetic shield plates so that a movement may be surrounded.

[0008]In the electromagnetic induction rechargeable watch according to claim 1 mentioned above, the invention according to claim 3 provides the periphery of magnetic shield plates so that a secondary coil may be surrounded.

[0009]In the electromagnetic induction rechargeable watch according to claim 1, 2, or 3 mentioned above, the invention according to claim 4 fixes magnetic shield plates soon with the cheek middle flask within a watch case.

[0010]In the electromagnetic induction rechargeable watch according to claim 1, 2, or 3 mentioned above, the invention according to claim 5 fixes magnetic shield plates soon by a movement.

[0011]In the electromagnetic induction rechargeable watch according to claim 1, 2, or 3 mentioned above, the invention according to claim 6 fixes magnetic shield plates soon with a watch case.

[0012]

[Mode for carrying out the invention]Hereinafter, it describes per this embodiment of the invention, referring to Drawings. The schematic structure of the electromagnetic induction rechargeable wrist watch by this invention and the schematic structure of a battery charger which performs charge of that wrist watch are shown in Fig.1. The code 10 in the figure is an electromagnetic induction rechargeable wrist watch, and 30 is a battery charger.

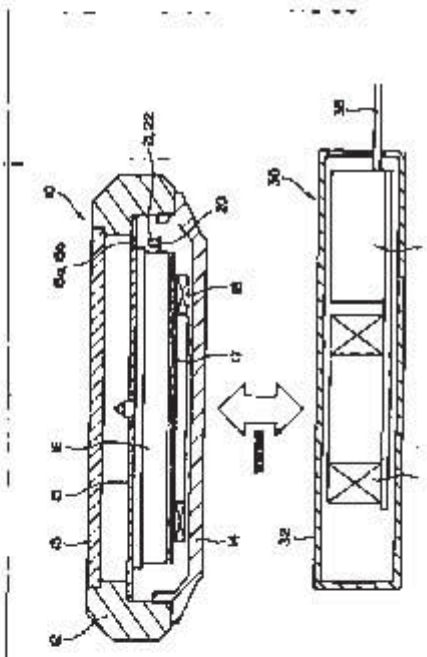
[0013]Like usual, the wrist watch 10 fixes the glass 13 to the side front of the watch case 12, and comes to **** the rear lid 14 on the back side. The rear lid 14 is a nonmagnetic material, that is, it builds it using a plastic and the metal which is not ferromagnetics.

[0014]In the watch case 12, while storing the movement 16 which attached the dial window 15, on both sides of the disc-like magnetic shield plates 17, the annular secondary coil 18 is arranged at the rear lid 14 side of the movement 16. That is, the magnetic shield plates 17 are arranged between the movement 16 and the secondary coil 18.

[0015]In this example, the circuit board 20 is provided to the movement 16. On the circuit board 20, LED21 [red] and LED22 [green] are respectively turned to the time stamp side of this wrist watch 10, and direct attachment is carried out, and they are attached. As shown in Fig.2, a small gap is separated, and the display holes 15a and 15b are put in order, and it opens in the 6:00 side of the dial window 15. It becomes impossible and to check the lighting status of both LED21 and 22 easily from outside through those display holes 15a and 15b, respectively. The code 24 in Fig.2 is a hour hand, 25 is the minute hand, 26 is a second pointer, and 27 is the date window.

[0016]The charge circuit of the graphic display wrist watch 10 is shown in Fig.3. To the movement 16, it is as in-series as LED21 [red], and LED22 [green] provides the rechargeable battery 28 in parallel to it as this Fig.3 shows.

[0017]On the other hand, the battery charger 30 is equipped with the primary coil 33 annular



Representative drawing

in the flat core box case 32, and the battery-charger circuit 34 as shown in Fig.1. The power cord 35 is pulled out from the battery-charger circuit 34.
[0018]And when charging the wrist watch 10 using this battery charger 30 now, the rear lid 14 side is turned down, the wrist watch 10 is carried on the battery charger 30, and it positions on the basis of something, and makes the axis line of the annular primary coil 33 and the secondary coil 18 both correspond, as shown in Fig.1.
[0019]And current is generated in the secondary coil 18 by electromagnetic induction by energizing in the magnetic flux of the arising primary coil 33. Thereby, as shown in Fig.3, the current of Ib flows into LED21 [red] and the rechargeable battery 28, and the current of Ic flows into LED22 [green].
[0020]The current Ib becomes small with a lapse of the time t as shown in Fig.4, but the current Ic is enlarged with a lapse of the time t. And when charge of the rechargeable battery 28 is insufficient, LED21 [red] is turned on, but it becomes astigmatism light, when the current Ib becomes below in a and is charged sufficiently. On the contrary, LED22 [green] which was astigmatism light at first will be turned on if the current Ic becomes more than a.
[0021]By the way, in the illustrated example mentioned above, although the magnetic shield plates 17 were formed in disc-like, it is good to provide so that the flange 17a may be built on the periphery of the magnetic shield plates 17 as it bends or attaches and is shown in Fig.5, and the movement 16 may be surrounded by the flange 17a. If it does in this way, the magnetic shield effect over the movement 16 can be further heightened by surrounding the movement 16 with the magnetic shield plates 17.
[0022]As it similarly bends, or it attaches and it is shown in Fig.6, it is good to provide so that the flange 17b may be built on the periphery of the magnetic shield plates 17 and the secondary coil 18 may be surrounded by the flange 17b. If it does in this way, the magnetic circuit from which magnetic flux returns to the battery-charger 30 side through the periphery of the magnetic shield plates 17 can be formed, and magnetic flux which leaks to the movement 16 side can be lessened.
[0023]Now, an example of the holding structure of the magnetic shield plates 17 used with the electromagnetic induction rechargeable wrist watch by this invention is shown in Fig.7. As shown in this Fig.7, with the cheek middle flask 40 within the watch case 12, the magnetic shield plates 17 hold a periphery and fix it soon. The cheek middle flask 40 fixes the movement 16, for example within the watch case 12.
[0024]Although the magnetic shield plates 17 were soon fixed with the cheek middle flask 40 within the watch case 12, it may be made to fix them soon in the example mentioned above with not only the cheek middle flask 40 but the movement 16, or the watch case 12. Even if it does not fix soon, it may be made to fix by them via other components.

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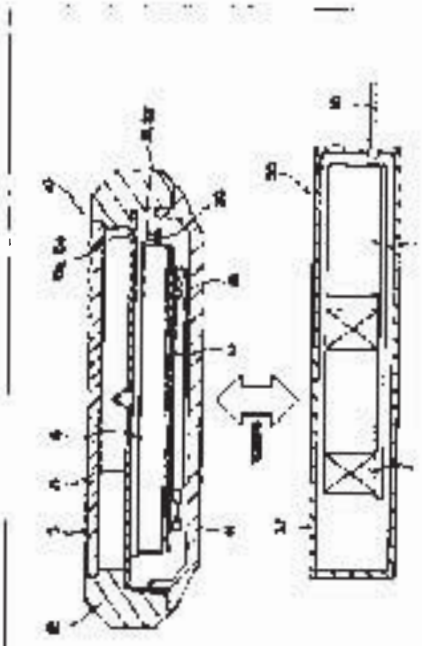
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is an explanatory view showing the schematic structure of the electromagnetic induction rechargeable wrist watch by this invention, and the schematic structure of a battery charger which performs charge of that wrist watch.
[Drawing 2]It is a plan view showing with a needle the dial window used with the wrist watch.
[Drawing 3]It is a charge circuit figure used with the wrist watch.
[Drawing 4]They are the current and the related curvilinear figure of charging time which flow through the charge circuit, and a lighting status explanatory view of LED.
[Drawing 5]It is an explanatory view showing the schematic structure of other electromagnetic induction rechargeable wrist watches by this invention, and the schematic structure of a battery charger which performs charge of that wrist watch.
[Drawing 6]Furthermore it is based on this invention, it is an explanatory view showing the schematic structure of other electromagnetic induction rechargeable wrist watches, and the schematic structure of a battery charger which performs charge of that wrist watch.
[Drawing 7]It is an explanatory view showing the schematic structure of a battery charger by this invention which performs charge of the schematic structure and wrist watch of other electromagnetic induction rechargeable wrist watches.
[Explanations of letters or numerals]
10 Wrist watch
12 Watch case
13 Glass
14 Rear lid
15 Dial window
15a Display hole
15b Display hole
16 Movement
17 Magnetic shield plates
17a Flange
17b Flange
18 Secondary coil
20 Circuit board
21 Red LED
22 Green LED
28 Rechargeable battery
30 Battery charger
32 Case
33 Primary coil
34 Battery-charger circuit
35 Power cord
40 Cheek middle flask



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