

LOCATING SEAT, LOCATING PIN, LOCATING MECHANISM, QUICK-CHANGE SUPPORT ASSEMBLY AND ELECTRIC AUTOMOBILE

This application claims the priority of Chinese patent applications 201910569887.9, 201910568751.6 and 201910569923.1, filed on June 27, 2019, the contents of which are incorporated herein by reference in their entirety.

Field of invention

The present invention relates to the field of power exchange equipment, in particular to a locating seat, a locating pin, a locating mechanism, a quick-change support assembly and an electric automobile.

Prior arts

The existing battery pack installation methods for electric automobile are generally divided into fixed and replaceable methods.

Wherein, the fixed battery pack is generally fixed in the automobile, and the automobile is directly used as the charging object when charging. The fixed battery pack is usually located by pins and fixed by bolts when connected to the automobile body. The location and fixing method has a good fixing effect and can basically ensure the fixation in X/Y/Z directions. However, the replacement of the battery pack shows a lot of clumsiness, which is not convenient for flexible disassembly of battery, at the same time, multiple disassembly of bolts will also increase the probability of bolt failure, which has a certain risk.

While the replaceable battery pack is generally installed in a movable way, and can be removed at any time and replaced with a new battery pack. At present, when the existing replaceable battery pack is connected to the automobile body, a locking mechanism is usually used between the battery pack and the automobile body; the locking mechanism generally includes a locking shaft generally arranged on the battery pack side and a locking seat generally arranged on the automobile body, and a slideway is arranged within the locking seat. The battery pack is generally installed from the bottom of the automobile body. The locking shaft along with the battery pack enters the slideway in the locking seat from below, and then the battery pack moves in the X direction in place to achieve the installation of the battery pack. However, in the installation method, the battery pack usually only is floating positioned, and does not be fixed after the float positioning, that is, the locking shaft can move in the X/Y/Z directions relative to the slideway. In this way, during the driving of the vehicle, the battery pack usually produces complex movements in the three directions of X/Y/Z,

resulting in a high failure rate of the battery pack, and it is difficult to determine the cause of the failure after the battery pack fails. In addition, due to the complex movement of the battery pack, when the force analysis of the battery pack is performed, the related force analysis is also very complicated.

In summary, in the current electric automobile, the fixed battery pack is inconvenient to disassemble, and the battery of the replaceable battery pack cannot be fixed in the X, Y, or Z directions, which makes the battery pack prone to failure.

Content of the present invention

The technical problem solved by the present invention is to overcome the defects in the prior art and provide a locating seat, a locating pin, a locating mechanism, a quick-change support assembly and an electric automobile.

The present invention solves the above technical problems through the following technical solutions:

The present invention provides a locating seat for locating and fixing the battery pack, the locating seat is used to accommodate the locating pin for fixing the battery pack, the side of the locating seat is provided with an opening and a slideway extending from the opening, the opening is used for the locating pin to enter the slideway; the slideway is provided with a first limiting part which is used to restrict the locating pin from separating from the locating seat along the axial direction.

In this solution, by adopting the above structure, the limitation on the moving direction of the locating pin is realized by utilizing the first limiting part, so that the locating pin cannot be separated from the locating seat along the axial direction thereof, and the battery pack using the locating pin is fixed in the axial direction. The solution reduces the movement direction of the battery pack, reduces the complexity of the movement state of the battery pack, helps to prolong the service life of the battery pack, and reduces the damage probability of the battery pack. Moreover, it is also conducive to analyze the reason why the battery pack fails.

Preferably, the slideway has a supporting platform which is used to support the locating pin, and the first limiting part is arranged on the supporting platform.

In this solution, by adopting the above structure, the supporting platform is used to realize the support of the locating pin, so that the locating pin is more stable.

Preferably, the section of the first limiting part is one of an arc shape, a V shape or a trapezoid shape.

In this solution, by adopting the above structure, the cross-section of the first limiting part is designed to be one shape of arc, V or trapezoid, which helps to the realization of the limit function of the locating seat, meanwhile simplifies the structural form of the first limiting part and improves the service cycle of the locating seat.

Preferably, the first limiting part is a convex part or a concave part;

Preferably, the convex part has a first limiting surface and a second limiting surface, and the intersection of the first limiting surface and the second limiting surface is the highest point of the convex part;

and/or, the first limiting surface and the second limiting surface are flat or curved.

In this solution, by adopting the above structure, the first limiting part is designed as a convex part or a concave part, which is beneficial to realize the limiting function of the locating seat, and at the same time simplifies the structural form of the first limiting part and prolongs the service life of the locating seat.

In this solution, by adopting the above structure, the convex part is designed as the first limiting surface and the second limiting surface, which simplifies the structural form of the convex part and occupies less space. In addition, the highest point of the convex part is conducive to improve the reliability of locating.

In this solution, by adopting the above structure, a flat or a curved surface is used to form the first limiting surface and the second limiting surface, which simplifies the structure of the first limiting surface and the second limiting surface.

Preferably, the locating seat further includes a cushion part, at least a part of the cushion part is located in the slideway, and when the locating seat is in the location state, the cushion part abuts against the wall surface of the locating pin;

preferably, the cushion part is an elastic pad.

In this solution, by adopting the above structure, the cushion part is used to absorb part of the kinetic energy when the locating pin is converted to the location state, which is beneficial to reduce the impact of the locating pin on the locating seat, reduce the noise when the locating pin is located, and improve the stability of the locating pin when it is in the location state.

In this solution, by adopting the above structure, the elastic pad is used as the cushion part, which reduces the cost of the cushion part and improves the cushion effect of the cushion part.

A locating seat is used for locating and fixing the battery pack, the locating seat comprises a locating seat body, and a side of the locating seat body is provided with an opening and a slideway extending from the opening, the opening is used for the locating pin of the battery pack entering the slideway; the locating seat further includes a clamping device which is arranged in the slideway, when the locating pin is at a location point, the clamping device abuts against the locating pin in the vertical direction.

In this solution, by adopting the above structure and providing the clamping device in the slideway, the locating pin at the location point is tightly clamped, thereby preventing the locating pin from moving in the vertical direction, thereby realizing the fixation of the locating pin in the vertical direction, and realizing the locating and fixation of the locating mechanism using the locating seat, the quick-change support assembly and the battery pack of the electric automobile in the vertical direction. This solution reduces the movement of the battery pack, reduces the complexity of the movement state of the battery pack, helps to improve the service life of the battery pack and reduces the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

Preferably, the clamping device is provided at the location point of the locating pin in the slideway.

In this solution, by adopting the above structure, the clamping device is arranged at the location point to make the locating pin more stable at the location point and reduce the probability of accidental movement of the locating pin at the location point.

Preferably, the clamping device includes a swing body and a fixed shaft, the fixed shaft is connected to the locating seat body, and the swing body can rotate around the fixed shaft; when the locating pin is at the location point, the swing body abuts against the outer wall of the locating pin;

preferably, the swing body has an arc surface, and the arc surface abuts against the outer wall of the locating pin;

and/or, when the locating pin does not enter the slideway, the swing body swings toward the entrance of the slideway;

and/or, the clamping device includes two clamping assemblies, each of the clamping assemblies includes one swing body and the fixed shaft, and the two clamping assemblies are symmetrically arranged on both sides of the slideway;

preferably, when the locating pin is located at the location point, the center line of the locating pin is coplanar with the center lines of the two fixed shafts;

preferably, the clamping device further includes an elastic part disposed between the locating seat body and the swing body, and the elastic part acts on the swing body so that when the swing body is not under force, the abutting surface of the swing body faces the direction into which the locating pin slides;

preferably, one end of the elastic part is inserted into the swing body, and the other end of the elastic part abuts against the locating seat body;

and/or, the elastic part is a spring.

In this solution, by adopting the above structure, the structure of the clamping device is simplified by using the swing body and the fixed shaft, the swing body can be rotated around the fixed shaft, which makes it easier for the swing body to switch to the location state, and improves the stability of the locating pin at the location point.

In this solution, by adopting the above structure, the arc surface of the swing body is used to abut the locating pin which improves the stability of the locating pin at the location point.

In this solution, by adopting the above structure, the swing body is swung toward the entrance, which makes it easier for the locating pin to enter the swing body, and improves the stability of the locating pin in the swing body.

In this solution, by adopting the above structure and using symmetrically arranged clamping assembly, when the locating pin is at the location point, the two sets of clamping assembly can clamp the locating pin at the same time, which improves the stability of the locating seat.

In this solution, by adopting the above structure, the center line of the locating pin and the center line of the two fixed shafts are designed to be coplanar, when the locating pin is at the location point, the distance between the locating pin and the two fixed shafts is the smallest, so that the two swing bodies clamp the locating pin more tightly, so that the axial force applied on the locating pins at this time is maximized, the locating pins are difficult to leave the location point, and the stability of the locating seat is improved.

In this solution, by adopting the above structure, the elastic part is used to make the swing body swings in the direction into which the locating pin slides, which facilitates the smooth sliding of the locating pin into the swing body, and further facilitates the clamping device to clamp the locating pin.

In this solution, by adopting the above structure, the elastic part is inserted into the

swing body and the locating seat body, which improves the stability of the elastic part, and is beneficial to apply elastic force to the swing body when the elastic part is replaced.

In this solution, by adopting the above structure, the use of springs simplifies the design form of the elastic part, prolongs the life of the elastic part, and reduces the use cost of the locating seat.

Preferably, the locating seat further includes a cushion part, at least a part of the cushion part is located in the slideway, and when the locating pin is at the location point, the cushion part abuts against the wall surface of the locating pin;

preferably, the cushion part is an elastic pad.

In this solution, by adopting the above structure, the cushion part is used to absorb part of the kinetic energy when the locating pin is converted to the location state, which is beneficial to reduce the impact of the locating pin on the locating seat, reduce the noise when the locating pin is located, and improve the stability of the locating pin at the location state.

In this solution, by adopting the above structure, the elastic pad is used as the cushion part, which reduces the cost of the cushion part and improves the cushion effect of the cushion part.

A locating pin, the locating pin is connected to the battery pack, and the locating pin is used to cooperate with the locating seat of at least one of the above, the locating pin is provided with a second limiting part which is used to cooperate with the first limiting part to limit the movement of the battery pack along the axial direction of the locating pin.

In this solution, by adopting the above structure, the second limiting part is used to cooperate with the first limiting part to improve the stability of the locating pin in the location state, so that the locating pin can be fixed in its axial direction, so as to realize the axial fixation of the battery pack using the locating pin. The solution reduces the moving direction of the battery pack, reduces the complexity of the moving state of the battery pack, helps to prolong the service life of the battery pack and reduces the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

Preferably, the first limiting part is a concave part, the second limiting part is a convex part, and the number of the second limiting parts is multiple, the multiple convex parts are arranged along the axial direction of the locating pin, or the multiple convex parts are arranged along the radial direction of the locating pin.

In this solution, by adopting the above structure, the convex part and the concave part are engaged with each other, which improves the stability of the locating pin in the location state. At the same time, multiple convex parts are arranged on the locating pin, which makes the locating pin more stable and not easy to leave the locating seat along its axial direction. It also avoids the change of the location state caused by the failure of a single convex part, and improves the safety factor of the locating pin.

Preferably, the second limiting part and the locating pin are an integral structure;

or, the second limiting part is detachably connected to the locating pin;

preferably, the second limiting part is sleeved on the locating pin;

preferably, the second limiting part is rotatable relative to the locating pin;

and/or, the locating pin further includes a shaft stop provided on the end surface of the locating pin, which is used to prevent the second limiting part from moving in the axial direction of the locating pin;

and/or, the second limiting part is a shaft sleeve which is in transition fit with the slideway.

In this solution, by adopting the above structure, the second limiting part and the locating pin are designed as an integral structure, which simplifies the manufacturing process of the locating pin and reduces the cost of the locating pin. The connection between the second limiting part and the locating pin is designed to be detachable, so that the second limiting part and the locating pin can be designed and manufactured separately, and the performance of the two is more in line with their respective use environments, which is beneficial to improve the quality of the locating pin.

In this solution, by adopting the above structure, the second limiting part is sleeved on the outside of the locating pin, so that the second limiting part can more fully cooperate with the first limiting part, and the stability of the locating pin in the locating state can be improved.

In this solution, by adopting the above structure, the second limiting part is designed to be rotatable, which reduces the resistance when the locating pin enters the slideway and is beneficial to improve the service life of the locating pin.

In this solution, by adopting the above structure, the shaft stop is used to prevent the second limiting part from moving in the axial direction, which improves the safety factor of the locating pin.

In this solution, by adopting the above structure, the use of the shaft sleeve that is in transition fit with the slideway makes the locating pin and the locating seat more stable, reducing the accidental movement of the locating pin.

A locating mechanism used for locating and fixing the battery pack, the locating mechanism includes the locating seat as described in at least one of the above and the locating pin as described in at least one of the above, and the locating pin is arranged on the battery pack, and the locating mechanism is used to restrict the battery pack from separating from the locating seat along the axial direction of the locating pin;

alternatively, the locating mechanism includes a locating pin and the locating seat as described in at least one of the above, the locating pin is arranged on the battery pack, and the locating pin enters the slideway from the opening.

In this solution, by adopting the above structure and using the mutual cooperation of the first limiting part of the locating seat and the second limiting part of the locating pin, the moving direction of the locating pin is limited, so that the locating pin can not be separated from the locating seat along its axial direction, so as to realize the axial fixation of the battery pack using the locating pin. The solution reduces the moving direction of the battery pack, reduces the complexity of the moving state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

In this solution, by adopting the above structure, the locating pin is fixed in the vertical direction by using the clamping device, so as to realize the fixation of the battery pack using the locating pin in the vertical direction. The solution reduces the moving direction of the battery pack, reduces the complexity of the moving state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

A quick-change support assembly for installing the battery pack, the quick-change support assembly includes a quick-change support, the quick-change support assembly further includes the locating mechanism as described above, and the locating seat is arranged on the quick-change support.

In this solution, by adopting the above structure and using the quick change support assembly including the locating seat, the battery pack located in the quick change support assembly cannot be separated from the quick change support along the axial direction of the locating pin, so as to realize the axial fixation of the battery pack using

the quick change support assembly. The solution reduces the moving direction of the battery pack, reduces the complexity of the moving state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

In this solution, by adopting the above structure and using the quick change support including the locating seat, the battery pack located in the quick change support assembly cannot be separated from the quick change support along the height direction, so as to realize the fixation of the battery pack using the quick change support assembly in the height direction. The solution reduces the moving direction of the battery pack, reduces the complexity of the moving state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

A quick-change support assembly for installing the battery pack to the electric automobile, the quick-change support assembly includes a quick-change support, a locking mechanism, and a locating mechanism, the locking mechanism and the locating mechanism are both arranged on the quick-change support, the locking mechanism is used to lock the battery pack on the electric automobile and restrict the battery pack from moving in a driving direction of the electric automobile; the locating mechanism is used to restrict the battery pack from moving in a direction perpendicular to the driving direction in the horizontal plane and/or restrict the battery pack from moving in the vertical direction.

In this solution, by adopting the above structure, the slideway locating mechanism and double swing locating mechanism are arranged in the quick change support assembly, which realizes the fixation of the battery pack in the driving direction of the electric automobile, the axial direction of the slideway pin and the vertical direction, this solution reduces the movement of the battery pack, reduces the complexity of the movement state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

Preferably, the locating mechanism includes a slideway locating mechanism which is used to restrict the movement of the battery pack in the direction perpendicular to the driving direction in the horizontal plane.

Preferably, the slideway locating mechanism comprises a slideway seat, which is connected to the quick change support for cooperating with the slideway pin on the

battery pack;

a side of the slideway seat is provided with an opening and a slideway extending from the opening, and the opening is used for allowing the slideway pin to enter the slideway;

The slideway of the slideway seat is provided with a first limiting part, and the slideway pin is provided with a second limiting part which is used to cooperate with the first limiting part to limit the movement of the battery pack along the axial direction of the slideway pin;

preferably, the slideway seat is arranged on the left side or the right side of the quick-change support;

and/or, the first limiting part is a convex part or the first limiting part is a concave part;

and/or, the first limiting part is a concave part, the second limiting part is a convex part, and the number of the second limiting parts is multiple, the multiple convex parts are arranged along the axial direction of the slideway pin, or the multiple convex parts are arranged along the radial direction of the slideway pin.

In this solution, by adopting the above structure, the slideway locating mechanism uses the first limiting part to limit the moving direction of the slideway pin, so that the slideway pin cannot be separated from the slideway seat along its axial direction, thereby realizing the axial fixation of the battery pack using the slideway pin. The solution reduces the movement of the battery pack, reduces the complexity of the movement state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

In this solution, by adopting the above structure, by arranging the slideway locating mechanism on the left or right side of the quick-change support, the battery pack can be fixed along the axial direction of the slideway pin, and it also avoids complicated installation of the battery pack and high locating accuracy requirements, which are caused by the simultaneous locating on both axial sides of the slideway pin.

In this solution, by adopting the above structure, the first limiting part is designed as a convex part or a concave part, which is beneficial to the realization of the limiting function of the slideway seat, and also simplifies the structural form of the first limiting part, and prolongs the service life of the slideway seat.

In this solution, by adopting the above structure, the convex part and the concave part are engaged with each other, which improves the stability of the slideway pin in the

location state. At the same time, multiple convex parts are arranged on the slideway pin, which makes the slideway pin more stable and not easy to leave the slideway seat along its axial direction. It also avoids the problem of the location state changing caused by the failure of a single convex part, and improves the safety factor of the slideway pin.

Preferably, the locating mechanism includes a double swing locating mechanism which is used to restrict the movement of the battery pack in the vertical direction;

Preferably, the double swing locating mechanism is symmetrically arranged on one or both of the left side and the right side of the quick-change support;

and/or, the double swing locating mechanism comprises a double swing seat and a double swing pin, the double swing seat is connected to the quick-change support, and the double swing pin is connected to the battery pack;

a side of the double swing seat is provided with an opening and a slideway extending from the opening, and the opening is used for allowing the double swing pin to enter the slideway;

the double swing seat also includes a clamping device arranged in the slideway, when the double swing pin is at the location point, the clamping device butts against the double swing pin in the vertical direction to limit the movement of the battery pack in the vertical direction.

In this solution, by adopting the above structure, the double swing locating mechanism is used to limit the movement of the battery pack in the vertical direction, which simplifies the structure of the quick-change support assembly, reduces the movement of the battery pack, reduces the complexity movement state of the battery pack, helps to prolong the service life of the battery pack and reduces the probability of damage to the battery pack.

In this solution, by adopting the above structure, the double swing locating mechanism is arranged on one side of the quick-change support, which realizes the restriction on the vertical movement of the battery pack, and the double swing locating mechanism is arranged on the two sides of the quick-change support to improve the stability of the battery pack.

In this solution, by adopting the above structure and providing a clamping device in the slideway, the double swing pin at the location point is tightly clamped, thereby preventing the double swing pin from moving in the vertical direction, thereby realizing the fixation of the double swing pin in the vertical direction, and realizing the locating

and fixation of the locating mechanism using the double swing seat, the quick-change support assembly and the battery pack of the electric automobile in the vertical direction, this solution reduces the movement of the battery pack, reduces the complexity of the movement state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

Preferably, the clamping device is provided at the location point of the double swing pin in the slideway, the clamping device includes a swing body and a fixed shaft connected to the double swing seat body, and the swing body can rotate around the fixed shaft; when the double swing pin is at the location point, the swing body abuts against the outer wall of the double swing pin;

preferably, the clamping device includes two clamping assembly, each of the clamping assemblies includes one swing body and the fixed shaft, and the two clamping components are symmetrically arranged on both sides of the slideway;

preferably, when the double swing pin is located at the location point, the center line of the double swing pin is coplanar with the center lines of the two fixed shafts;

and/or, the clamping device further includes an elastic part disposed between the double swing seat body and the swing body, the elastic part acts on the swing body so that when the swing body is not under force, an abutting surface of the swing body faces the direction into which the double swing pin slides, one end of the elastic part is inserted into the swing body, and the other end of the elastic part abuts against the double swing seat body.

In this solution, by adopting the above structure, the clamping device is arranged at the location point to make the double swing pin more stable at the location point and reduce the probability of accidental movement of the double swing pin at the location point. The structure of the clamping device is simplified by using the swing body and the fixed shaft, and the swing body can be rotated around the fixed shaft, which makes it easier for the swing body to switch to the location state, and improves the stability of the double swing pin at the location point at the same time.

In this solution, by adopting the above structure and using symmetrically arranged clamping assembly, when the double swing pin is at the location point, the two sets of clamping assembly can clamp the double swing pin at the same time, which improves the stability of the double swing pin.

In this solution, by adopting the above structure, the center line of the double swing pin

and the center line of the two fixed shafts are designed to be coplanar, when the double swing pin is at the location point, the distance between the double swing pin and the two fixed shafts is the smallest, so that the two swing bodies clamp the double swing pin more tightly, so that the axial force of the double swing pins at this time is maximized, the double swing pins are difficult to leave the location point, and the stability of the double swing pin is improved.

In this solution, by adopting the above structure, the elastic part is used to make the swing body swings toward the direction into which the double swing pin slides, which facilitates the smooth sliding of the double swing pin into the swing body, and further facilitates the clamping device to clamp the double swing pin. The elastic part is inserted into the swing body and the double swing seat body, which improves the stability of the elastic part, and is beneficial to apply elastic force to the swing body when the elastic part is replaced.

An electric automobile includes a battery pack and the quick-change support assembly as described in at least one of the above.

In this solution, by adopting the above structure and using the quick-change support assembly, the battery pack of the electric automobile can be fixed in the axial direction of the locating pin. The solution reduces the moving direction of the battery pack, reduces the complexity of the moving state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

In this solution, by adopting the above structure and using the quick-change support assembly, the battery pack of the electric automobile can be fixed in the height direction. The solution reduces the moving direction of the battery pack, reduces the complexity of the moving state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

In this solution, by adopting the above structure and using the quick-change support assembly, the battery pack of the electric automobile can be fixed in the vertical direction and the axial direction of the slideway pin. The solution reduces the moving direction of the battery pack, reduces the complexity of the moving state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

On the basis of conforming to the general knowledge in the art, the above preferred

conditions can be arbitrarily combined to obtain the better examples of the invention.

In the present invention, by arranging the first limiting part on the locating seat, the first limiting part is used to limit the movement direction of the locating pin, so that the locating pin cannot be separated from the locating seat along its axial direction, so as to realize the axial fixation of the battery pack using the locating pin. The invention reduces the moving direction in the height direction of the battery pack, reduces the complexity of the moving state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

Brief description of the drawings

Fig.1 is a structural schematic view of the locating seat according to Embodiment 1 of the present invention.

Fig.2 is another structural schematic view of the locating seat according to Embodiment 1 of the present invention.

Fig.3 is a structural schematic view of the A-A section of the locating seat according to Embodiment 1 of the present invention.

Fig.4 is a structural schematic view of the locating seat including a elastic pad according to Embodiment 1 of the present invention.

Fig.5 is a structural schematic view of the locating pin according to Embodiment 2 of the present invention.

Fig.6 is a structural schematic cross-section of the locating pin according to Embodiment 2 of the present invention.

Fig.7 is a structural schematic view of the locating mechanism according to Embodiment 3 of the present invention.

Fig.8 is a structural schematic cross-section of the locating mechanism according to Embodiment 3 of the present invention.

Fig.9 is a structural schematic view of the quick-change support assembly according to Embodiment 4 of the present invention.

Fig.10 is a structural schematic view of a battery pack assembly of an electric automobile according to Embodiment 5 of the present invention.

Fig.11 is a structural schematic view of the locating seat according to Embodiment 6 of

the present invention.

Fig.12 is another structural schematic view of the locating seat according to Embodiment 6 of the present invention.

Fig.13 is a structural schematic view of the locating mechanism according to Embodiment 7 of the present invention.

Fig.14 is a structural schematic cross-section of the locating mechanism according to Embodiment 7 of the present invention.

Fig.15 is another structural schematic cross-section of the locating mechanism according to Embodiment 7 of the present invention.

Fig.16 is a structural schematic view of a locating pin of the locating mechanism according to Embodiment 7 of the present invention.

Fig.17 is a structural schematic view of the quick-change support assembly according to Embodiment 8 of the present invention.

Fig.18 is a structural schematic view of a battery pack assembly of an electric automobile according to Embodiment 9 of the present invention.

Fig.19 is a structural schematic view of the quick-change support assembly according to Embodiment 10 of the present invention.

Fig.20 is a structural schematic view of a slideway locating mechanism in the quick-change support assembly according to Embodiment 10 of the present invention.

Fig.21 is a structural schematic view of the double swing locating mechanism in the quick-change support assembly according to Embodiment 10 of the present invention.

Fig.22 is a structural schematic view of a battery pack assembly of an electric automobile according to Embodiment 11 of the present invention.

Description of reference signs in the drawings:

Embodiment 1-Embodiment 5: locating seat 1; slideway 11; supporting platform 111; opening 12; concave part 13; first limiting surface 131; second limiting surface 132; elastic pad 14; locating pin 2; pin seat 21; pin shaft 22; shaft sleeve 23; shaft stop 24; locating mechanism 3; quick-change support assembly 4; quick-change support 41; battery pack assembly 5; battery pack 51.

Embodiment 6-Embodiment 9: locating seat 10; locating seat body 101; slideway 11; opening 12; clamping device 13; clamping assembly 130; swing body 131; fixed shaft 132; elastic pad 14; spring 15; locating pin 20; locating mechanism 30; quick-change support assembly 40; quick-change support 41; battery pack assembly 50; battery pack 51.

Embodiment 10-Embodiment 11: quick-change support assembly 10; quick-change support 11; locking mechanism 20; slideway locating mechanism 30; slideway seat 31; slideway 11; slideway pin 32; shaft sleeve 23; double swing locating mechanism 40; double swing seat 41; double swing pin 42; battery pack assembly 60; battery pack 61.

Detailed description of the preferred embodiment

The present invention is further described below by means of embodiments, but does not therefore limit the present invention to the scope of the embodiments.

Embodiment 1

As shown in Fig. 1-Fig. 4, this embodiment is a locating seat 1 for locating and fixing the battery pack, the locating seat 1 is used to accommodate the locating pin for fixing the battery pack, a side of the locating seat 1 is provided with an opening 12 and a slideway 11 extending from the opening 12, and the opening 12 is used for the locating pin to enter the slideway 11; the slideway 11 is provided with a first limiting part, which is used to restrict the locating pin from separating from the locating pin 1 along the axial direction.

In this embodiment, the first limiting part is used to limit the movement direction of the locating pin, so that the locating pin 2 cannot be separated from the locating seat 1 along its axial direction, so as to realize the axial fixation of the battery pack using the locating pin. The embodiment reduces the moving direction of the battery pack, reduces the complexity of the moving state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

As shown in Fig. 2, the slideway 11 in this embodiment has a supporting platform 111 for supporting the locating pin, and the first limiting part is provided on the supporting platform 111. In this embodiment, the supporting platform 111 is used to support the locating pin, making the locating pin more stable. Of course, in other embodiments, the supporting platform 111 can also be designed in other forms.

In this embodiment, the first limiting part is designed as a concave part 13 which has a first limiting surface 131 and a second limiting surface 132, and the intersection of the first limiting surface 131 and the second limiting surface 132 is the lowest point of the concave part. In this embodiment, the concave part 13 is designed as the first limiting surface 131 and the second limiting surface 132, which simplifies the structural form of the concave part 13 and is beneficial to improve the limit function of the concave part 13. In this embodiment, the first limiting surface 131 and the second limiting surface 132 are approximately planar, and the intersection of the two is transitional by circular arc. The sharp corner is avoided, which is beneficial to increase the service life of the first limiting part. In other embodiments, the first limiting surface 131 and the second limiting surface 132 can also be designed in other forms, such as curved surfaces. Of course, the first limiting part can also be designed as a convex part, similar to the concave part 13.

As another embodiment, the section of the first limiting part can also be one of arc, V-shape or trapezoid. In this embodiment, the section of the first limiting part is designed as one of arc, V-shape or trapezoid, which is beneficial to the realization of the limit function of the locating seat 1, simplifies the structural form of the first limiting part and improves the service cycle of the locating seat 1 at the same time.

As shown in Fig. 4, the locating seat 1 further includes a cushion part, at least a part of the cushion part is located in the slideway 11, and when the locating seat 1 is in the location state, the cushion part abuts against the wall surface of the locating pin. In this embodiment, the cushion part is used to absorb the kinetic energy when the locating pin is converted to the location state, which is beneficial to reduce the impact of the locating pin on the locating seat 1, reduce the noise when the locating pin is located, and is beneficial to improve the stability of the locating pin at the location state. Specifically, in this embodiment, the cushion part is an elastic pad 14. In this embodiment, by adopting the above structure, the elastic pad 14 is used as the cushion part, which reduces the cost of the cushion part and improves the buffer and cushion effect of the cushion part. The material of the elastic pad 14 may be silica gel, of course, other materials may also be selected for the elastic pad 14. The cushion part can also choose other forms.

Embodiment 2

As shown in Fig. 5 and Fig. 6, this embodiment is a locating pin 2 connected to the battery pack, the locating pin 2 is used to cooperate with the locating seat 1 as above, and the locating pin 2 is provided with a second limiting part which is used to cooperate with the first limiting part to limit the axial movement of the battery pack along the

locating pin 2. In this embodiment, utilizing the second limiting part being cooperate with the first limiting part to improve the stability of the locating pin 2 in the location state, so that the locating pin 2 can be fixed in its axial direction, so as to realize the axial fixation of the battery pack using the locating pin 2. The embodiment reduces the moving direction of the battery pack, reduces the complexity of the moving state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

In this embodiment, the locating pin 2 includes a pin seat 21, a pin shaft 22, a shaft sleeve 23 and a shaft stop 24. The second limiting part is the shaft sleeve 23. The shaft sleeve 23 and the slideway 11 can also be designed as a transition fit. The use of the shaft sleeve 23 that is in transition fit with the slideway 11 makes the locating pin 2 more stable relative to the locating seat 1, reducing the accidental movement of the locating pin 2.

In Fig. 6, the shaft sleeve 23 is sleeved on the pin shaft 22. By sleeving the shaft sleeve 23 outside the locating pin 2, the shaft sleeve 23 can more fully cooperate with the first limiting part of the locating seat 1, which is beneficial to improve the stability of the locating pin 2 in the location state.

In this embodiment, the shaft sleeve 23 can rotate relative to the pin shaft 22. The shaft sleeve 23 is designed to be rotatable, which reduces the resistance when the locating pin 2 enters the slideway 11 and is beneficial to prolong the service life of the locating pin 2. In addition, the shaft sleeve 23 and the pin shaft 22 are designed to be detachably connected, so that the shaft sleeve 23 and the pin shaft 22 can be designed and manufactured separately, and the performance of the two can be more in line with their respective service environment, which is beneficial to improve the quality of the locating pin 2.

In Fig. 6, the locating pin 2 further includes a shaft stop 24 provided on the end surface of the locating pin 2, which is used to prevent the second limiting part from moving in the axial direction of the locating pin 2. By using the shaft stop 24 to prevent the second limiting part from moving in the axial direction, the safety factor of the locating pin 2 is improved.

In other embodiments, the second limiting part and the locating pin 2 can also be designed as an integral structure. By designing the second limiting part and the locating pin 2 as an integral structure, the manufacturing process of the locating pin 2 is simplified and the cost of the locating pin 2 is reduced.

In this embodiment, the second limiting part is designed as a shaft sleeve 23 bulging outwardly, and in other embodiments, the second limiting part can also be designed as other forms, such as inward depression or wave shape.

In order to further improve the safety factor of the locating pin 2, the second limiting part can also be convex part in other forms, and the number of the second limiting parts is multiple, the multiple convex parts are arranged along the axial direction of the locating pin 2, or the multiple convex parts are arranged along the radial direction of the locating pin 2. In this embodiment, utilizing the convex part being engaged with the concave part 13 of the locating seat 1 to improve the stability of the locating pin 2 in the location state. At the same time, the multiple convex parts are arranged on the locating pin 2, which makes the locating pin 2 more stable and cannot leave the locating seat 1 along its axial direction. It also avoids the location state changing caused by the failure of a single convex part, and improves the safety factor of the locating pin 2.

Embodiment 3

As shown in Fig. 7 and Fig. 8, this embodiment is a locating mechanism 3 for locating and fixing the battery pack, the locating mechanism 3 includes the locating seat 1 in Embodiment 1 and the locating pin 2 in Embodiment 2, the locating pin 2 is arranged on the battery pack, and the locating mechanism 3 is used to restrict the battery pack from separating from the locating seat 1 along the axial direction of the locating pin 2. In this embodiment, using the mutual cooperation of the first limiting part of the locating seat 1 and the second limiting part of the locating pin 2, realizing the limitation for the moving direction of the locating pin 2, so that the locating pin 2 can not be separated from the locating seat 1 along its axial direction, so as to realize the axial fixation of the battery pack using the locating pin 2. The embodiment reduces the moving direction of the battery pack, reduces the complexity of the moving state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

Embodiment 4

As shown in Fig. 9, this embodiment is a quick-change support assembly 4 for installing the battery pack, the quick-change support assembly 4 includes a quick-change support 41, the quick-change support assembly 4 further includes a locating seat 1 of the locating mechanism 3, and the locating seat 1 is arranged on the quick-change support 41. The locating seat 1 is arranged on one side of the quick-change support 41. In this embodiment, by using the quick change support assembly 4 including the locating

seat 1, the battery pack located in the quick change support assembly 4 cannot be separated from the quick change support 41 along the axial direction of the locating pin 2, so as to realize the axial fixation of the battery pack using the quick change support assembly 4. The embodiment reduces the moving direction of the battery pack, reduces the complexity of the moving state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

Embodiment 5

This embodiment is an electric automobile, and Fig. 10 shows a battery pack assembly 5 of the electric automobile. The electric automobile of this embodiment includes the battery pack assembly 5 and the quick-change support assembly 4 in embodiment 4.

In this embodiment, by adopting the above structure and using the quick-change support assembly 4, the battery pack 51 of the electric automobile can be fixed in the axial direction of the locating pin 2. The embodiment reduces the moving direction of the battery pack 51, reduces the complexity of the moving state of the battery pack 51, helps to prolong the service life of the battery pack 51 and reduce the probability of damage to the battery pack 51. At the same time, it is also helpful to analyze the reason why the battery pack 51 fails.

Embodiment 6

As shown in Fig. 11 and Fig. 12, this embodiment is a locating seat 10 for locating and fixing the battery pack, the locating seat 10 comprises a locating seat body 101, a side of the locating seat body 101 is provided with an opening 12 and a slideway 11 extending from the opening 12, and the opening 12 is used for the locating pin of the battery pack to enter the slideway 11, the locating seat 10 further includes a clamping device 13 which is arranged in the slideway 11, when the locating pin is at the location point, the clamping device 13 abuts against the locating pin in the vertical direction. In this embodiment, by providing a clamping device 13 in the slideway 11, the locating pin at the location point is tightly clamped, thereby preventing the locating pin from moving in the vertical direction, thereby realizing the fixation of the locating pin in the vertical direction, and realizing the locating and fixation of the locating mechanism using the locating seat 10, the quick-change support assembly and the battery pack of the electric automobile in the vertical direction, this embodiment reduces the movement of the battery pack, reduces the complexity of the movement state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the

battery pack fails.

As an embodiment, the clamping device 13 is provided at the location point of the locating pin in the slideway 11. In this embodiment, the clamping device is arranged at the location point to make the locating pin more stable at the location point and reduce the probability of accidental movement of the locating pin at the location point.

Specifically, the clamping device 13 includes a swing body 131 and a fixed shaft 132, the fixed shaft 132 is connected to the locating seat body 101, and the swing body 131 can rotate around the fixed shaft 132; when the locating pin is at the location point, the swing body 131 abuts against the outer wall of the locating pin. In this embodiment, the structure of the clamping device 13 is simplified by using the swing body 131 and the fixed shaft 132, and the swing body 131 can be rotated around the fixed shaft 132, which makes it easier for the swing body 131 to be switched to the location state, and improves the stability of the locating pin at the location point. In other embodiments, the clamping device 13 can also be designed in other forms.

As an embodiment, the swing body 131 has an arc surface, and the arc surface abuts against the outer wall of the locating pin. In this embodiment, utilizing the arc surface of the swing body 131 abutting against the locating pin, the stability of the locating pin at the location point is improved. In other embodiments, the swing body 131 may also be designed in other forms.

In order to facilitate the locating pin to slide into the swing body 131, when the locating pin does not enter the slideway 11, the swing body 131 can be swung toward the entrance of the slideway 11. In this embodiment, the swing body 131 is swung toward the entrance, which makes it easier for the locating pin to enter the swing body 131 and at the same time improves the stability of the locating pin in the swing body 131.

As an embodiment, the clamping device 13 may further include an elastic part disposed between the locating seat body 101 and the swing body 131, and the elastic part acts on the swing body 131 so that when the swing body 131 is not under other force, the abutting surface of the swing body 131 faces the direction into which the locating pin slides. In this embodiment, the elastic part is used to make the swing body swing toward the direction into which the locating pin slides, which facilitates the smooth sliding of the locating pin into the swing body 131, and further facilitates the clamping device 13 to clamp the locating pin.

In order to improve the stability of the elastic part, one end of the elastic part can be inserted into the swing body 131, and the other end of the elastic part abuts against the locating seat body 101. In this embodiment, the elastic part is inserted into the swing

body 131 and the locating seat body 101, which improves the stability of the elastic part, and is beneficial to apply elastic force to the swing body 131 when the elastic part is replaced.

In this embodiment, the elastic part is designed as a spring 15. In this embodiment, the use of the spring 15 simplifies the design form of the elastic part, improves the life of the elastic part, and reduces the use cost of the locating seat 10. In other embodiments, the elastic part can also be designed in other forms, and of course, other installation positions can also be selected.

As an embodiment, the clamping device 13 includes two clamping assemblies 130, each clamping assembly 130 includes one swing body 131 and one fixed shaft 132, and the two clamping assemblies 130 are symmetrically arranged on both sides of the slideway 11. In this embodiment, by using clamping assembly 130 arranged symmetrically, when the locating pin is at the location point, the two sets of clamping assembly 130 can clamp the locating pin at the same time, which improves the stability of the locating seat 10. In other embodiments, only one set of clamping assembly 130 may be provided, which can also solve the corresponding technical problems.

In this embodiment, as shown in Fig.14 and Fig.15, when the locating pin is located at the location point, the center line of the locating pin is coplanar with the center lines of the two fixed shafts 132. In this embodiment, the center line of the locating pin and the center line of the two fixed shafts 132 are designed to be coplanar, when the locating pin is at the location point, the distance between the locating pin and the two fixed shafts 132 is the smallest, so that the two swing bodies 131 clamp the locating pin more tightly, so that at this time the axial force applied on the locating pins is maximized, the locating pins are difficult to leave the location point, and the stability of the locating seat 10 is improved. When the locating pin is at the location point, the locating pin and the two swing bodies 131 can also be designed as a transition fit; this embodiment can further make the two swing bodies 131 clamp the locating pin more tightly, so that the axial force applied on the locating pin is greater at this time, the locating pin is more difficult to leave the location point and is more firmly fixed at the location point.

As an embodiment, the locating seat 10 further includes a cushion part, at least a part of the cushion part is located in the slideway 11, and when the locating pin is in the location state, the cushion part abuts against the wall surface of the locating pin. In this embodiment, the cushion part is used to absorb part of the kinetic energy when the locating pin is converted to the location state, which is beneficial to reduce the impact of the locating pin on the locating seat 10, reduce the noise when the locating pin is located, and improve the stability of the locating pin at the location state.

Specifically, in this embodiment, the cushion part is an elastic pad 14. In this embodiment, the elastic pad 14 is used as the cushion part, which reduces the cost of the cushion part and improves the cushion effect of the cushion part. In other embodiments, the cushion part can also be designed in other forms.

In this embodiment, as shown in Fig.11 and Fig.12, by arranging accommodating cavities for the clamping assembly 130 on both sides of the slideway 11, a set of clamping assembly 130 are respectively arranged in the accommodating cavities on both sides. The accommodating cavity provides an accommodating space for the clamping assembly 130. At the same time, a mounting hole for the fixed shaft 132 is provided in the locating seat body 101, so that the swing body 131 can swing around the fixed shaft 132 in the accommodating cavity. When the swing body 131 rotates to the left or right to the limit point, the outer wall of the swing body 131 contacts the locating seat body 101, thereby limiting the continuous rotation of the swing body 131, at this time, the arc surface of the swing body 131 abuts on the edge of the slideway 11 in alignment, so that the locating pin reaching the abut joint can smoothly enter or leave the arc surface of the swing body 131. Under normal circumstances, that is, when the locating pin does not enter the arc surface of the swing body 131, the swing body 131 will rotate to the direction into which the locating pin slides under the pressure of the spring 15. At this time, the arc surface of the swing body 131 is align with the edge of the slideway 11.

The locating pin enters the slideway 11 from the opening 12 and continues to move along the slideway 11. When the locating pin reaches the abut joint of the slideway 11 and the arc surface of the swing body 131, since the slideway 11 abuts on the arc surface in alignment, the locating pin can smoothly enter the arc surface of the swing body 131.

When the locating pin continues to move along the arc surface and gradually reaches the middle of the arc surface from the edge of the arc surface, the distance between the axis of the locating pin and the axis of the fixed shaft 132 on the upper and lower sides gradually decreases, and the pressure generated by the locating pin on the arc surface gradually increases, which causes the swing body 131 to rotate around the fixed shaft 132.

When the locating pin reaches the middle position of the arc surface, that is, when the axis of the locating pin is coplanar with the axis of the fixed shaft 132 on the upper and lower sides, and that is, the distance between the axis of the locating pin and the axis of the fixed shaft 132 on the upper and lower sides is the smallest, the locating pin and the arc surface of the swing body 131 are in a transition fit state, and the locating pin exerts

the greatest pressure on the arc surface of the swing body 131. This position is the location point of the locating pin. The locating pin is under the greatest fixing pressure at this location point, so that the locating pin is clamped and fixed by the upper and lower clamping assembly 130, so that the locating pin cannot move in the vertical direction. In addition, since there is no relative displacement between the fixed shaft 132 and the arc surface of the swing body 131, there is no friction between the locating pin and the swing body 131 at the location point, so that the clamping assembly 130 will not generate heat due to the friction at the location point, which is beneficial to improve the stability and service life of the invention. At this time, the elastic pad 14 also abuts against the locating pin.

When the locating pin continues to slide away from the middle position of the arc surface, the distance between the axis of the locating pin and the axis of the fixed shaft 132 on the upper and lower sides gradually increases, the pressure generated by the locating pin on the arc gradually decreases, which makes the swing body 131 rotate around the fixed shaft 132.

When the locating pin leaves the arc surface, under the pressure of the spring 15, the swing body 131 rotates to the direction into which the locating pin slides. At this time, the arc surface of the swing body 131 is align with the edge of the slideway 11.

Embodiment 7

As shown in Fig.13-Fig.16, this embodiment is a locating mechanism 30, the locating mechanism 30 includes a locating pin 20 arranged on the battery pack and the locating seat 10 according to Embodiment 6, and the locating pin 20 enters the slideway 11 from the opening 12. In this embodiment, the locating pin 20 is fixed in the vertical direction by using the clamping device 13, so as to realize the fixation of the battery pack using the locating pin 20 in the vertical direction. The embodiment reduces the moving direction of the battery pack, reduces the complexity of the moving state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

As an embodiment, the locating pin 20 can also be designed as an integral structure, since the integral structure is processed, the locating pin 20 of this embodiment has simple structure and good strength and rigidity. Heat treatment can also be carried out at the matching position of the locating pin 20 with the clamping device 13 to increase the wear resistance, this embodiment can further prolong the service life of the locating pin 20 and reduce the service cost of the locating mechanism 30.

In this embodiment, the locating pin 20 enters the locating seat body 101 through the opening 12 of the slideway 11. When the locating pin 20 does not enter the clamping assembly 130, under the pressure of the spring 15, the swing body 131 swings toward the direction into which the locating pin 20 slides. When the locating pin 20 gradually slides into the arc surface of the swing body 131 in the slideway 11, the swing body 131 begins to roll around the fixed shaft 132 under the combined action of the pressure of the locating pin 20 and the elastic force of the spring 15; when the locating pin 20 reaches the location point, that is, when the locating pin 20 reaches the middle of the arc surface of the swing body 131, the axes of the upper and lower fixed shafts 132 are coplanar with the axis of the locating pin 20. At this time, the distance between the locating pin 20 and the two fixed shafts 132 is the smallest, therefore, the two swing bodies 131 exert the greatest pressure on the locating pin 20, that is, the locating pin 20 receives the greatest pressure from the upper and lower clamping assembly 130, so that the locating pin 20 is fixed in the vertical direction. As an embodiment, the locating pin 20 and the two swing bodies 131 are designed as a transition fit, which can further make the two swing bodies 131 clamp the locating pin 20 more tightly, that is, the axially loaded of the locating pin 20 is greater at this time, so that the locating pin 20 is more difficult to leave the location point and is more firmly fixed at the location point.

In this embodiment, an elastic pad 14 is further provided at the end of the slideway 11, a part of the elastic pad 14 is provided in the slideway 11, and the other part is inserted into the locating seat body 101. The elastic pad 14 is beneficial to reduce the impact of the locating pin 20 on the locating seat 10, reduce the noise when the locating pin 20 is located, and improve the stability when the locating pin 20 is in the location state.

Embodiment 8

As shown in Fig. 17, this embodiment is a quick-change support assembly 40 for installing the battery pack, the quick-change support assembly 40 includes a quick-change support 41, the quick-change support assembly 40 further includes the locating mechanism 30 in Embodiment 7, and the quick-change support 41 is connected to the locating seat 10. In this embodiment, by using the quick change support 41 including the locating seat 10, the battery pack located in the quick change support assembly 40 cannot be separated from the quick change support 41 along the height direction, so as to realize the fixation of the battery pack using the quick change support assembly 40 in the height direction. The embodiment reduces the moving direction of the battery pack, reduces the complexity of the moving state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

Embodiment 9

As shown in Fig. 18, this embodiment is an electric automobile, and the battery pack assembly 50 of the electric automobile is shown in the figure. The electric automobile includes a battery pack assembly 50 and the quick-change support assembly 40 as in Embodiment 8. The quick-change support assembly 40 includes the locating seat 10 in Embodiment 6, the battery pack 51 includes a locating pin 20 and a battery pack 51, and the locating pin is arranged on the side of the battery pack 51. The locating pin 20 and the locating seat 10 cooperate with each other, so that the battery pack 51 of the electric automobile can be fixed in the height direction. The embodiment reduces the moving direction of the battery pack 51, reduces the complexity of the moving state of the battery pack 51, helps to prolong the service life of the battery pack 51 and reduce the probability of damage to the battery pack 51. At the same time, it is also helpful to analyze the reason why the battery pack 51 fails.

Embodiment 10

As shown in Fig. 19- Fig. 22, this embodiment is a quick-change support assembly 10 for installing the battery pack to the electric automobile, the quick-change support assembly 10 includes a quick-change support 11, a locking mechanism 20, and a locating mechanism, and the locking mechanism 20 and the locating mechanism are both arranged on the quick-change support 11, the locking mechanism 20 is used to lock the battery pack with the electric automobile and restrict the battery pack from moving in the driving direction of the electric automobile; the locating mechanism is used to restrict the battery pack from moving in the direction perpendicular to the driving direction in the horizontal plane and/or restrict the battery pack from moving in the vertical direction. In this embodiment, the slideway locating mechanism 30 and the double swing locating mechanism 40 are provided in the quick-change support assembly 10 to realize the fixation of the battery pack in the axial direction of the slideway pin 32 and in the vertical direction, and this embodiment reduces the movement of the battery pack, reduces the complexity of the movement state of the battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack. At the same time, it is also helpful to analyze the reason why the battery pack fails.

As an embodiment, the locating mechanism may further include a slideway locating mechanism 30 which is used to restrict the battery pack from moving in the direction perpendicular to the driving direction in the horizontal plane.

Specifically, the slideway locating mechanism 30 is the same as the locating mechanism

3 in the Embodiments 1-5, the slideway seat 31 is the same as the locating seat 1 in the Embodiments 1-5, and the slideway pin 32 is the same as the locating pin 2 in the Embodiments 1-5. The first limiting part is the same as the first limiting surface 131 in Embodiments 1-5, and the second limiting part is the same as the second limiting surface 132 in Embodiments 1-5.

The slideway 11 of the slideway seat 31 is provided with a first limiting part, the slideway pin 32 is provided with a second limiting part which is used to cooperate with the first limiting part to limit the axial movement of the battery pack along the slideway pin 32.

In this embodiment, by arranging the slideway locating mechanism 30 on the left or right side of the quick-change support 11, the battery pack can be fixed along the axial direction of the slideway pin 32, and the battery pack is restricted from moving in the direction perpendicular to the driving direction in the horizontal plane, and it also avoids the problems of simultaneous locating on both axial sides of the slideway pin 32, which leads to complex installation of the battery pack and high locating accuracy requirements.

In order to simplify the structural form of the first limiting part, the first limiting part can be designed as a convex part or a concave part. In this embodiment, the first limiting part is designed as a convex part or a concave part, which is beneficial to the realization of the limiting function of the slideway seat 31, and also simplifies the structural form of the first limiting part, and prolongs the service life of the slideway seat 31.

As an embodiment, the second limiting part is sleeved on the slideway pin 32, and the second limiting part can rotate relative to the slideway pin 32. In this embodiment, the second limiting part is sleeved on the outside of the slideway pin 32, so that the second limiting part can more fully cooperate with the first limiting part, and the stability of the slideway pin 32 in the locating state can be improved. At the same time, the second limiting part is designed to be rotatable, which reduces the resistance when the slideway pin 32 enters the slideway and is beneficial to prolong the service life of the slideway pin 32.

As an embodiment, the locating mechanism may further include a double swing locating mechanism 40 which is used for restricting the movement of the battery pack along the vertical direction. In this embodiment, the double swing locating mechanism 40 is used to limit the movement of the battery pack in the vertical direction, which simplifies the structure of the quick-change support assembly 10, reduces the movement of the battery pack, reduces the complexity of the movement state of the

battery pack, helps to prolong the service life of the battery pack and reduce the probability of damage to the battery pack.

Specifically, the double swing locating mechanism 40 is the same as the locating mechanism 30 in the Embodiments 6-9, the double swing seat 41 is the same as the locating seat 10 in the Embodiments 6-9, and the double swing pin 42 is the same as the locating pin 20 in the Embodiments 6-9.

As an embodiment, the double swing locating mechanism 40 is symmetrically arranged on one or both of the left side and the right side of the quick-change support 11. In this embodiment, the double swing locating mechanism 40 is arranged on one side of the quick-change support 11, which realizes the restriction on the vertical movement of the battery pack, and the double swing locating mechanism 40 is arranged on the two sides of the quick-change support 11, which improves the stability of the battery pack.

Embodiment 11

This embodiment is an electric automobile, which includes a battery pack assembly 60 and the quick-change support assembly 10 in embodiment 10. Fig. 22 shows the battery pack assembly 60 in this embodiment. In this embodiment, the quick-change support assembly 10 is used to fix the battery pack 61 of the electric automobile in the driving direction of the electric automobile, the vertical direction, and the axial direction of the slideway pin 32, which reduces the moving direction of the battery pack 61, reduces the complexity of the moving state of the battery pack 61, helps to prolong the service life of the battery pack 61 and reduce the probability of damage to the battery pack 61. At the same time, it is also helpful to analyze the reason why the battery pack 61 fails.

Although the specific embodiments of the present invention are described above, those skilled in the art should understand that these are only examples, and various changes or modifications can be made to these embodiments without departing from the principle and essence of the present invention. Therefore, the protection scope of the present invention is defined by the appended claims.

Although the specific embodiments of the present invention have been described above, those skilled in the art should understand that this is only an example, a person skilled in the art can make various changes or modifications to these embodiments without departing from the principle and essence of the present invention, but these changes and modifications all fall within the protection scope of the present invention. Therefore, the protection scope of the present invention is defined by the appended claims.

Claims

1. A locating seat for locating and fixing a battery pack, the locating seat is used to accommodate a locating pin for fixing the battery pack, a side of the locating seat is provided with an opening and a slideway extending from the opening, the opening is used for the locating pin to enter the slideway; wherein the slideway is provided with a first limiting part, the first limiting part is used to restrict the locating pin from separating from the locating seat along the axial direction.

2. The locating seat according to claim 1, wherein the slideway has a supporting platform, the supporting platform is used to support the locating pin and the first limiting part is arranged on the supporting platform.

3. The locating seat according to claim 1 or 2, wherein the section of the first limiting part is one of an arc shape, a V shape or a trapezoid shape.

4. The locating seat according to at least one of claims 1-3, wherein the first limiting part is a convex part or the first limiting part is a concave part;

preferably, the convex part has a first limiting surface and a second limiting surface, and the intersection of the first limiting surface and the second limiting surface is the highest point of the convex part;

and/or, the first limiting surface and the second limiting surface are flat or curved.

5. The locating seat according to at least one of claims 1-4, wherein the locating seat further includes a cushion part, at least a part of the cushion part is located in the slideway, and when the locating seat is in the location state, the cushion part abuts against the wall surface of the locating pin;

preferably, the cushion part is an elastic pad.

6. A locating seat for locating and fixing the battery pack, the locating seat comprises a locating seat body, a side of the locating seat body is provided with an opening and a slideway extending from the opening, the opening is used for the locating pin of the battery pack to enter the slideway, wherein the locating seat further includes a clamping device which is arranged in the slideway, when the locating pin is at a location point, the clamping device abuts against the locating pin in the vertical direction.

7. The locating seat according to claim 6, wherein the clamping device is provided

at the location point of the locating pin in the slideway.

8. The locating seat according to claim 6 or 7, wherein the clamping device includes a swing body and a fixed shaft, the fixed shaft is connected to the locating seat body, and the swing body can rotate around the fixed shaft; when the locating pin is at the location point, the swing body abuts against the outer wall of the locating pin;

preferably, the swing body has an arc surface, and the arc surface abuts against the outer wall of the locating pin;

and/or, when the locating pin does not enter the slideway, the swing body swings toward the entrance of the slideway;

and/or, the clamping device includes two clamping assemblies, each of the clamping assemblies includes one swing body and one fixed shaft, and the two clamping assemblies are symmetrically arranged on both sides of the slideway;

preferably, when the locating pin is located at the location point, the center line of the locating pin is coplanar with the center lines of the two fixed shafts;

preferably, the clamping device further includes an elastic part disposed between the locating seat body and the swing body, and the elastic part acts on the swing body so that when the swing body is not under force, an abutting surface of the swing body faces the direction into which the locating pin slides;

preferably, one end of the elastic part is inserted into the swing body, and the other end of the elastic part abuts against the locating seat body;

and/or, the elastic part is a spring.

9. The locating seat according to at least one of claims 6-8, wherein the locating seat further includes a cushion part, at least a part of the cushion part is located in the slideway, and when the locating pin is at the location point, the cushion part abuts against the wall surface of the locating pin;

preferably, the cushion part is an elastic pad.

10. A locating pin, the locating pin is connected to the battery pack, wherein the locating pin is used to cooperate with the locating seat according to at least one of claims 1-5, and the locating pin is provided with a second limiting part which is used to cooperate with the first limiting part to limit movement of the battery pack along the axial direction of the locating pin.

11. The locating pin according to claim 10, wherein the first limiting part is a concave part, the second limiting part is a convex part, and the number of the second limiting parts is multiple, multiple convex parts are arranged along the axial direction of the locating pin, or the plural convex parts are arranged along the radial direction of the locating pin.

12. The locating pin according to claim 10 or 11, wherein the second limiting part and the locating pin are an integral structure;

or, the second limiting part is detachably connected to the locating pin;

preferably, the second limiting part is sleeved on the locating pin;

preferably, the second limiting part is rotatable relative to the locating pin;

and/or, the locating pin further includes a shaft stop provided on an end surface of the locating pin, which is used to prevent the second limiting part from moving in the axial direction of the locating pin;

and/or, the second limiting part is a shaft sleeve which is in transition fit with the slideway.

13. A locating mechanism for locating and fixing the battery pack, wherein the locating mechanism includes the locating seat according to at least one of claims 1-5 and the locating pin according to at least one of claims 10-12, the locating pin is arranged on the battery pack, and the locating mechanism is used to restrict the battery pack from separating from the locating seat along the axial direction of the locating pin;

or, the locating mechanism includes a locating pin and the locating seat according to at least one of claims 6-9, the locating pin is arranged on the battery pack, and the locating pin enters the slideway from the opening.

14. A quick-change support assembly for installing the battery pack, the quick-change support assembly includes a quick-change support, wherein the quick-change support assembly further includes the locating mechanism according to claim 13, and the locating seat is arranged on the quick-change support.

15. A quick-change support assembly for installing the battery pack to an electric automobile, the quick-change support assembly includes a quick-change support, a locking mechanism, and a locating mechanism, the locking mechanism and the locating mechanism are both arranged on the quick-change support, wherein the locking

mechanism is used to lock the battery pack with the electric automobile and restrict the battery pack from moving in the driving direction of the electric automobile; the locating mechanism is used to restrict the battery pack from moving in the direction perpendicular to the driving direction in the horizontal plane and/or restrict the battery pack from moving in the vertical direction.

16. The quick-change support assembly according to claim 15, wherein the locating mechanism includes a slideway locating mechanism which is used to restrict the movement of the battery pack in the direction perpendicular to the driving direction in the horizontal plane.

17. The quick-change support assembly according to claim 16, wherein the slideway locating mechanism comprises a slideway seat, which is connected to the quick change support for cooperating with the slideway pin on the battery pack;

a side of the slideway seat is provided with an opening and a slideway extending from the opening, and the opening is used for allowing the slideway pin to enter the slideway;

the slideway of the slideway seat is provided with a first limiting part, the slideway pin is provided with a second limiting part which is used to cooperate with the first limiting part to limit movement of the battery pack along the axial direction of the slideway pin;

preferably, the slideway seat is arranged on the left side or the right side of the quick-change support;

and/or, the first limiting part is a convex part or the first limiting part is a concave part;

and/or, the first limiting part is a concave part, the second limiting part is a convex part, and the number of the second limiting parts is multiple, multiple convex parts are arranged along the axial direction of the slideway pin, or the multipleconvex parts are arranged along the radial direction of the slideway pin.

18. The quick-change support assembly according to at least one of claims 15-17, wherein the locating mechanism includes a double swing locating mechanism which is used to restrict the movement of the battery pack in the vertical direction;

preferably, the double swing locating mechanism is symmetrically arranged on

one or both of the left side and the right side of the quick-change support;

and/or, the double swing locating mechanism comprises a double swing seat and a double swing pin, the double swing seat is connected to the quick-change support, and the double swing pin is connected to the battery pack;

a side of the double swing seat is provided with an opening and a slideway extending from the opening, and the opening is used for allowing the double swing pin to enter the slideway;

the double swing seat also includes a clamping device, which is arranged in the slideway, when the double swing pin is at a location point, the clamping device butts against the double swing pin in the vertical direction to limit the movement of the battery pack in the vertical direction.

19. The quick-change support assembly according to claim 18, wherein the clamping device is provided at the location point of the double swing pin in the slideway, the clamping device includes a swing body and a fixed shaft, the fixed shaft is connected to the double swing seat body, and the swing body can rotate around the fixed shaft; when the double swing pin is at the location point, the swing body abuts against the outer wall of the double swing;

preferably, the clamping device includes two clamping assemblies, each of the clamping assemblies includes one swing body and one fixed shaft, and the two clamping assemblies are symmetrically arranged on both sides of the slideway;

preferably, when the double swing pin is located at the location point, the center line of the double swing pin is coplanar with the center lines of the two fixed shafts;

and/or, the clamping device further includes an elastic part disposed between the double swing seat body and the swing body, the elastic part acts on the swing body so that when the swing body is not under force, the abutting surface of the swing body faces the direction into which the double swing pin slides; one end of the elastic part is inserted into the swing body, and the other end of the elastic part abuts against the double swing seat body.

20. An electric automobile, wherein it includes a battery pack and a quick-change support assembly according to at least one of claims 14-19.