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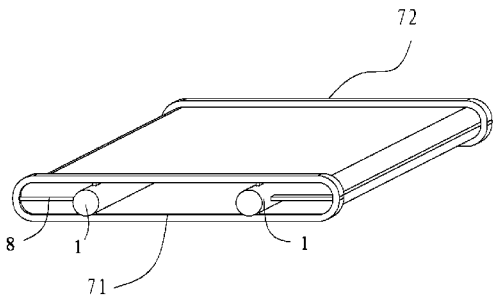

Fig. 8

(57) Abstract: A battery may be provided. The battery may comprise: a battery housing (90) having at least an opening end; a battery cover sealing the opening end; an electric core received in the battery housing (90) which comprises a positive heat-conducting member (1) and a negative heat-conducting member (2) that are electrically insulated from each other, the positive heat-conducting member (1) and the negative heat-conducting member (2) each having at least an end penetrating through the battery cover respectively; and an electrolyte filled in a space formed by the battery housing (90) with the battery cover.

BATTERY

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the priority to and benefits of Chinese Patent Application No.201010622284.X filed with the State Intellectual Property Office of the People's Republic of China (SIPO) on Dec. 31, 2010, the content of which is incorporated herein by reference in their entirety.

FIELD

The present disclosure relates to the field of energy storage, more particularly to a battery.

BACKGROUND

The statements in this section merely provide background information related to the present disclosure and may or may not constitute prior art.

With the exhaustion of the global natural energy resources and the growing attention to the environmental protection, electrical vehicles (EV) and hybrid electrical vehicles (HEV) have been drawn attention widely due to their advantages such as low exhaust emissions and low energy consumption. A power battery is one of the key parts of the EV/HEV vehicles, which may requires high power, long cycling life and excellent extreme environmental tolerance.

SUMMARY

In viewing thereof, the present disclosure is directed to solve at least one of the problems existing in the prior art. Therefore, a battery may need to be provided, which may have a homogenized and/or controllable internal temperature.

According to an embodiment of the present disclosure, a battery may be provided. The battery may comprise: a battery housing having at least an opening end; a battery cover sealing the opening end; an electric core received in the battery housing which comprises a positive heat-conducting member and a negative heat-conducting member that are electrically insulated from each other, the positive heat-conducting member and

the negative heat-conducting member each having at least an end penetrating through the battery cover respectively; and an electrolyte filled in a space formed by the battery housing with the battery cover.

With the battery according to an embodiment the present disclosure, the battery core includes the heat-conducting member which may adjust the internal temperature of the battery core. When the internal temperature of the battery core rises quickly or the battery is in an extreme thermal environment, the heat-conducting member may transfer the internal heat in the battery core and cool the battery quickly, thus preventing the further thermal reaction of substances in the electrodes, avoiding potential safety risks such as explosion caused by heat accumulation and slow heat dissipation, and enhancing the safety of the battery. At the same time, the heat-conducting member may ensure the internal temperature consistency of the battery, so that the battery always works in a superior state to enhance the cycling performance of the battery. When the battery is in an extreme cold or hot environment, the heat-conducting member may transfer heat quickly, for example, transfer heat between a heat accumulated region, such as positive and negative tabs, and a current collector in the electric core, thus ensuring the internal temperature balance of the electric core. Therefore, not only will large heat not be accumulated on the positive and negative tabs to avoid potential safety risks so that the battery may be always in a good operating state, but also the temperature balance of positive and negative electrodes of the battery may be ensured. Moreover, because the heat may be quickly transferred, the temperature of the battery core may quickly reach a predetermined temperature to ensure the operating performance of the electric core, and consequently the battery may operate in various complex environments. Furthermore, the heat-conducting member disposed in the battery core may function as a positive or negative terminal or pole for leading out current as well as a support and/or a backbone for stably holding the electric core, thus simplifying the assembling, facilitating the winding of the electric core, increasing a winding compactness of the electric core, and preventing damage to the battery or a battery pack resulted from loosening and deformation of the battery core caused by bumpiness and shake of the battery when the battery is moved. Therefore, losses brought by the failure of the battery pack comprising a plurality of batteries connected in series, in parallel or in series and parallel may be avoided.

Additional aspects and advantages of the embodiments of the present disclosure will be given in part in the following descriptions, become apparent in part from the following descriptions, or be learned from the practice of the embodiments of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects and advantages of the invention will become apparent and more readily appreciated from the following descriptions taken in conjunction with the drawings in which:

Fig. 1 is a cross-sectional view of a heat-conducting member in a battery according to an embodiment of the present disclosure;

Fig. 2 is a sectional view of an insulating roll core in a battery according to an embodiment of the present disclosure;

Fig. 3 is a schematic perspective view of an electric core in a battery according to an embodiment of the present disclosure;

Fig. 4 is a schematic perspective view of an electric core in a battery according to an embodiment of the present disclosure, with a first connector and a second connector connected to both ends of the electric core;

Fig. 5 is a partial perspective view of a battery according to an embodiment of the present disclosure;

Fig. 6 is a sectional view of an insulating roll core in a battery according to another embodiment of the present disclosure;

Fig. 7 is a schematic perspective view of an electric core in a battery according to another embodiment of the present disclosure;

Fig. 8 is a schematic perspective view of an electric core in a battery according to another embodiment of the present disclosure, with a first connector and a second connector connected to both ends of the electric core; and

Fig. 9 is a perspective view of a battery according to another embodiment of the present disclosure.

DETAILED DESCRIPTION

It will be appreciated by those of ordinary skill in the art that the disclosure may be embodied in other specific forms without departing from the spirit or essential character thereof. The presently disclosed embodiments are therefore considered in all respects to be illustrative and not restrictive. The same or similar elements and the elements having same or similar functions are denoted by like reference numerals throughout the descriptions.

Embodiment 1

A battery according to Embodiment 1 of the present disclosure will be described in detail with reference to Figs. 1-5. As shown in Fig. 2, two heat-conducting members, i.e., a positive heat-conducting member 1 and a negative heat-conducting member 2, are arranged in parallel. And injection molding is performed on surfaces of the heat-conducting members 1 and 2 so that an insulating roll core 3 is formed with ends of the positive heat-conducting member 1 and the negative heat-conducting member 2 being exposed outside the insulating roll core 3. The positive and negative heat-conducting members 1, 2 are at least partially received in the insulating roll core 3. An insulating filler 5 which is electrically insulating and thermally conductive is filled between the positive and negative heat-conducting members 1, 2. In one embodiment, an insulating layer may be formed on an external surface of each of the positive heat-conducting member 1 and the negative heat-conducting member 2, thus achieving electrical insulation between the positive and negative heat-conducting members 1, 2, between the positive heat-conducting member 1 and a positive plate, and between the negative heat-conducting member 2 and a negative plate respectively.

There are no special limitations on the number of the positive heat-conducting member 1 and the negative heat-conducting member 2, which may be determined according to dimensions of the positive heat-conducting member 1, the negative heat-conducting member 2 and an electric core 6. In one embodiment, the positive heat-conducting member 1 and the negative heat-conducting member 2 are electrically insulated from each other, the positive heat-conducting member 1 is electrically connected with a positive tab 61 and insulated from a negative tab 62, and the negative

heat-conducting member 2 is electrically connected with the negative tab 62 and insulated from the positive tab 61.

There are no special limitations on the materials for the positive and negative heat-conducting members 1, 2, which may be conductive materials such as metals having superior thermal conductivity or non-conductive materials such as ceramics having superior thermal conductivity. In some embodiments, when the positive and negative heat-conducting members 1, 2 are made of conductive materials, the positive heat-conducting member 1 needs to be electrically insulated from the negative electrode while electrically connected with the positive tab 61, and the negative heat-conducting member 2 needs to be electrically insulated from the positive tab 61 while electrically connected with the negative tab 62. In other embodiments, when the positive and negative heat-conducting members 1, 2 are made of non-conductive materials, the positive heat-conducting member 1 or the negative heat-conducting member 2 may be thermally connected with the positive tab 61 and the negative tab 62 simultaneously.

In one embodiment, the positive and negative heat-conducting members 1, 2 may be made of metals, so that the positive and negative heat-conducting members 1, 2 may be used as a channel for leading out current to be used as positive and negative terminals or poles of the battery respectively after the positive and negative heat-conducting members 1, 2 are electrically connected with the positive and negative tabs 61, 62 respectively. For example, the positive heat-conducting member 1 may be made of aluminum and the negative heat-conducting member 2 may be made of copper, thus further facilitating the connection between the positive heat-conducting member 1 and the positive tab 61 as well as between the negative heat-conducting member 2 and the negative tab 62, further reducing the internal resistance and accelerating the heat transfer rate. By the positive and negative heat-conducting members 1, 2 mentioned above, the battery is further optimized with simple structure so that the entire connection performance of the battery may be ensured and the breakage, shedding, cold soldering, etc. may be avoided. Meanwhile, the positive heat-conducting member 1 and the negative heat-conducting member 2 may be used as the current-leading terminals or poles for the battery respectively, so that the current conducting area and the heat conducting area are increased, thus decreasing internal resistance thereof.

It should be noted that the positive heat-conducting member 1 or the negative heat-conducting member 2 may be connected with the battery cover to lead out the current. Alternatively, both the positive heat-conducting member 1 and the negative heat-conducting member 2 may penetrate through the battery cover for leading out currents respectively. At this time, at least one of the positive heat-conducting member 1 and the negative heat-conducting member 2 may be electrically insulated from the battery cover. When the positive heat-conducting member 1 is connected with the battery cover for leading out current, the negative heat-conducting member 2 may be connected with the battery housing 90, alternatively, the negative heat-conducting member 2 may penetrate through the battery cover whereas electrically insulated therefrom. When the negative heat-conducting member 2 is connected with the battery cover for leading out current, the positive heat-conducting member 1 may be connected with the battery housing 90, alternatively, the positive heat-conducting member 1 may penetrate through the battery cover whereas electrically insulated therefrom. Alternatively, the positive heat-conducting member 1 and the negative heat-conducting member 2 may penetrate through the battery cover for leading out currents respectively. At this time, the positive heat-conducting member 1 and the negative heat-conducting member 2 are used as the positive and negative terminals or poles of the battery with electrical insulating members being disposed between the positive heat-conducting member 1 and the battery cover as well as between the negative heat-conducting member 2 and the battery cover respectively.

Further, there are no special limitations on the shape of the positive and negative heat-conducting members 1, 2, which may be designed according to the battery core 6. For example, the positive heat-conducting member 1 or the negative heat-conducting member 2 may be a hollowed member such as a hollowed tube, a solid member, a rod-shaped member, a sheet-shaped member, a straight member, a bending U-shaped member, etc. In one embodiment, the positive heat-conducting member 1 or the negative heat-conducting member 2 may be a hollowed member, thus further accelerating the heat transfer rate. When the internal temperature of the battery core arises quickly, the positive and negative heat-conducting members 1, 2 may transfer the internal heat in the battery core and cool the battery quickly, thus avoiding potential safety risks such as explosion

caused by heat accumulation and slow heat dissipation, enhancing the safety of the battery, and ensuring the internal temperature consistency inside the battery. The thickness and the width of the positive and negative heat-conducting members 1, 2 may be determined as the condition may require. In one embodiment, the thickness of the positive and negative heat-conducting members 1, 2 may range from about 0.1mm to about 5mm, particularly, from about 1mm to about 3mm.

As shown in Fig. 1, each of the positive and negative heat-conducting members 1, 2 being formed into a tube shape may be formed with projections 4 on an external surface and an internal surface thereof for further heat dissipation, thus increasing heat conducting area and accelerating the heat transfer rate. That is, an inner wall of the heat-conducting member may be formed with projections 4 having a shape of, for example, a needle, a cone, a sheet or a column, thus accelerating the heat transfer rate inside the battery core 6.

The shape of the insulating roll core 3 may be determined according to the shape of the electric core. The insulating filler 5 filled between the positive heat-conducting member 1 and the negative heat-conducting member 2 may be engineering plastics, for example, polyphenyl sulfide (PPS).

As shown in Fig. 3, a positive plate having the positive tab 61, a negative plate having the negative tab 62 and a separator between the positive plate and the negative plate are wound on an external surface of the insulating roll core 3 to form the electric core 6. In one embodiment, the positive heat-conducting member 1, the negative heat-conducting member 2 and the insulating layer are integrally formed into the insulating roll core 3 which is wound with the positive plate, the negative plate and the separator between the positive plate and the negative plate to form the desired electric core 6. By integrally forming the insulating roll core 3 with injection molding, the shape of a support comprising the heat-conducting member may be easily determined according to the shape of the electric core for facilitating battery assembly, and the positive and negative heat-conducting member 1, 2 may be fixed so that the electric core may not be damaged due to shaking, etc. In one embodiment, the insulating roll core 3 is square which is located at the center of the electric core 6 and is used as a support or backbone for holding the electric core 6,

thus increasing a winding compactness of the electric core as well as lowering process difficulty.

The positive plate includes a first coating region with a positive material coated thereon and a first non-coating region without the positive material coated thereon; the negative plate includes a second coating region with a negative material coated thereon and a second non-coating region without the negative material coated thereon; the positive tab 61 is formed by the coiled first non-coating region at the first end of the electric core 6; and the negative tab 62 is formed by the coiled second non-coating region at the second end of the electric core 6. The electric core 6 may have a square shape, a circular shape, etc. In another embodiment, the closed annular positive tab 61 may be formed by hot pressing a plurality of coiled first non-coating regions at the first end of the electric core 6, and the negative tab 62 may be formed by hot pressing a plurality of coiled second non-coating regions at the second end of the electric core 6.

In one embodiment, the positive and negative heat-conducting member 1, 2 are thermally connected with the positive and negative tabs 61, 62 respectively. Therefore, the heat in the heat accumulated region such as the positive and negative tabs 61, 62 may be quickly transferred to the current collector in the electric core to ensure the temperature consistency inside the battery, and consequently not only will heat not be accumulated on the positive and negative tabs 61, 62 to avoid potential safety risks, but also the temperature consistency of positive and negative electrodes of the battery may be ensured.

The ends of the positive heat-conducting member 1 and the negative heat-conducting member 2 are extended out of the electric core 6. As shown in Fig. 4, a first connector 71 is used for thermally and/or electrically connecting the positive heat-conducting member 1 with the positive tab 61 by, for example, welding, bonding or riveting. And a second connector 72 is used for thermally and/or electrically connecting the negative heat-conducting member 2 with the negative tab 62 by, for example, welding, bonding, or riveting, thus conveniently connecting the positive heat-conducting member 1 with the positive tab 61 and connecting the negative heat-conducting member 2 with the negative tab 62 as well as avoiding poor connection such as breakage, shedding or virtual connection. In another embodiment, each of the first and second connectors 71, 72 may

have a bending portion, through which simple connections between the positive heat-conducting member 1 and the positive tab 61 as well as between the negative heat-conducting member 2 and the negative tab 62 may be achieved to prevent breakage to the positive and negative tabs 61, 62 respectively.

The shapes of the first and second connectors 71, 72 may be configured to be adapted to those of the positive and negative tabs 61, 62, to facilitate the connection between the first connector 71 and the positive tab 61 and between the second connector 72 and the negative tab 62 as well as shorten current conducting paths. In one embodiment, the first connector 71 is annular which is fitted over the first non-coating region, and the second connector 72 is annular which is fitted over the second non-coating region. In one embodiment, the thickness of the first and second connectors 71, 72 may range from about 1mm to about 10mm. In another embodiment, the thickness of the first and second connectors 71, 72 may range from about 3mm to about 5mm. In some embodiments, the first and second connectors 71, 72 may be made of metals. In one embodiment, the first connector 71 and the positive tab 61 may be made of aluminum, and the second connector 72 and the negative tab 62 may be made of copper. The areas of the first connector 71 and the second connector 72 may be large to increase the current conducting area and the heat conducting area, thus not only reducing the internal resistance but also accelerating the conduction rate inside the battery.

As shown in Fig. 4, a plurality of first electrical connecting elements 8 are connected between the first connector 71 and the positive heat-conducting member 1, and, alternatively, a plurality of second electrical connecting elements (not shown) are connected between the second connector 72 and the negative heat-conducting member 2. Therefore, the connection between the positive heat-conducting member 1 and the first connector 71 as well as between the negative heat-conducting member 2 and the second connector 72 may be achieved, which may be simple in operation and easy to weld, and, further, may increase the current conducting area, reduce the internal resistance of the battery, enhance the rate discharge performance of the battery and increase the heat transfer rate inside the battery. The shape and the number of the first and second electrical connecting elements may be determined as the condition may require. In one embodiment, the first and second electrical connecting elements, the first and second

connectors 71, 72 and the positive and negative heat-conducting members 1, 2 may be welded finally to form the electric core 6. In another embodiment, the first and second electrical connecting elements and the first and second connectors 71, 72 may be integrally formed, and then the positive and negative heat-conducting members 1, 2 may be welded to form the electric core 6. The first and second electrical connecting elements are made of metals, which may be identical with materials for the positive and negative tabs 61, 62 respectively.

As shown in Fig. 5, the battery may comprise: a battery housing 90 having two opening ends; a battery cover sealing the two opening ends; an electric core 6 received in the battery housing 90 which comprises two heat-conducting members; and an electrolyte filled in a space formed by the battery housing 90 and the battery cover.

The battery is made by placing the electric core into the battery housing 90, filling the electrolyte into the battery housing 90, sealing the battery housing 90 and forming accordingly. The battery cover includes a first cover 9 hermetically sealing a first end of the battery housing and a second cover hermetically sealing a second end of the battery housing, and the positive heat-conducting member 1 and the negative heat-conducting member 2 penetrate through the first cover 9 and the second cover respectively which are hermetically sealed with the positive heat-conducting member 1 and the negative heat-conducting member 2 respectively, thus conveniently connecting the positive heat-conducting member 1 with the positive tab 61 and connecting the negative heat-conducting member 2 with the negative tab 62 to avoid poor connection shortcomings such as breakage, shedding or virtual connection. Therefore, the positive heat-conducting member 1 and the negative heat-conducting member 2 are used as a positive terminal or pole and a negative terminal or pole respectively for leading out currents, thus increasing the current conducting area and reducing the internal resistance for conducting current.

Both ends of the positive heat-conducting member 1 penetrate through the first cover 9 and the second cover (not shown) at both ends of the battery housing 90, and first insulating members may be provided between the positive heat-conducting member 1 and the first cover 9 as well as between the positive heat-conducting member 1 and the second cover respectively to ensure hermetically sealing, thus leading out positive current.

In other words, one end of the positive heat-conducting member 1 penetrates through the first cover 9 at the first end of the battery housing 90 to be used as a positive terminal or pole of the battery, and the other end of the positive heat-conducting member 1 penetrates through the second cover at the second end of the battery housing 90 to be used as a positive terminal or pole of the battery. In one embodiment, the positive heat-conducting member 1 may be firstly penetrated into an insulating spacer and then through the first and second covers, and then the first insulating member may be injection molded at high temperature, thus preventing the influence of liquid polymers with high temperature on an interior of the battery. In another embodiment, preformed insulating members formed by extrusion, such as conical rubber plugs, having a hollowed loudspeaker shape and having good leading-in performance may be provided between the positive heat-conducting member 1 and the first cover 9 as well as between the positive heat-conducting member 1 and the second cover respectively, thus facilitating the penetrating of the positive heat-conducting member 1 and the negative heat-conducting member 2 as well as the hermetically sealing between the positive heat-conducting member 1 and the first cover 9, between the positive heat-conducting member 1 and the second cover, between the negative heat-conducting member 2 and the first cover 9, and between the negative heat-conducting member 2 and the second cover. Both ends of the negative heat-conducting member 2 penetrate through the first cover 9 and the second cover at both ends of the battery housing, and second insulating members may be provided between the negative heat-conducting member 2 and the first cover 9 as well as between the negative heat-conducting member 2 and the second cover respectively to ensure hermetically sealing, thus leading out negative current. In other words, one end of the negative heat-conducting member 2 penetrates through the first cover 9 at the first end of the battery housing 90 to be used as a negative terminal or pole of the battery, and the other end of the negative heat-conducting member 2 penetrates through the second cover at the second end of the battery housing 90 to be used as a negative terminal or pole of the battery.

The first cover 9 and the second cover may hermetically seal the first end and the second end of the battery housing by laser welding, electron beam welding, bonding, riveting, hot-melt welding, ultrasonic welding, etc. respectively. Then, an electrolyte may

be filled in a space formed by the battery housing 90 with the battery cover. And the battery is sealed and formed accordingly.

According to an embodiment of the present disclosure, the positive heat-conducting member 1 and the negative heat-conducting member 2 may not only be used as a positive terminal or pole and a negative terminal or pole respectively for leading out currents, but also be used as a path for conducting the heat in the battery rapidly, thus increasing the safety of the battery and ensuring the internal temperature consistency of the battery. Therefore, the battery may normally operate under extreme temperature conditions.

Embodiment 2

As shown in Figs. 6-9, the battery is formed substantially similar to that in Embodiment 1, with the exception that U-shaped solid members spaced apart from each other are used as the positive heat-conducting member 1 and the negative heat-conducting member 2, with the bottoms of the U-shaped tubes being opposed to each other. And injection molding is performed on surfaces of the heat-conducting members 1 and 2 so that an insulating roll core 3 is formed with ends of the positive heat-conducting member 1 and the negative heat-conducting member 2 being exposed outside the insulating roll core 3. The positive and negative heat-conducting members 1, 2 are at least partially received in the insulating roll core 3. An insulating filler 5 which is electrically insulating and thermally conductive is filled between the positive and negative heat-conducting members 1, 2. In one embodiment, an insulating layer may be formed on an external surface of each of the positive heat-conducting member 1 and the negative heat-conducting member 2.

The battery cover includes a first cover 9 hermetically sealing a first end of the battery housing and a second cover hermetically sealing a second end of the battery housing 90. And both ends of the positive heat-conducting member 1 penetrate through the first cover 9 at the first end of the battery housing 90 to be used as positive terminals or poles, thus leading out a positive current. And both ends of the negative heat-conducting member 2 penetrate through the second cover at the second end of the battery housing 90 to be used as negative terminals or poles, thus leading out a negative current. That is, the currents with the same polarity are led out from one end of the battery to avoid short circuit

between positive and negative electrodes of the battery. At this time, as shown in Fig. 8, both ends of the positive heat-conducting member 1 may be connected with the first connector 71 through the plurality of first electrical connecting elements 8. And both ends of the negative heat-conducting member 2 may be connected with the second connector 72, thus increasing the current conducting area and the heat conducting area, reducing the internal resistance of the battery, and accelerating the heat transfer rate accordingly.

As shown in Fig. 9, the battery is made by placing the electric core into a battery housing 90, filling the electrolyte into the battery housing 90, sealing the battery housing 90 and forming accordingly. Both ends of the positive heat-conducting member 1 penetrate through the first cover 9, and a first insulating member may be provided between the positive heat-conducting member 1 and the first cover 9 to ensure hermetically sealing, thus leading out a positive current. Similarly, both ends of the negative heat-conducting member 2 penetrate through the second cover, and a second insulating member may be provided between the negative heat-conducting member 2 and the second cover to ensure hermetically sealing, thus leading out a negative current. The first cover 9 and the second cover may hermetically seal the first end and the second end of the battery housing 90 by laser welding, electron beam welding, bonding, riveting, hot-melt welding, ultrasonic welding, etc. respectively.

With the battery according to this embodiment of the present disclosure, because the current with the same polarity are led out from one end of the battery, short circuit between positive and negative electrodes of the battery may be avoided, both ends of the positive heat-conducting member 1 may be electrically connected with the first connector 71, and both ends of the negative heat-conducting member 2 may be electrically connected with the second connector 72, which may be convenient to achieve. It should be noted that each of the positive heat-conducting member 1 and the negative heat-conducting member 2 may include, but are not limited to, a U-shaped member, a serpentine member or a sinuous member, provided that both ends of the positive heat-conducting member 1 penetrate through the first cover 9 and both ends of the negative heat-conducting member 2 penetrate through the second cover.

The internal temperature of the battery according to an embodiment of the present disclosure may be homogenized and/or controllable, and thus the battery may always work in a superior operating state.

Although explanatory embodiments have been shown and described, it would be appreciated by those skilled in the art that changes, alternatives, and modifications can be made in the embodiments without departing from spirit and principles of the invention. Such changes, alternatives, and modifications all fall into the scope of the claims and their equivalents.

WHAT IS CLAIMED IS:

1. A battery, comprising:

a battery housing having at least an opening end;

a battery cover sealing the opening end;

an electric core received in the battery housing which comprises a positive heat-conducting member and a negative heat-conducting member that are electrically insulated from each other, the positive heat-conducting member and the negative heat-conducting member each having at least an end penetrating through the battery cover respectively; and

an electrolyte filled in a space formed by the battery housing with the battery cover.

2. The battery of claim 1, wherein the electric core comprises:

an insulating roll core with the positive heat-conducting member and the negative heat-conducting member at least partially received therein; and

a positive plate having a positive tab, a negative plate having a negative tab and a separator between the positive plate and the negative plate which are wound on the insulating roll core, wherein

the positive heat-conducting member is at least thermally connected with the positive tab, and the negative heat-conducting member is at least thermally connected with the negative tab.

3. The battery of claim 2, wherein the positive heat-conducting member is electrically connected with the positive tab and insulated from the negative tab;

the negative heat-conducting member is electrically connected with the negative tab and insulated from the positive tab; and

the positive heat-conducting member and the negative heat-conducting member penetrate through the battery cover respectively.

4. The battery of claim 3, wherein the battery cover includes a first cover hermetically sealing a first end of the battery housing and a second cover hermetically sealing a second end of the battery housing, wherein

the positive heat-conducting member and the negative heat-conducting member penetrate through the first cover and the second cover respectively which are hermetically sealed with the positive heat-conducting member and the negative heat-conducting member respectively.

5. The battery of claim 3, wherein the battery cover includes a first cover hermetically sealing a first end of the battery housing and a second cover hermetically sealing a second end of the battery housing; and

both ends of the positive heat-conducting member penetrate through the first cover, and both ends of the negative heat-conducting member penetrate through the second cover.

6. The battery of claim 3, further comprising:

a first connector for thermally and/or electrically connecting the positive heat-conducting member with the positive tab; and

a second connector for thermally and/or electrically connecting the negative heat-conducting member with the negative tab.

7. The battery of claim 6, wherein:

the positive plate includes a first coating region with a positive material coated thereon and a first non-coating region without the positive material coated thereon;

the negative plate includes a second coating region with a negative material coated thereon and a second non-coating without the negative material coated thereon;

the positive tab is formed by the coiled first non-coating region at the first end of the electric core; and

the negative tab is formed by the coiled second non-coating region at the second end of the electric core.

8. The battery of claim 7, wherein the first connector is annular which is fitted over the first non-coating region, and the second connector is annular which is fitted over the second non-coating region.

9. The battery of claim 8, wherein a plurality of first electrical connecting elements are connected between the first connector and the positive heat-conducting member, and a plurality of second electrical connecting elements are connected between the second connector and the negative heat-conducting member.

10. The battery of claim 3, wherein an insulating layer is formed on an external surface of each of the positive and negative heat-conducting members.

11. The battery of claim 10, wherein the positive heat-conducting member, the negative heat-conducting member and the insulating layer are integrally formed into the insulating roll core which is wound with the positive plate, the negative plate and the separator between the positive plate and the negative plate to form the electric core.

12. The battery of claim 3, wherein the positive heat-conducting member is made of aluminum and the negative heat-conducting member is made of copper.

13. The battery of claim 1, wherein each of the positive and negative heat-conducting members is formed with projections on an external surface thereof for heat dissipation.

14. The battery of claim 11, wherein a filler which is electrically insulating and thermally conductive is filled between the negative and positive heat-conducting members.

15. The battery of claim 1, wherein the positive heat-conducting member and the negative heat-conducting member each are a hollowed elongated member with projections formed on an inner peripheral surface thereof.

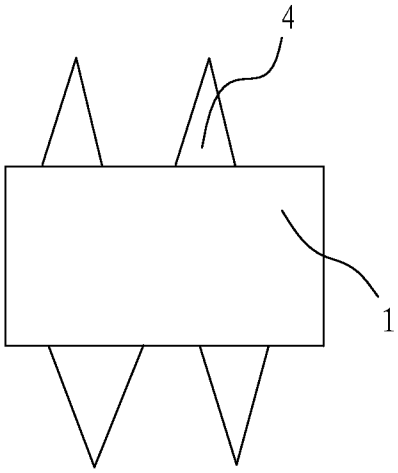

Fig. 1

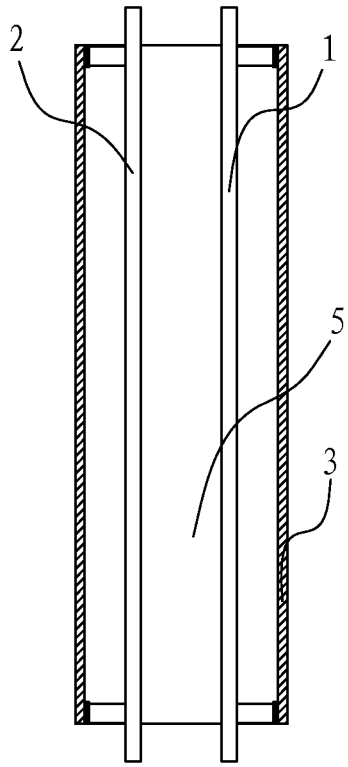

Fig. 2

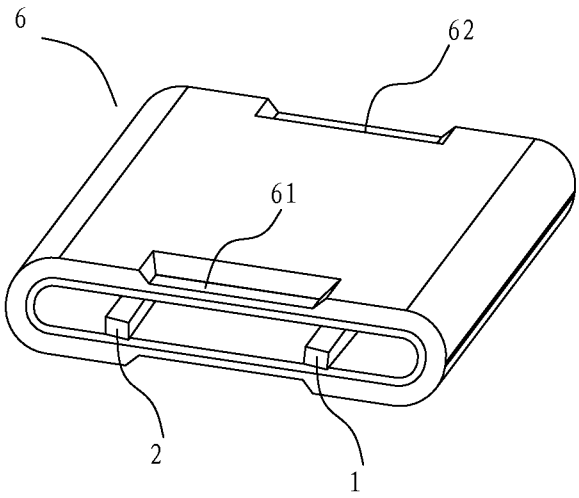

Fig. 3

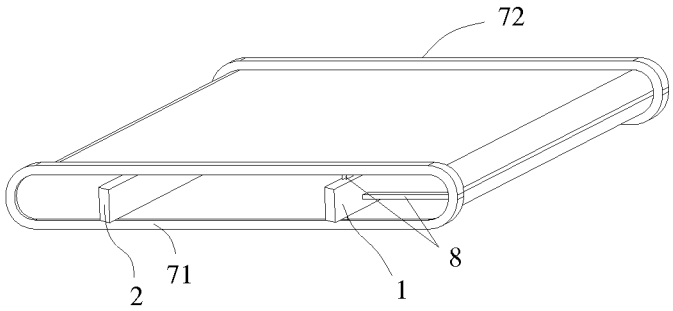

Fig. 4

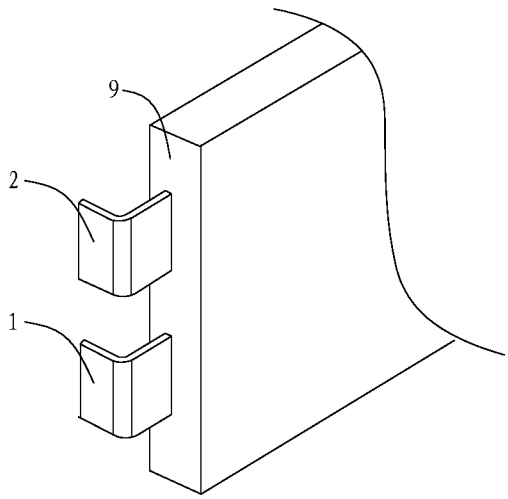

Fig. 5

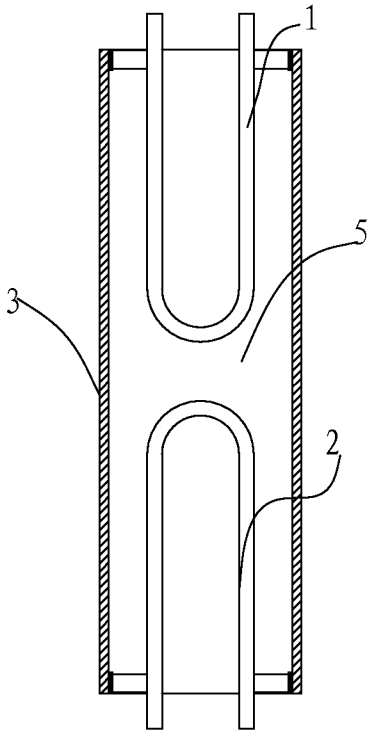

Fig. 6

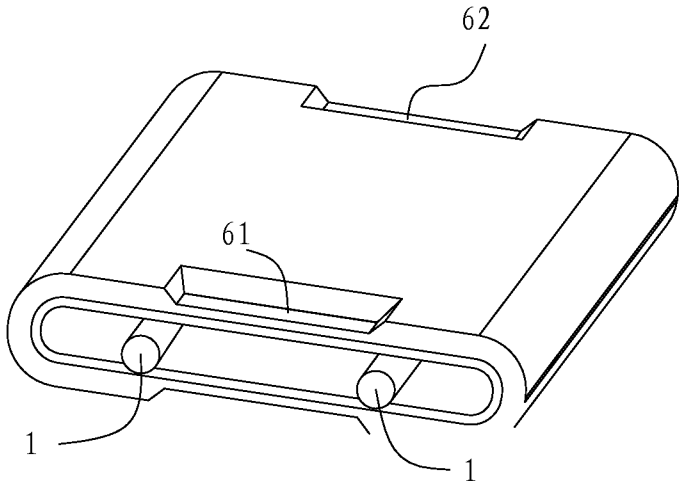

Fig. 7

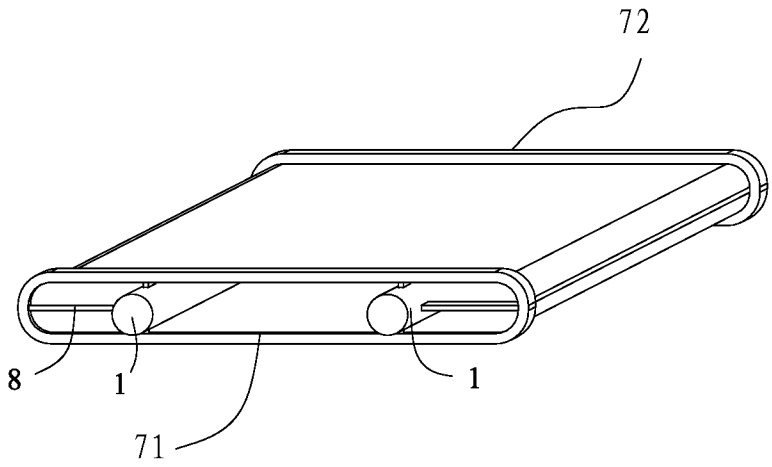

Fig. 8

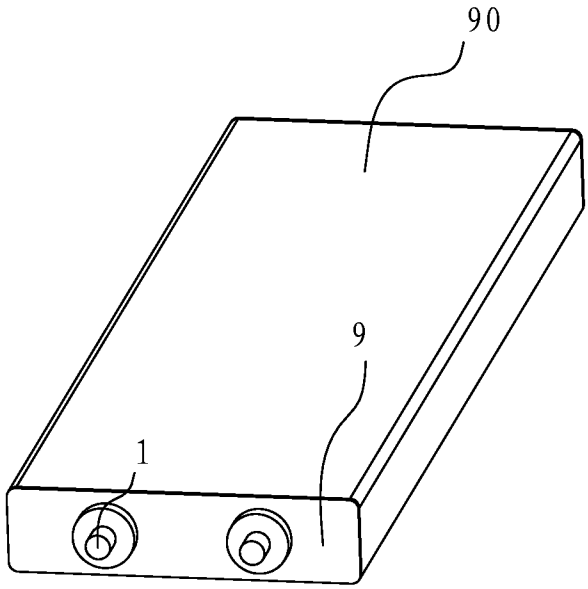

Fig. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2011/084861

A. CLASSIFICATION OF SUBJECT MATTER

H01M 10/06(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC:H01M10,H01M4,H01M6

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPODOC; WPI;CNPAT;CPRS:cell,batter+,tube,hollow,pipe,case,box, container,tin,heat, thermic+, temperature,positive,negative,cathode,anode

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN1462084A(CHUNLAN GROUP CORP)17 Dec.2003(17.12.2003)claims,fig2,embodiment	1
A	the whole document	2-15
A	DE102008034862A(DAIMLER AG)28 Jan.2010(28.01.2010) the whole document	1-15
A	US4565752A(GTE GOVERNMENT SYSTEMS CORP)21 Jan.1986(21.01.1986) the whole document	1-15
PX	CN201985215U(Gao Bin)21 Sep.2011(21.09.2011) claims1-4,examples1-6	1-15
PX	CN201936949U(BYD CO LTD)17 Aug.2011(17.08.2011) claims1-13,examples1-2	1-15
A	CN2773919Y(NO 18 INST CHINA ELECTRONIC SCI TECH GRO)19 Apr.2006(19.04.2006) The whole document	1-15

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

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"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 Jan. 2012（30.01.2012）	**08 Mar. 2012 (08.03.2012)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer Zhang Xiaolin Telephone No. (86-10)62411560

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2011/084861

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN1462084A	17.12.2003	CN1180503C	15.12.2004
DE102008034862A	28.01.2010	None	
US4565752A	21.01.1986	WO8603889A	03.07.1986
		EP0208741A	21.01.1987
		JPS62501248A	14.05.1987
		DK8604032A	22.08.1986
		JP5088513B	22.12.1993
CN201985215U	21.09.2011	None	
CN201936949U	17.08.2011	None	
CN2773919Y	19.04.2006	None	