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(54) **FASTENING STRUCTURE FOR ELECTRIC HEATING PANELS OF ELECTRIC HEATER, AND ELECTRIC HEATER**

(57) An electric heating plate (1) fixing structure of an electric heater and an electric heater, the electric heating plate (1) fixing structure of an electric heater including a cross beam (2), an outer support (3) and a first support (4), the cross beam (2) being connected with the outer support (3), the electric heating plate (1) being connected with the first support (4), and the first support (4) being connected with the cross beam or/and the outer support (3).

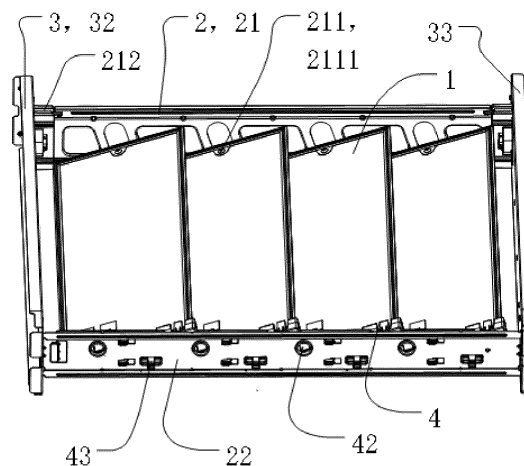


Fig. 1

Description

Cross-reference to Related Application

[0001] This invention is based upon and claims the priority of application No. CN201810708587. X, filed on July 2, 2018, the invention of which is incorporated herein by reference in its entirety.

Technical Field

[0002] The present invention relates to a technical field of household appliances, and more particularly to an electric heating plate fixing structure of an electric heater and an electric heater.

Background

[0003] The electric heating plates of an electric heater in the related art are fixed by using ceramic base assemblies and bolt assemblies; fixing the electric heating plates on the upper and lower cross beams by ceramic base assemblies and bolt assemblies. The number of electric heating plates of an electric heater in the market is substantially between 3 and 5, each of two ends of each plate is provided with a ceramic base assembly and a bolt assembly, the whole machine is provided with 6-10 ceramic base assemblies and bolt assemblies, and no preassembly can be achieved, so that at least two operators are required to achieve assembly, and it is necessary to use both the electric screwdriver and the sleeve to fix. The assembly is complex, the efficiency is low, and there are high requirements for operators, which greatly increasing labor costs. Furthermore, since the upper and lower cross beams are sheet metal parts, the wire at the bottom of the electric heating plates in the related art can only be fixed by buckles of the lower cross beam, so that the wire fixing method is complex, the efficiency is low, and there is a hidden trouble of sheet metal burrs scratching the wire.

[0004] In the related art, the fixing solution of electric heating plates is as described in patent CN202303622U, and the electric heating plates are fixed by using ceramic base assemblies and bolt assemblies, for example, for a four-plates product, the fixing of the plates requires eight ceramic bases, eight screws and eight nuts, so that there are many parts to be assembled, the operation is complex, and the assembling efficiency is low.

Summary

[0005] In order to solve the problems existing in the background, the present invention provides an electric heating plate fixing structure of an electric heater and an electric heater. The electric heating plate fixing structure can omit a ceramic base assembly, has a simple structure, is easy to assemble, and has high efficiency, thereby greatly reducing labor costs.

[0006] To achieve the object above, according to one aspect of the present invention, the following technical solutions are used:

an electric heating plate fixing structure of an electric heater, includes a cross beam, an outer support and a first support, wherein the cross beam is connected with the outer support, the electric heating plate is connected with the first support, and the first support is connected with the cross beam and/or the outer support.

[0007] In some embodiments, the first support is in a snap-fit connection and/or in a threaded connection with the cross beam; and/or, the first support is in a snap-fit connection and/or in a threaded connection with the outer support.

[0008] In some embodiments, the first support is provided with a groove, and one end of the electric heating plate is inserted into the groove.

[0009] In some embodiments, there are a plurality of grooves and a plurality of electric heating plates, and each of the plurality of electric heating plates corresponds to one groove of the plurality of grooves.

[0010] In some embodiments, the groove includes side walls and a bottom wall, one end of each of the side walls is connected to the bottom wall, and the other end of each of the side walls is a free end.

[0011] In some embodiments, each of the side walls is provided with a buckle structure; the buckle structure includes a first buckle portion and a second buckle portion; the first buckle portion and the second buckle portion are disposed on inner side surfaces of two opposite side walls of the groove and are provided opposite to each other; and the snap-fit part of each one of the first buckle portion and the second buckle portion extends toward the direction of the other of the first buckle portion and the second buckle portion located.

[0012] In some embodiments, there are a plurality of buckle structures provided on the groove.

[0013] In some embodiments, inner sides of the side walls are provided with a rib, the rib is provided on two opposite surfaces of the side walls, the rib forms a U-shaped groove in a direction toward an opening of the groove, and the opening of the U-shaped groove and the opening of the groove face a same direction.

[0014] In some embodiments, the cross beam includes a lower cross beam, the bottom wall is fixed on the lower cross beam, and the bottom wall is provided with a wire layout hole and/or a wire layout groove.

[0015] In some embodiments, the wire layout hole includes two elastic clamping arms arranged oppositely.

[0016] In some embodiments, the first support is made of a non-conductive material, and the first support is made of a high-temperature-resistant material.

[0017] In some embodiments, the cross beam includes an upper cross beam, the electric heating plate is connected with the upper cross beam, and the upper cross beam is connected with the outer support by an insulating structure.

[0018] In some embodiments, the upper cross beam

is in a snap-fit connection and/or in a threaded connection with the insulating structure; and/or, the outer support is in a snap-fit connection and/or in a threaded connection with the insulating structure.

[0019] In some embodiments, the insulating structure is made of a non-conductive material, and includes a body, and a first connecting portion and a second connecting portion respectively located at two sides of the body, wherein the first connecting portion is used for the connection between the insulating structure and the upper cross beam, and the second connecting portion is used for the connection between the insulating structure and the outer support.

[0020] In some embodiments, the first connecting portion includes a first buckle, the upper cross beam is provided with a first fitting hole fitted with the first buckle, the first buckle includes a pair of buckles oppositely provided at a front side and a rear side of the body, and the snap-fit part of each one of the pair of buckles extends toward the direction where the other one of the pair of buckles located; and/or the second connecting portion includes a second buckle, and the outer support is provided with a second fitting hole fitted with the second buckle, wherein the second buckle includes a plurality of pairs of buckles provided at a front side and a back side of the body, and the plurality of pairs of buckles are arranged in sequence in the up-down direction.

[0021] In some embodiments, the insulating structure is made of a plastic material.

[0022] According to another aspect of the present invention, the following technical solution is used: an electric heater, including the electric heating plate, wherein the electric heating plate is fixed by the electric heating plate fixing structure above.

[0023] The present invention proposes an electric heating plate fixing structure and an electric heater, in which a ceramic base assembly can be omitted, and instead, the first support is used, so that the structure is simple, the assembly is easy, and the installation efficiency is high, thereby greatly reducing labor costs.

Brief Description of the Drawings

[0024] The above and other objects, features and advantages of the present invention will be more apparent from the following description of embodiments of the present invention with reference to the accompanying drawings, in which:

Fig. 1 is a schematic diagram of an overall structure of an electric heating plate fixing structure of the electric heater according to the present invention;
Fig. 2 is a front view of the electric heating plate fixing structure of the electric heater according to the present invention;
Fig. 3 is a schematic diagram of an overall structure of the first support of the electric heating plate fixing structure according to the present invention;

Fig. 4 is an enlarged view of part A in Fig. 3 according to the present invention;

Fig. 5 is a side view of the electric heating plate fixing structure according to the present invention;

Fig. 6 is an enlarged view of part B in Fig. 5 according to the present invention;

Fig. 7 is a partial schematic diagram of the first support of the electric heating plate fixing structure according to the present invention;

Fig. 8 is a left side view of a connection of the insulating structure according to the present invention;

Fig. 9 is a schematic diagram of the structure of a connection of the insulating structure of the electric heating plate in accordance with the present invention;

Fig. 10 is a schematic diagram of the structure of another embodiment of the connection of the insulating structure of the electric heating plate according to the present invention;

Fig. 11 is a sectional view of the connection of the insulating structure of the electric heating plate according to the present invention.

[0025] In the figures,

1: electric heating plate; 2: cross beam; 21: upper cross beam; 211: connecting piece; 2111: first through hole; 212: insulating structure; 22: lower cross beam; 23: first fitting hole; 3: outer support; 31: second fitting hole; 32: left support; 33: right support; 4: first support; 41: groove; 411: side wall; 4111: notch; 4112: side plate; 4113: rib; 4114: reinforcing rib; 4115: buckle structure; 412: bottom wall; 413: U-shaped groove; 42: wire layout hole; 43: wire layout groove; 5: insulating structure; 51: first connecting portion; 511: first buckle; 52: second connecting portion; 521: second buckle; 522: first screw; 53: body; 54: protruding structure; 541: second screw; 542: reinforcing rib.

Detailed Description of the Embodiments

[0026] The present invention is described on the basis of the below embodiments, but the present invention is not limited only to these embodiments. In the following detailed description of the invention, some specific details are described in detail.

[0027] Furthermore, it will be understood by a person skilled in the art that the figures provided herein are for illustration purposes and that the figures are not necessarily drawn to scale.

[0028] Unless it is clearly defined by the context to be otherwise, words such as "comprise", "include" and the like in the entire description and claims are to be construed in an inclusive sense, rather than an exclusive or exhaustive sense; that is to say, in the sense of "including, but not limited to".

[0029] In the description of the present invention, it should be understood that the terms "first", "second", etc. are only used for descriptive purposes, and cannot be construed as indicating or implying relative importance.

In addition, in the description of the present invention, unless it is defined to be otherwise, "a plurality of" means two or more.

[0030] The present invention provides an electric heating plate 1 fixing structure of an electric heater, and an electric heater including the electric heating plate 1 fixing structure. As shown in Fig. 1, the electric heating plate 1 fixing structure includes a cross beam 2 and an outer support 3, the cross beam 2 is supported by the outer support 3, the cross beam 2 includes a lower cross beam 22, a first support 4 is provided between the lower end of the electric heating plate 1 and the lower cross beam 22, and the first support 4 is provided with a groove 41 or a buckle. In one embodiment, as shown in Fig. 3, the first support 4 is provided with a plurality of grooves 41, the number of the grooves 41 matches the number of the electric heating plates 1 of the electric heater, the lower end of the electric heating plate 1 is inserted into the groove 41, the electric heating plate 1 is clamped in the groove 41, the groove 41 can limit the position of the electric heating plate 1, and the electric heating plate 1 is fixed by the groove 41, that is, the electric heating plate 1 is connected with the lower cross beam 22 by the first support 4. In addition, as shown in Fig. 2, the cross beam 2 further includes an upper cross beam 21, the upper end of the electric heating plate 1 is connected with the upper cross beam 21 by a fastener, the fastener is a bolt assembly, a screw assembly or a buckle assembly, and the bolt assembly is used here; preferably, the upper cross beam 21 is provided with a connecting piece 211 protruding toward the direction of the electric heating plate 1, the connecting piece 211 is provided with a threaded hole, and the electric heating plate 1 is directly fixed on the connecting piece 211 by a bolt so as to achieve the connection between the electric heating plate 1 and the upper cross beam 21, so that the connection is simple, time-saving and labor-saving, and the connection strength is high. In other embodiments, the electric heating plate 1 can also be connected with the upper cross beam 21 by the first support 4, and the specific connecting manner will not be redundantly repeated here. In a preferred embodiment, two ends of the upper cross beam 21 are respectively connected with the outer support 3 by insulating structures 5; preferably, the insulating structure 5 is made of a plastic material, which is easy to process and shape, and is low in cost; the insulating structure 5 is in a threaded connection or a snap-fit connection with the upper cross beam 21; likewise, the insulating structure 5 is also in a threaded connection or a snap-fit connection with the outer support 3, so as to ensure the firmness of the connection, and the insulation between the upper cross beam 21 and the outer support 3. In addition, the first support 4 is also made of an insulating material, preferably a plastic material, which is easy to process and shape, is low in cost, and can ensure a high connection strength; by the insulating structure 5 and the first support 4, the electric heating plates 1 can be insulated from the outer support 3, and by

the fixing structure above, the original ceramic base assembly is omitted, achieving the advantages of convenient connection, simple assembly, and high efficiency, thereby greatly reducing labor costs.

[0031] It should be noted that, the connection manner between the first support 4 and the electric heating plate 1 is not limited to the connection manner of groove 41 or buckle, and the connection manner can also be a threaded connection, by providing, on the electric heating plate 1 and the first support 4, connecting holes which match with each other, and then achieving connection by stud or screw, and this can also satisfy the requirement for connection and insulation, and the first support 4 can also in a snap-fit connection or a threaded connection with the lower cross beam 22. In the present application, the electric heating plate 1 of the electric heater is fixed by the first support 4, so that the operation process is simple, the man-hour on the assembly process can be greatly shortened, the efficiency is obviously improved, which can be increased by about 48%.

[0032] In a preferred embodiment, as shown in Fig. 3 and Fig. 4, the groove 41 includes side walls 411 and a bottom wall 412, wherein one end of each of the side walls 411 is connected to the bottom wall 412, the other end of each of the side walls 411 is a free end, notches 4111 are provided on the side walls 411, and the notches 4111 extend from the free end toward the bottom wall 412. Preferably, the notches 4111 extend from the free end to the upper surface of the bottom wall 412, so that a plurality of side plates 4112 that are provided at intervals are formed on the side walls 411, and this can reduce the amount of material used for the first support 4, reducing costs. In addition, as the notches 4111 divide the sides of the groove 41 into a plurality of side plates 4112, the elasticity of the side plates 4112 can be increased, thereby facilitating the installation of the electric heating plate 1. Preferably, a rib 4113 is provided on the inner wall surfaces of part of the side plates 4112 of the groove 41, which are used for clamping the electric heating plate 1 in the groove 41. The provision of the notches 4111 facilitates the processing of the groove 41, reducing labor costs and time costs. Reinforcing ribs 4114 are provided on at least part of the outer wall surfaces of the side plates 4112. Preferably, the reinforcing ribs 4114 are provided on the outer wall surfaces of all the side plates 4112, and the rib 4113 is provided on the inner wall surfaces of all the side plates 4112. Each of the rib 4113 forms a U-shaped groove 413 in a direction toward an opening of the groove 41. The opening of the U-shaped groove 413 and the opening of the groove 41 face a same direction, so as to ensure the stability and security of the connection between the first support 4 and the electric heating plate 1. Alternatively, the reinforcing ribs 4114 can be provided on the outer wall surfaces of a part of the side plates 4112, and the ribs 4113 are provided on the inner wall surfaces of the other part of the side plates 4112, thereby reducing the material cost. Preferably, the side plates 4112 on which the reinforcing ribs 4114 are provided and

the side plates 4112 on which the ribs 4113 are provided are alternatively arranged. In this way, the reinforcing ribs 4114 and the ribs 4113 are arranged alternatively on the connection between the electrical heating plate 1 and the first support 4, ensuring the strength of the connection, and improving the service life of the electric heater. Furthermore, the inner walls of part of the side plates 4112 are provided with buckles 4115. In this embodiment, the buckles 4115 are provided on the inner walls of the side plates 4112 having the reinforcing ribs 4114. As shown in Fig. 6, each of the buckles 4115 includes a first buckle portion and a second buckle portion, the first buckle portion and the second buckle portion are disposed on the inner side surfaces of two opposite side walls of the groove, and are provided opposite to each other. The snap-fit part of each one of the first buckle portion and the second buckle portion extends toward the direction of the other of the first portion and the second buckle portion. The end portion of the electric heating plate 1 is provided with a protruding structure, and the protruding structure can pass through the first buckle portion and the second buckle portion to be located on the lower side of the buckle 4115, so that the end portion of the electric heating plate 1 can be fixed by the buckle structure 4115. Preferably, a plurality of buckles 4115 are provided on each of the grooves 41, and there are three buckles in total in the embodiment shown in Fig. 4. The number of buckles is not particularly limited, as long as the electric heating plate 1 can be firmly fixed.

[0033] In a preferred embodiment, as shown in Fig. 1 and Fig. 4, the bottom wall 412 is provided with a wire layout hole 42 and/or a wire layout groove 43. In the present application, the wire layout hole 42 and the wire layout groove 43 are both provided, and a folded edge structure that is folded toward the direction away from the groove 41 is provided around the lower cross beam 22. On the one hand, the structural strength of the lower cross beam 22 can be improved, and on the other hand, space for the wire arrangement of the electric heater can be provided. The first support 4 is provided with cylindrical structure protruding toward the direction of the lower cross beam 22, and the lower cross beam 22 is provided with a first fitting hole fitted with the cylindrical structure, the cylindrical structure is provided with a through hole, and the cylindrical structure is the wire layout holes 42 used for the passage of the wires. In addition, the first support 4 is provided with the wire layout groove 43 protruding toward the direction of the lower cross beam 22, the lower cross beam 22 is provided with second fitting hole fitted with the wire layout groove structure, the wire layout groove 43 is used for the arrangement of the wires, and the wire layout groove 43 includes two elastic clamping arms disposed opposite to each other, so as to ensure the close fitting between the wire layout groove 43 and the second fitting hole, and furthermore, it is more convenient to arrange the wires, and the safety of the arrangement of wires in the wire layout groove 43 is improved. By providing the wire layout holes 42 and the

wire layout grooves 43 in the first support 4, the wires of the electric heating plate 1 are fixed in the wire layout hole 42 and the wire layout groove 43 of the first support 4, so that the wire arrangement is more reasonable and the assembly efficiency is high, solving the hidden troubles of the wiring being complicated and the wires being easy to be scratched in the prior art. In addition, since the first support 4 is made of a plastic material, the processing is convenient, and compared with sheet metal materials, the hidden trouble of burrs scratching the wires can further be avoided.

[0034] As shown in Fig. 1 and Fig. 3, one end of the electric heating plate 1 of the electric heater is directly fixed on the upper cross beam 21 by a threaded connection, and the other end is directly inserted into the groove 41 of the first support 4 which is made of a plastic material, and is directly fixed by the groove 41 of the first support 4, so that the installation is simple. The first support 4 is provided with the wire layout hole 42 and the wire layout groove 43, and the wires of the electric heating plate 1 are fixed in the wire layout hole 42 and the wire layout grooves 43 of the first support 4, so that the assembly efficiency is high, solving the hidden troubles of the wiring being complicated and the wires being easy to be scratched in the prior art.

[0035] As shown in Fig. 1, in the present application, the electric heating plate 1 is directly connected with the upper cross beam 21. The upper cross beam 21 and the outer support 3 are connected by the insulating structure 5. The insulating structure 5 is connected with the upper cross beam 21 and the outer support 3 respectively, thereby ensuring that the upper cross beam 21 and the outer support 3 are not in direct contact, so that the upper cross beam 21 is in an insulated connection with the outer support 3. In this way, although the electric heating plate 1 is directly connected with the upper cross beam 21, the insulation between the electric heating plate 1 and the outer support 3 can also be achieved. By the insulating structure 5, the original ceramic base assembly is omitted, which has a relatively high assembly difficulty, solving the problems of low assembly efficiency and labor consumption when the electric heating plates 1 are fixed by the ceramic base assemblies in the prior art, and greatly reducing the production cost of products.

[0036] It should be noted that, as shown in Fig. 9 and Fig. 10, the upper cross beam 21 is in a snap-fit connection and/or a threaded connection with the insulating structure 5, and/or the outer support 3 is in a snap-fit connection and/or a threaded connection with the insulating structure 5. The snap-fit connection and/or the threaded connection above between the insulating structure 5 and the upper cross beam 21 and between the insulating structure 5 and the outer support 3 can be used separately, or the two connections can both be used or can be used alternatively, that is, the snap-fit connection or the threaded connection can be used in both the connection between the insulating structures 5 and the upper cross beam 21 and the connection between the insulating

structures 5 and the outer support 3, or the snap-fit connection and the threaded connection can both be used in the two connections, or the snap-fit connection can be used in one connection, and the threaded connection can be used in the other connection, as long as the upper cross beam 21 and the outer support 3 are insulated from each other by the insulating structure 5. Certainly, in addition to the snap-fit connection and the threaded connection, other connection manners can also be used, such as bonding.

[0037] In a particular embodiment, as shown in Fig. 9 and Fig. 10, the upper cross beam 21 and the insulating structure 5 are connected by using both the snap-fit connection and the threaded connection, the insulating structure 5 and the outer support 3 are also connected by using both the snap-fit connection and the threaded connection. Preferably, the insulating structure 5 includes a protruding structure 54, the protruding structure 54 is disposed on one side, close to the outer support 3, of the body 53, or the protruding structure 54 is disposed on a lower side or an upper side of the body 53 (for ease of description, in the present invention, a side directly facing the viewer in Fig. 1 is the front side, and an opposite side thereof is the rear side, and the upper, lower, left and right sides in Fig. 1 are the upper, lower, left and right sides in the present application), the protruding portion of the protruding structure 54 is in a threaded connection with the outer support 3, so as to ensure the stability of the connection between the insulating structure 5 and the outer support 3, and the protruding structure 54 includes a reinforcing rib 542, so as to enhance the strength and stability of the protruding structure 54.

[0038] In a preferred embodiment, as shown in Fig. 9 and Fig. 11, the insulating structure 5 includes a body 53, and a first connecting portion 51 and a second connecting portion 52 which are respectively disposed at two sides of the body 53, wherein, the first connecting portion 51 is used for the connection between the insulating structure 5 and the upper cross beam 21, and the second connecting portion 52 is used for the connection between the insulating structure 5 and the outer support 3. Furthermore, the first connecting portion 51 includes a first buckle 511, the upper cross beam 21 is provided with a first fitting hole 23 fitted with the first buckle 511. The first buckle 511 includes a pair of buckles oppositely provided on a front side and a rear side of the body 53, and a snap-fit part of each one of the pair of buckles extends toward a direction where the other one of the pair of buckles located, thereby realizing the fixation by the snap-fit connection, and guaranteeing the effective of the snap-fit connection, so that the insulating structure 5 is in a firmly snap-fit connection with the upper cross beam 21. As shown in Fig. 4, a first screw 522 is also used to connect the body 53 of the insulating structure 5 and the upper cross beam 21, so as to ensure the connection strength and prevent the influence caused by the falling off of the first buckle 511.

[0039] In addition, as shown in Fig. 8 and Fig. 9, the

second connecting portion 52 includes a second buckle 521, a second fitting hole 31 fitted with the second buckle 521 is provided on the outer support 3, the second buckle 521 includes a plurality of pairs of buckles provided on a front side and a rear side of the body 53, the plurality of pairs of buckles are arranged in sequence in an up-down direction, the provision of the plurality of pairs of buckles can effectively ensure the stable snap-fit connection between the insulating structure 5 and the outer support 3, so as to improve the reliability of the connection; preferably, there are two pairs of buckles, and in the up-down direction, the first connecting portion 51 is disposed between the two pairs of second buckles 521, so that the whole construction of the insulating structure 5 is reasonable, thereby ensuring the connection strength between the insulating structure 5 and the upper cross beam 21 and the connection strength between the insulating structure 5 and the outer support 3, and ensuring the stability of the overall structure formed after the insulating structure 5 is connected with the outer support 3 and the upper cross beam 21. Furthermore, the protruding structure 54 is connected with the outer support 3 by using the second screw 541, thereby preventing the influence caused by the falling off of the second buckles 521 and ensuring the stability of the connection.

[0040] More preferably, the insulating structure 5 is made of a non-conductive material, preferably a plastic material, which has good insulating property, is easy to process, and has a low cost.

[0041] In one particular embodiment, as shown in Fig. 1, the cross beam 2 includes an upper cross beam 21 and a lower cross beam 22, the outer support 3 includes a left support 32 and a right support 33, the upper cross beam 21 is connected with the left support 32 and the right support 33 respectively through the insulating structure 5, the lower cross beam 22 is in a threaded connection with the left support 32 and the right support 33 respectively, the electric heating plate 1 is in a directly threaded connection with the upper cross beam 21, the electric heating plate 1 is connected with the lower cross beam 22 by the first support 4, the cross beam 2 and the outer support 3 are made into a structure which is separable in the up-down and left-right directions, so as to facilitate the connection operation of an operator, improving the connection efficiency, and reducing the installation time; the electric heater includes a plurality of electric heating plates 1 which are fixed on the upper cross beam 21 and the lower cross beam 22, and are disposed between the left support 32 and the right support 33, so as to provide a good heating effect, and to better satisfy user requirements. It should be noted that the insulating structure 5 may be used for the connection between the lower cross beam 22 and the outer support 3, and the first support 4 is provided on the upper cross beam 21, so as to achieve the insulation effect between the electric heating plates 1 and the outer support 3.

[0042] Those skilled in the art can easily understand that, on the premise of no conflict, the described various

preferred solutions can be freely combined and superposed.

[0043] It should be understood that the above-described embodiments are merely exemplary, rather than limiting, and that various obvious or equivalent modifications or replacements can be made by those skilled in the art without departing from the basic principle of the present invention, which shall belong to the scope of the claims of the present invention.

Claims

1. An electric heating plate fixing structure of an electric heater, comprising a cross beam, an outer support and a first support, wherein the cross beam is connected with the outer support, the first support is used for connecting an electric heating plate of the electric heater, and the first support is connected with the cross beam and/or the outer support.
2. The electric heating plate fixing structure as claimed in claim 1, wherein the first support is in a snap-fit connection and/or a threaded connection with the cross beam; and/or the first support is in a snap-fit connection and/or a threaded connection with the outer support.
3. The electric heating plate fixing structure as claimed in claim 2, wherein the first support is provided with a groove, and one end of the electric heating plate is inserted into the groove.
4. The electric heating plate fixing structure as claimed in claim 3, wherein there are a plurality of grooves and a plurality of electric heating plates, and each of the plurality of electric heating plates corresponds to one groove of the plurality of grooves.
5. The electric heating plate fixing structure as claimed in claim 3, wherein the groove comprises side walls and a bottom wall, one end of each of the side walls is connected to the bottom wall, and the other end of each of the side walls is a free end.
6. The electric heating plate fixing structure as claimed in claim 5, wherein each of the side walls is provided with a buckle structure, the buckle structure comprises a first buckle portion and a second buckle portion, the first buckle portion and the second buckle portion are disposed on inner side surfaces of two opposite side walls of the groove and are provided opposite to each other, and a snap-fit part of any one of the first buckle portion and the second buckle portion extends toward a direction where the other of the first buckle portion and the second buckle portion located.
7. The electric heating plate fixing structure as claimed in claim 6, wherein there are a plurality of the buckle structures provided on the groove.
8. The electric heating plate fixing structure as claimed in claim 5, wherein inner sides of the side walls are provided with a rib, the rib is provided on two opposite surfaces of the side walls, the rib forms a U-shaped groove in a direction toward an opening of the groove, and an opening of the U-shaped groove and the opening of the groove face a same direction.
9. The electric heating plate fixing structure as claimed in claim 5, wherein the cross beam comprises a lower cross beam, the bottom wall is fixed on the lower cross beam, and the bottom wall is provided with a wire layout hole and/or a wire layout groove.
10. The electric heating plate fixing structure as claimed in claim 9, wherein the wire layout groove comprises two elastic clamping arms arranged oppositely.
11. The electric heating plate fixing structure as claimed in any one of claims 1 to 10, wherein the first support is made of a non-conductive material, and/or the first support is made of a high-temperature-resistant material.
12. The electric heating plate fixing structure as claimed in any one of claims 1 to 10, wherein the cross beam comprises an upper cross beam, the electric heating plate is connected with the upper cross beam, and the upper cross beam is connected with the outer support by an insulating structure.
13. The electric heating plate fixing structure as claimed in claim 12, wherein the cross beam further comprises a lower cross beam, the first support is connected with the lower cross beam, a lower end of the electric heating plate is connected with the support, and an upper end of the electric heating plate is connected with the upper cross beam.
14. The electric heating plate fixing structure as claimed in claim 12, wherein the upper cross beam is in a snap-fit connection and/or in a threaded connection with the insulating structure; and/or, the outer support is in a snap-fit connection and/or in a threaded connection with the insulating structure.
15. The electric heating plate fixing structure as claimed in claim 14, wherein the insulating structure is made of a non-conductive material, and comprises a body, and a first connecting portion and a second connecting portion which are respectively located at two sides of the body, wherein the first connecting portion is used for the connection between the insulating structure and the upper cross beam, and the second

connecting portion is used for the connection between the insulating structure and the outer support.

16. The electric heating plate fixing structure as claimed in claim 15, wherein the first connecting portion comprises a first buckle, the upper cross beam is provided with a first fitting hole fitted with the first buckle, the first buckle comprises a pair of buckles oppositely provided at a front side and a rear side of the body, and a snap-fit part of each one of the pair of buckles extends toward a direction where the other one of the pair of buckles located; and/or, the second connecting portion comprises a second buckle, and the outer support is provided with a second fitting hole fitted with the second buckle, the second buckle comprises a plurality of pairs of buckles provided at a front side and a rear side of the body, and the plurality of pairs of buckles are sequentially arranged in an up-down direction.
17. The electric heating plate fixing structure as claimed in claim 12, wherein the insulating structure is made of a plastic material.
18. An electric heater, an electric heating plate of the electric heater being fixed by the fixing structure as claimed in any one of claims 1 to 17.

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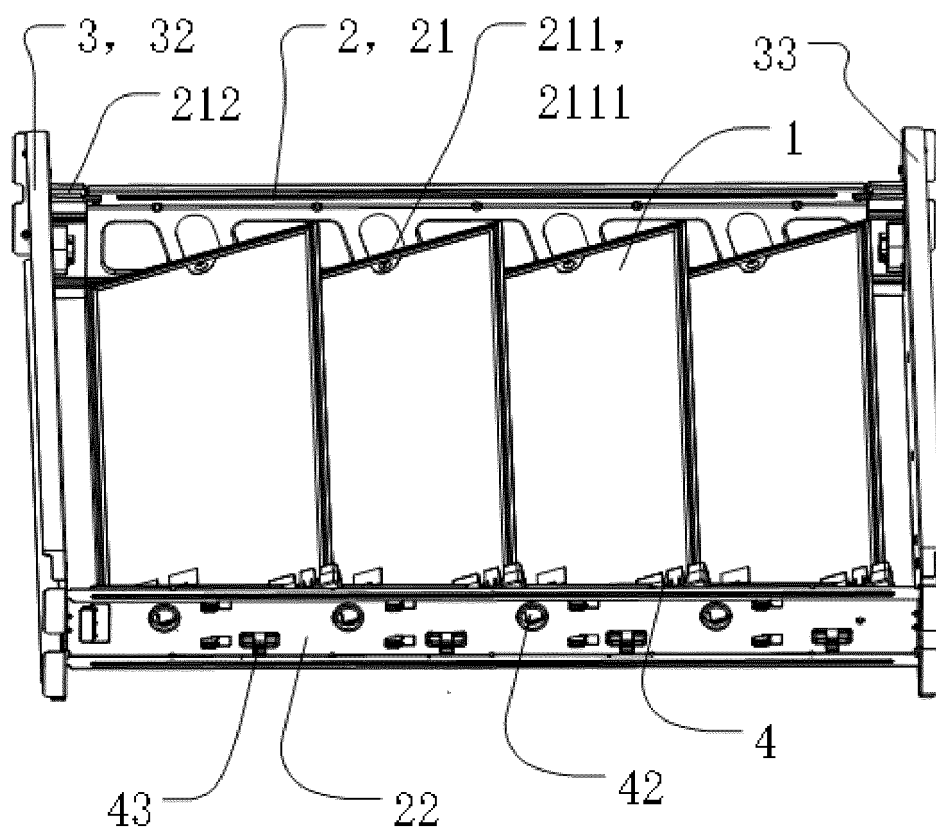


Fig. 1

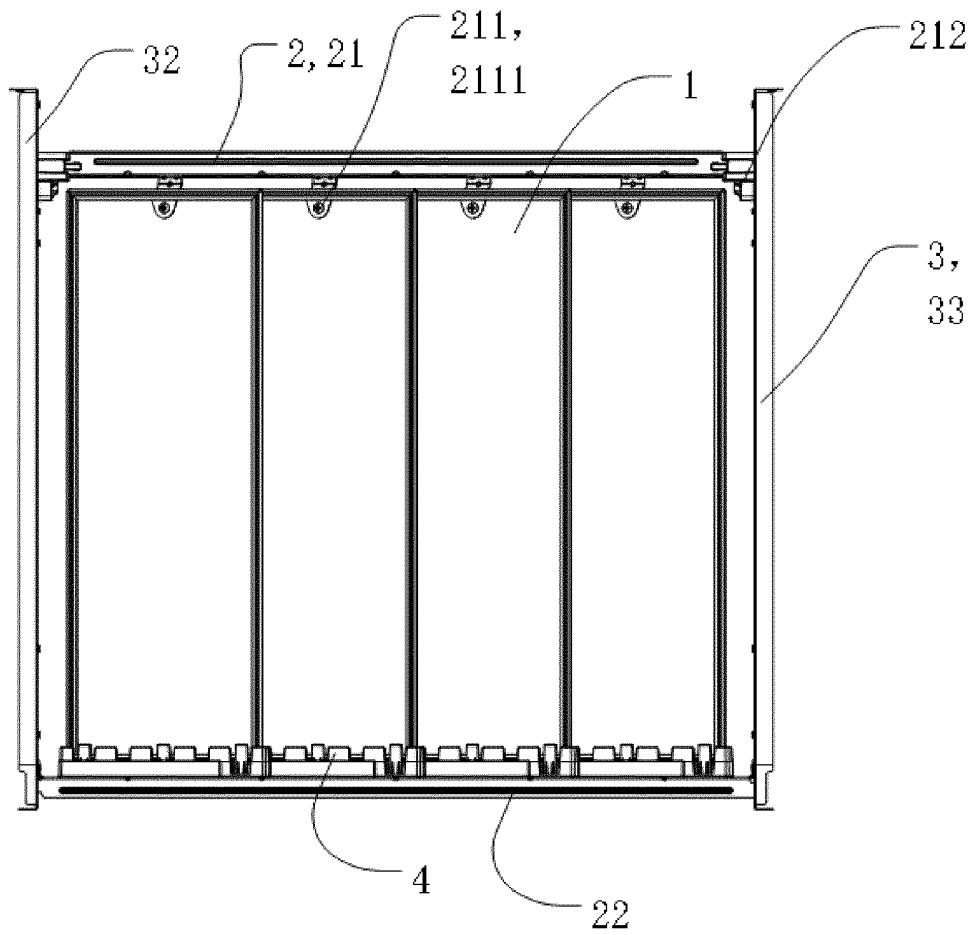


Fig. 2

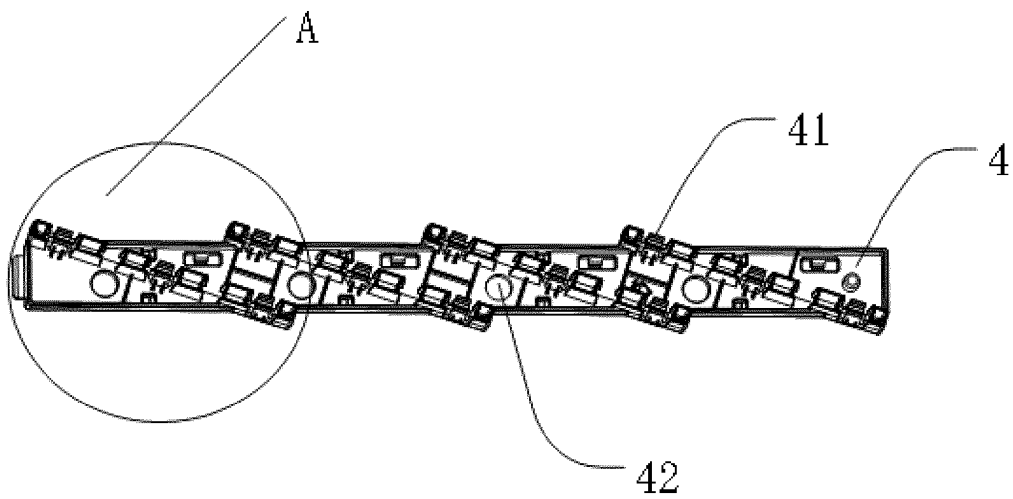


Fig. 3

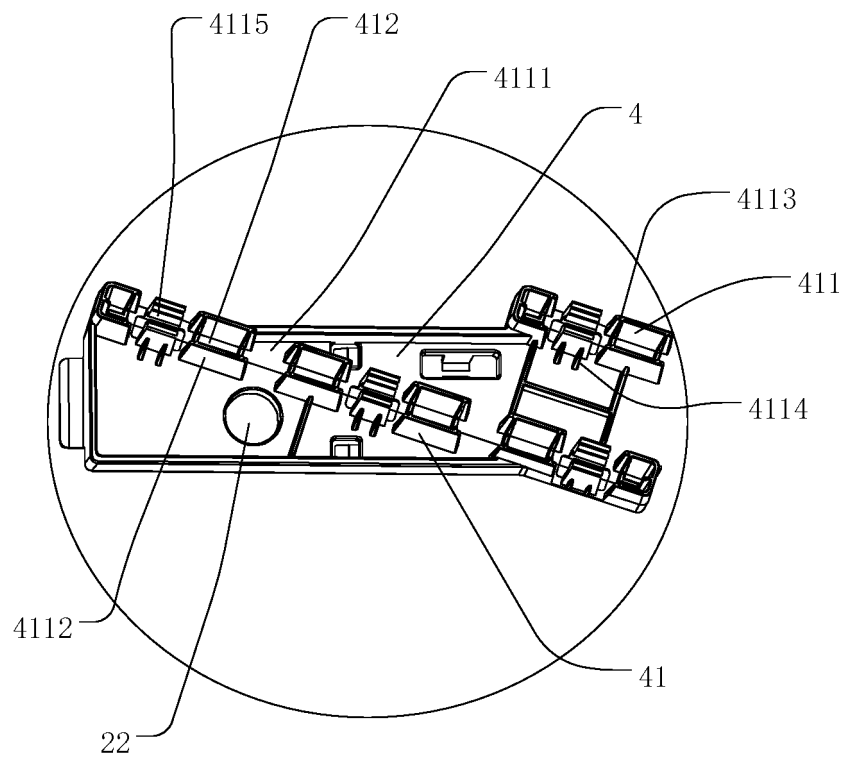


Fig. 4

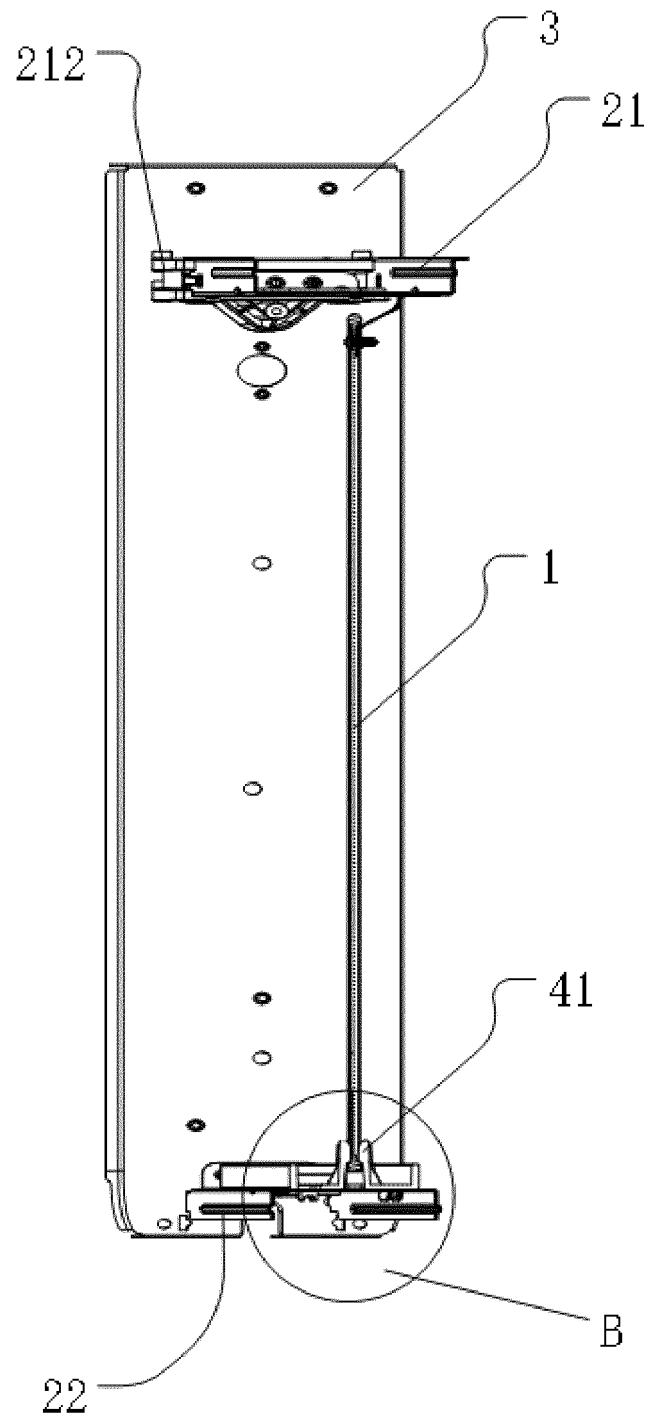


Fig. 5

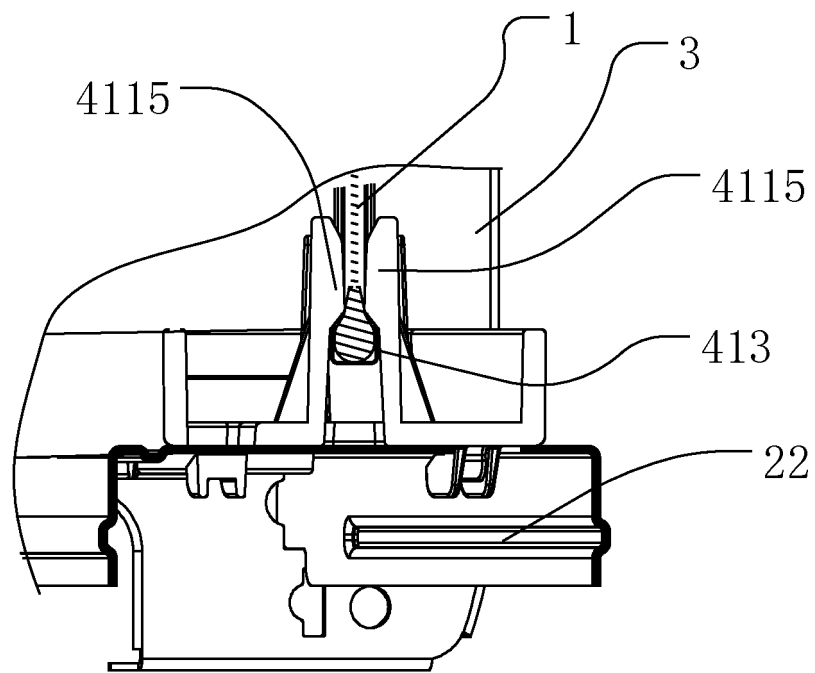


Fig. 6

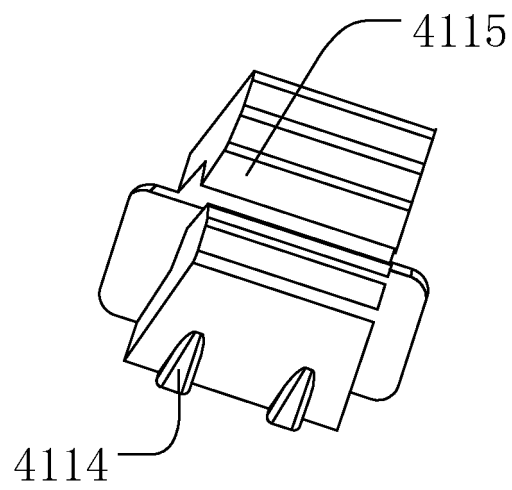


Fig. 7

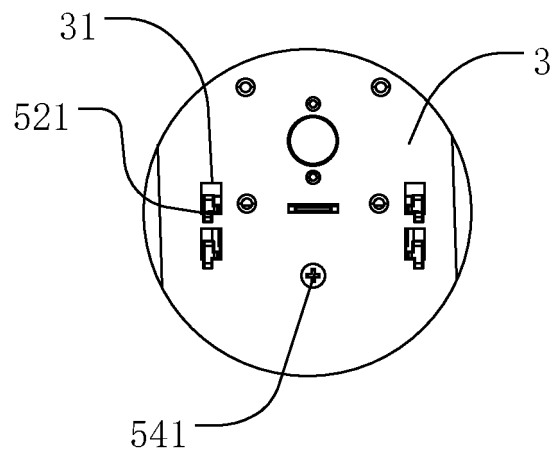


Fig. 8

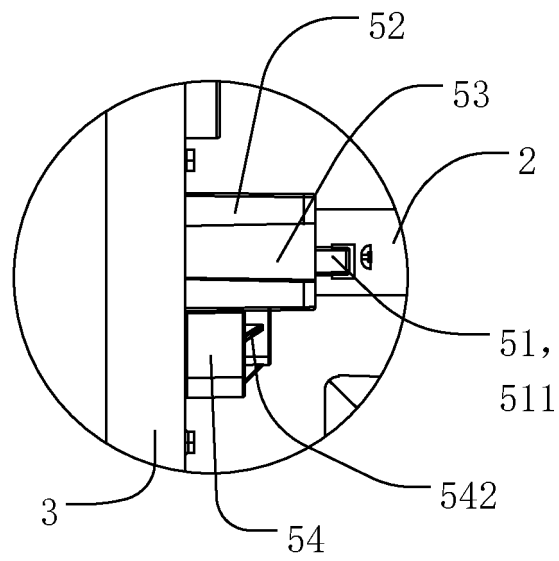


Fig. 9

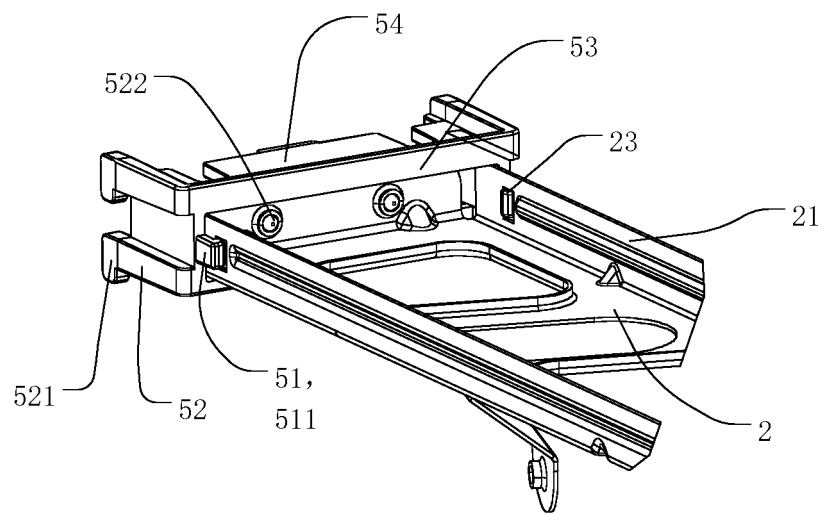


Fig. 10

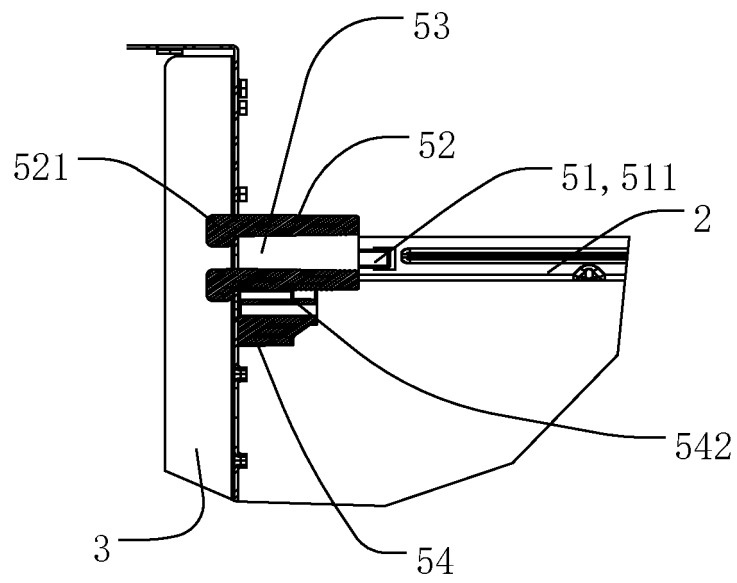


Fig. 11

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2018/122310

A. CLASSIFICATION OF SUBJECT MATTER F24D 19/02(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) F24D 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) CNPAT, CNKI, CNTXT, VEN: 电暖气, 电暖器, 电热片, 横梁, 支架, 卡接, 螺纹, 卡槽, 卡扣, 孔, 弹性, 横梁, 绝缘, 塑胶, heat+, warmer, frame, bracket, beam, electric+, upper, lower, plug, insulat+, elastic+, exhaust, isolat+, groove, slot, plastic																					
C. DOCUMENTS CONSIDERED TO BE RELEVANT																					
<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>CN 206600862 U (ANZHAO ZHONGSHAN ELECTRICAL APPLIANCE CO., LTD.) 31 October 2017 (2017-10-31) description, paragraphs [0017]-[0020], and figures 1-6</td> <td>1-18</td> </tr> <tr> <td>PX</td> <td>CN 108826435 A (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI) 16 November 2018 (2018-11-16) description, paragraphs [0045]-[0056], and figures 1-11</td> <td>1-18</td> </tr> <tr> <td>A</td> <td>CN 207094750 U (BEIJING JINKUN WANYUAN TECHNOLOGY CO., LTD.) 13 March 2018 (2018-03-13) entire document</td> <td>1-18</td> </tr> <tr> <td>A</td> <td>CN 207378923 U (NANJING HUAICUI INTELLIGENT TECHNOLOGY CO., LTD.) 18 May 2018 (2018-05-18) entire document</td> <td>1-18</td> </tr> <tr> <td>A</td> <td>CN 206439897 U (XINJIANG AODE PUSHENG ENERGY SAVING TECHNOLOGY CO., LTD.) 25 August 2017 (2017-08-25) entire document</td> <td>1-18</td> </tr> <tr> <td>A</td> <td>CN 202361471 U (LEI, ZHONGBIN) 01 August 2012 (2012-08-01) entire document</td> <td>1-18</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	CN 206600862 U (ANZHAO ZHONGSHAN ELECTRICAL APPLIANCE CO., LTD.) 31 October 2017 (2017-10-31) description, paragraphs [0017]-[0020], and figures 1-6	1-18	PX	CN 108826435 A (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI) 16 November 2018 (2018-11-16) description, paragraphs [0045]-[0056], and figures 1-11	1-18	A	CN 207094750 U (BEIJING JINKUN WANYUAN TECHNOLOGY CO., LTD.) 13 March 2018 (2018-03-13) entire document	1-18	A	CN 207378923 U (NANJING HUAICUI INTELLIGENT TECHNOLOGY CO., LTD.) 18 May 2018 (2018-05-18) entire document	1-18	A	CN 206439897 U (XINJIANG AODE PUSHENG ENERGY SAVING TECHNOLOGY CO., LTD.) 25 August 2017 (2017-08-25) entire document	1-18	A	CN 202361471 U (LEI, ZHONGBIN) 01 August 2012 (2012-08-01) entire document	1-18
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<table border="0"> <tr> <td style="vertical-align: top;"> * Special categories of cited documents: “A” document defining the general state of the art which is not considered to be of particular relevance “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 </td> <td style="vertical-align: top;"> “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 </td> </tr> </table>	* Special categories of cited documents: “A” document defining the general state of the art which is not considered to be of particular relevance “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																			
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Date of the actual completion of the international search 16 February 2019	Date of mailing of the international search report 25 February 2019																				
Name and mailing address of the ISA/CN National Intellectual Property Administration, PRC (ISA/CN) No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088 China Facsimile No. (86-10)62019451	Authorized officer Telephone No.																				

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2018/122310

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2005085696 A (DENSO CORPORATION) 31 March 2005 (2005-03-31) entire document	1-18
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2018/122310

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Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN	206600862	U	31 October 2017	None	
CN	108826435	A	16 November 2018	None	
CN	207094750	U	13 March 2018	None	
CN	207378923	U	18 May 2018	None	
CN	206439897	U	25 August 2017	None	
CN	202361471	U	01 August 2012	None	
JP	2005085696	A	31 March 2005	None	

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