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(54) DIRECT-PLUG-IN TYPE RELAY SOCKET

(57) Provided is a direct-plug-in type relay socket capable of preventing welding pollution. The direct-plug-in type relay socket comprises a base, a leading-out member, a spring piece, an input clamping spring and an inner wire, wherein the base is provided with a first accommodating cavity and a second accommodating cavity, and the leading-out member and the spring piece are arranged in the first accommodating cavity of the base; the leading-out member comprises an internal connection part and an external connection part, And the spring piece cooperates with the external connection part such that a plugged-in outer wire can be tightly pressed on the external connection part; the input clamping spring is arranged in the second accommodating cavity of the base; and two ends of the inner wire are respectively electrically connected to the internal connection part of the leading-out member and the input clamping spring by means of laser welding.

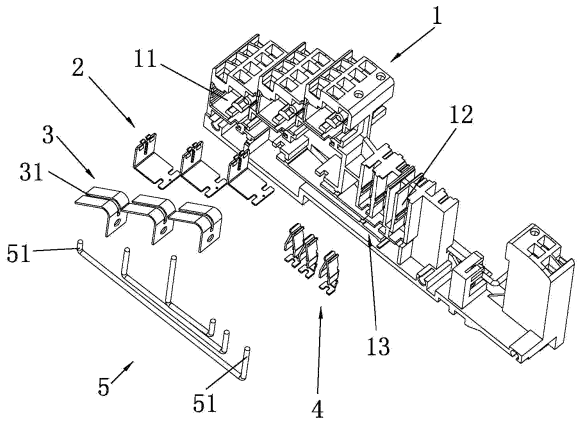

Fig. 1

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present disclosure claims priority to Chinese Patent Applications No. 202010218318.2, No. 202010218344.5, and No. 202010218966.8 filed on March 25, 2020, the disclosures of which are hereby incorporated by reference in their entirety.

TECHNICAL FIELD

[0002] The present disclosure relates to a relay socket, in particular to a direct insertion type relay socket.

BACKGROUND

[0003] The direct insertion type relay socket is an external accessory of a relay, which has an input clip spring and a leading-out member for inserting an external wire (referred to as an outer wire), and both of which are connected by an inner wire. When the relay is installed, it is required to insert a leading-out pin of the relay into the clip spring to realize the connection between the relay and the external wire. According to the direct insertion type relay socket in the prior art, the clip spring and the leading-out member may be connected by conductive strips, which are not of standard parts in market and have relatively high cost. To this end, round copper wires are often used to connect the input clip spring with the leading-out member, to reduce production cost. However, the wires are electrically connected to the input clip spring and the leading-out member by a tin soldering, which results in a problem that there is welding contamination inside the relay socket, and it is easy to change original appearance and properties of the input clip spring and the leading-out member because of welding.

SUMMARY

[0004] The present disclosure provides a direct insertion type relay socket capable of avoiding welding contamination with regard to the technical problems existed in the prior art.

[0005] According to one aspect of the present disclosure, a direct insertion type relay socket includes a seat, a leading-out member, a spring sheet, a clip spring and an inner wire, wherein the seat has a first chamber and a second chamber; the leading-out member and the spring sheet are disposed in the first chamber of the seat; the leading-out member comprises an inner connecting portion and an outer connecting portion; and the spring sheet cooperates with the outer connecting portion to press an inserted outer wire against the outer connecting portion; and the clip spring is disposed in the second chamber of the seat; and two ends of the inner wire are electrically connected with the inner connecting portion of the leading-out member and the clip spring by a laser welding.

[0006] According to one embodiment of the present disclosure, snap-fit parts are provided on the two ends of the inner wire, respectively; and clamping openings are provided on the inner connecting portion of the leading-out member and the clip spring, respectively; the snap-fit part at one end of the inner wire is snapped in the clamping opening of the inner connecting portion, and is welded with the inner connecting portion together by the laser welding; the snap-fit part at the other end of the inner wire is snapped in the clamping opening of the clip spring, and is welded with the clip spring together by the laser welding.

[0007] According to one embodiment of the present disclosure, the seat is provided with a wire channel that communicates with the first chamber and the second chamber, and the inner wire is disposed in the wire channel.

[0008] According to one embodiment of the present disclosure, the spring sheet is provided with a slit; the outer connecting portion of the leading-out member is a side plate, and a bottom end of the side plate is connected to the inner connecting portion; a protruding strip is integrally formed on an inner side surface of the side plate, corresponds to the slit on the spring sheet, and is configured to separate the two inserted outer wires.

[0009] According to one embodiment of the present disclosure, a first limiting groove is provided on a side wall of the first chamber of the seat; a limiting portion is disposed on a top end of the side plate, and is snapped into the first limiting groove.

[0010] According to one embodiment of the present disclosure, the limiting portion comprises several limiting blocks spaced apart from each other, and each of the limiting blocks extends obliquely upward to the outside of the side plate.

[0011] According to one embodiment of the present disclosure, two inclined blocks inclined downward are disposed on the inner side surface of the side plate, and positioned on two sides of the protruding strip; and bottom ends of the two inclined blocks are pressed against two inserted outer wires, respectively.

[0012] According to one embodiment of the present disclosure, a second limiting groove is provided on a bottom of the first chamber of the seat; the inner connecting portion of the leading-out member is a bottom plate, and a protruding portion is disposed on a top surface and/or a bottom surface of the end portion of the bottom plate, and the end portion of the bottom plate and the protruding portion are both disposed in the second limiting groove, and form an interference fit.

[0013] According to one embodiment of the present disclosure, the leading-out member, the spring sheet, the clip spring and the inner wire is multiple in number, and correspond one by one.

[0014] According to one embodiment of the present disclosure, the spring sheet is in an inverted V shape, and has one side abutted against the side wall of the first

chamber and the other side matched with the outer connecting portion.

[0015] According to one embodiment of the present disclosure, the direct insertion type relay socket further comprises a casing that covers the seat.

[0016] According to one embodiment of the present disclosure, a number of the seats is at least two, and the at least two seats have a same structure and are engaged together.

[0017] Compared with the prior art, the present disclosure has following advantageous effects:

1. The present disclosure can implement an electrical connection between the inner wires and the inner connecting portion of the leading-out member and the clip spring by using a laser welding instead of the welding process, which can avoid an introduction of welding contamination and also protect original appearances and properties of the clip spring and the leading-out member.
2. The inner connecting portion of the leading-out member and the clip spring are respectively provided with an clamping opening, and the end of the inner wire is pre-positioned by using the clamping opening, in order to facilitate the subsequent laser welding process of the inner wire.
3. The inner wire is inserted into the wire channel of the seat in a manner of being pressed in a width direction of the seat, which makes the operation of inserting the inner wire more convenient and makes the interior of the seat more concise and compact.
4. For the arrangement of the protruding strip, there is no need to provide a partition in the present disclosure, to ensure that the two outer wires have independent installation space so as to avoid problems that the outer wires are not pressed by the spring sheet effectively due to the possibility of slipping into the slit in the middle of the spring sheet when the outer wires are inserted, and that unsafe connection is caused by the mutual interference of the outer wires. Compared with the relay socket provided with the partition, it is obvious that the structure and installation procedure of the present disclosure is simple and the cost is low.
5. The limiting portion is disposed on the top end of the side plate, and snapped into the first limiting groove correspondingly arranged on the side wall of the chamber, to provide a limit to the leading-out member laterally and avoid the shaking of the leading-out member laterally, thereby improving an impact resistance of the leading-out member and improving a working stability of the present disclosure. In particular, the limiting portion includes a plurality of limiting blocks that are spaced apart from each other and are respectively bent to the outside of the side plate, which not only simplifies the process of forming the limiting blocks, but also avoids the outer wire so as to protect the outer wire from being interfered by the limiting blocks. The arrangement of the protruding portion can provide a limit to the leading-out member vertically, avoid a vertical shaking of the leading-out member, thereby improving the impact resistance of the leading-out member and improving the working stability of the present disclosure.
6. The arrangement of the inclined blocks can improve the pulling-out resistance of the outer wire.
7. The number of the seats is at least two, and the at least two seats have the same structure and are engaged together, so that the present disclosure can select relays with different ways for cooperation according to actual needs, thereby broadening application of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The above and other features and advantages of the present disclosure will become more apparent by describing the exemplary embodiments thereof in detail with reference to the accompanying drawings.

Fig. 1 is an exploded perspective view of a direct insertion type relay socket according to the present disclosure (a seat without a casing is shown);
Fig. 2 is a structural schematic view of a leading-out member in the direct insertion type relay socket according to the present disclosure;
Fig. 3 is the structural schematic view of a clip spring in the direct insertion type relay socket according to the present disclosure;
Fig. 4 is a front view of the leading-out member, a spring sheet, a clip spring, an inner wire and a seat in an assembled state of the direct insertion type relay socket according to the present disclosure;
Fig. 5 is an enlarged schematic view of part A in Fig. 4;
Fig. 6 is an exploded schematic view of two seats in the direct insertion type relay socket according to the present disclosure;
Fig. 7 is an exploded schematic view of a casing and the seat in the direct insertion type relay socket according to the present disclosure;
Fig. 8 is a structural schematic view of a structure provided by the present disclosure;
Fig. 9 is a partially enlarged schematic view of the structure shown in Fig. 8;
Fig. 10 is a schematic view showing the structure shown in Fig. 8 is connected with an inner wire;
Fig. 11 is a structural schematic view of another structure provided by the present disclosure;
Fig. 12 is a structural schematic view of the relay socket using the structural components shown in Figs. 8 to 11;
Fig. 13 is a schematic view showing that the clip spring and the leading-out member in the relay socket shown in Fig. 12 is connected with a wire;
Fig. 14 is an exploded schematic view of an outer

wire connecting structure according to the present disclosure;

Fig. 15 is a schematic perspective view of the leading-out member in the outer wire connecting structure according to the present disclosure;

Fig. 16 is a sectional view of the leading-out member in the outer conductor connecting structure according to the present disclosure;

Fig. 17 is a three-dimensional schematic view of a spring sheet in the outer wire connecting structure according to the present disclosure;

Fig. 18 is a partially enlarged schematic view of the outer wire connecting structure according to the present disclosure;

Fig. 19 is a structural schematic view of the outer wire connecting structure according to the present disclosure when an outer wire is inserted;

Fig. 20 is a structural schematic view of the outer wire connecting structure according to the present disclosure when the outer wire is inserted in place;

Fig. 21 is an exploded schematic view of the direct insertion type relay socket according to the present disclosure;

Fig. 22 is the front view of the direct insertion type relay socket (excluding the casing) according to the present disclosure;

Fig. 23 is a three-dimensional schematic view of another leading-out member in the outer wire connecting structure according to the present disclosure.

DETAILED DESCRIPTION

[0019] Now, the exemplary implementations will be described more completely with reference to the accompanying drawings. However, the exemplary implementations can be done in various forms and should not be construed as limiting the implementations as set forth herein. Although terms having opposite meanings such as "up" and "down" are used herein to describe the relationship of one component relative to another component, such terms are used herein only for the sake of convenience, for example, "in the direction illustrated in the figure". It can be understood that if a device denoted in the drawings is turned upside down, a component described as "above" something will become a component described as "under" something. Other relative terms, such as "top", "bottom", etc., also have similar meanings. When a structure is described as "above" another structure, it probably means that the structure is integrally formed on another structure, or, the structure is "directly" disposed on another structure, or, the structure is "indirectly" disposed on another structure through an additional structure.

[0020] Words such as "one", "an/a", "the" and "said" are used herein to indicate the presence of one or more elements/component parts/and others. Terms "including", and "having" have an inclusive meaning which means that there may be additional elements/component parts/and others in addition to the listed elements/component parts/and others. Terms "first" and "second" are used herein only as markers, and they do not limit the number of objects modified after them.

[0021] Referring to Fig. 1 to Fig. 7, the direct insertion type relay socket of the present disclosure includes a seat 1, leading-out members 2, spring sheets 3, clip springs 4 and inner wires 5.

[0022] The seat 1 has a first chamber 11 and a second chamber 12. The leading-out members 2 and the spring sheets 3 are installed in the first chamber 11 of the seat 1. The leading-out member 2 includes an inner connecting portion and an outer connecting portion. The spring sheet 3 is matched with the outer connecting portion to press the inserted two outer wires against the outer connecting portion. The clip spring 4 is interference fit in the second chamber 12 disposed on the seat 1.

[0023] The inner wire 5 has two ends that are electrically connected to the inner connecting portion of the leading-out member 2 and the clip spring 4 by a laser welding, respectively. Evidently, the inner wire is a wire positioned in the seat, which is named for the convenience of distinguishing it from an external wire (referred to as the outer wire) connected to the socket, rather than indicating or implying that the component must have a specific orientation and be configured and operated in a specific orientation, thereby not being construed as limiting the present disclosure.

[0024] In this embodiment, the inner connecting portion of the leading-out member 2 is provided with a U-shaped clamping opening 221 and the clip spring 4 is provided with a U-shaped clamping opening 40. Snap-fit parts 51, for example upwardly bent extension parts, are respectively disposed on both ends of the inner wire 5. The snap-fit part 51 on one end of the inner wire 5 is engaged in the clamping opening 221 of the inner connecting portion and extends through the clamping opening 221, and the portion of which higher than the clamping opening 221 is melted by a laser and flows down instantly to fill the clamping opening 221, such that the inner wire 5 and the inner connecting portion of the leading-out member 2 are melted together. The snap-fit part 51 on the other end of the inner wire 5 is engaged in the clamping opening 40 of the clip spring 4 and extends through the clamping opening 40, and the portion of which higher than the clamping opening 40 is melted by the laser and flows down instantly to fill the clamping opening 40, such that the inner wire 5 and the clip spring 4 are melted together. The snap-fit parts 51 on the both ends of the inner wire 5 are higher than the corresponding clamping openings, respectively. As shown in Fig. 5, a difference at height between a top end of the snap-fit part 51 and the clamping opening 221 is h. A laser welding refers to that the snap-fit part 51 of the inner wire is welted by a laser at a high temperature, and the molten copper liquid gets the inner wire and the clip spring or the leading-out member welted together. The clamping opening can provide pre-positioning for the ends of the inner wire 5, in

order to facilitate a subsequent laser welding process. In addition, the clamping opening also makes the pre-positioning operation of the inner wire 5 convenient.

[0025] In this embodiment, the seat 1 is provided with a wire channel 13 that communicates with a first chamber 11 and a second chamber 12, and the inner wire 5 is arranged in a length direction of the seat 1, and the inner wire 5 is pressed into the wire channel 13 in the width direction of the seat 1.

[0026] In this embodiment, as shown in Fig. 2, the outer connecting portion is a side plate 21, the inner connecting portion is a bottom plate 22, and a bottom end of the side plate 21 is integrally connected with an end of the bottom plate 22. A limiting part is disposed at a top end of the side plate 21 and inserted into a first limiting groove 111 that is disposed corresponding to the side wall of the first chamber 11, as shown in Fig. 5. The limiting part specifically includes several limiting blocks 211 spaced apart from each other, and each of the limiting block 211 extends obliquely upward to the outside of the side plate 21. The outside of the side plate 21 refers to a side of the side plate 21 facing away from the spring sheet 3. The bottom plate 22 is provided with an clamping opening 221. A protruding portion 222 is disposed on a top surface at the other end of the bottom plate 22, and also disposed on a bottom surface of the bottom plate 22, or on the bottom surface and the top surface of the bottom plate 22. The end portions of the bottom plate 22 and the protruding portion 222 are disposed in a second limiting groove 112 that is correspondingly disposed at the bottom of the first chamber 11, in an interference fit, as shown in Fig. 5. The limiting part, that is, a plurality of limiting blocks 211 provides a lateral positioning for the leading-out member 2, and the protruding portion 222 provides a vertical positioning for the leading-out member 2, thereby improving an impact resistance of the leading-out member 2 and stability of the operation of the present disclosure.

[0027] In this embodiment, the spring sheet 3 is in an inverted V shape, one side of which is abutted against the side wall of the first chamber 11, and the other side of which a long slit 31 is arranged in the middle thereof and is matched with the outer connecting portion (i.e., the side plate 21). A supporting shaft 14 is disposed in the first chamber 11, and the spring sheet 3 has an angled portion in an arc shape and bypassing the supporting shaft 14. A protruding strip 212 is integrally formed on the inner side surface of the side plate 21 (i.e., a face of the side plate 21 facing towards the spring sheet 3), corresponds to a slit 31 disposed in the middle of the spring sheet 3 and separates the two inserted outer wires. The protruding strip 212 may be formed by partially cutting the side plate to be bent, and a height of the protrusion of the protruding strip 212 is easy to be regulated to ensure that the protruding strip 212 has a sufficient height for a good isolation. In addition, the protruding strip 212 may also be formed by punching the side plate 21. The protruding strip 212 has an advantage that the structure and installing process of the leading-out member 2 of the present disclosure become simpler and have a low cost, and also that there is no need to provide additional partitions for the present disclosure, that is to ensure independent installation spaces for the two outer wires respectively, to avoid possibility that the outer wires when being inserted may slip to the slit in the middle of the spring sheet 3, resulting in problems that the spring sheet 3 cannot be effectively engaged and that unsafe connection is caused by mutual interference of the outer wires.

[0028] In this embodiment, two inclined blocks 213 inclined downward are disposed on the inner side surface of the side plate 21. The two inclined blocks 213 are positioned on two sides of the protruding strip 212, and the two outer wires are respectively pressed to the bottom ends of the two inclined blocks 213 so as to improve a pulling-out resistance capacity of the two outer wires.

[0029] The number of the seats 1 is at least two, and the at least two seats 1 have the same structure and are provided together. Specifically, the adjacent seats 1 are engaged in a manner of corporation between a splicing shaft and a splicing hole. Specifically, the number of the seats 1 is two in this embodiment, but is not limited thereto. In other embodiments, the number of the seats may be one or more than two. The structures of the two seats 1 are basically the same and are basically symmetrical.

[0030] As shown in Fig. 6, one of opposite inner side surfaces of the two seats 1 is provided with a splicing shaft 15, and the other one thereof is provided with a splicing hole 16, and the splicing shaft 15 is inserted and matched with the splicing hole 16. The leading-out members 2, the spring sheets 3, the clip springs 4, and the inner wires 5 on the seat 1 each are in plural, and correspond one-to-one. Therefore, the present disclosure is applicable for the two-way relay using only one of the seats 1 and the four-way relay using the two seats 1, and as the number of seats 1 is further increased, the present disclosure is also applicable for the multiple-way relay.

[0031] In this embodiment, as shown in Fig. 7, the present disclosure further includes a casing 6 which covers the two seats 1 spliced together.

[0032] The direct insertion type relay socket of the present disclosure may implement an electrical connection between the inner wires 5 and the inner connecting portion of the leading-out member 2 and the clip springs 4 by using a laser welding instead of the welding process, which can avoid an introduction of welding contamination and also protect original appearances and properties of the clip spring 4 and the leading-out member 2.

[0033] The parts that are not mentioned in the direct insertion type relay socket of the present disclosure all are the same as the prior art or can be implemented by use of the related art.

[0034] In addition, the clip spring and/or the leading-out member in the existing relay sockets are generally connected to the wire by means of a snap-fit. As being connected, the wire is snapped by a narrow end of a snap-fit port while pushing the wire into a wide end of the

snap-fit port and protruding the wire out of the narrow end of the snap-fit port disposed in the clip spring/leading-out member. Such snap-fit port only realizes one-way limit, to not avoid the loosening of the wire in the pushing-in direction, so that the connection between the snap-fit port and the wire is not reliable enough.

[0035] As for the problem of unreliable connection between the structure and the wire, the present disclosure further provides a structure with reliable connection and a relay socket using the same.

[0036] According to one aspect of the present disclosure, a structure with reliable connection includes a conductive body provided with a snap-fit unit for the electrical connection with an inner wire. The snap-fit unit includes a first snap-fit port and a second snap-fit port, which are formed for snapping the inner wires and into which the inner wires are laterally pressed. The first snap-fit port has a diameter that gradually increases in a direction from the first snap-fit port to the second snap-fit port, and the second snap-fit port has a diameter that gradually increases in a direction from the second snap-fit port to the first snap-fit port; alternatively, the first snap-fit port has a diameter that gradually decreases in a direction from the first snap-fit port to the second snap-fit port, and the second snap-fit port has a diameter that gradually decreases in a direction from the second snap-fit port to the first snap-fit port.

[0037] According to one embodiment of the present disclosure, the snap-fit unit includes at least two first cantilevers arranged at intervals and at least two second cantilevers arranged at intervals, and the first snap-fit port is formed between the at least two first cantilevers, and the second snap-fit port is formed between the at least two second cantilevers.

[0038] According to one embodiment of the present disclosure, the first cantilevers and the second cantilevers are in one-to-one correspondence, and a connecting portion is connected between the first cantilever and the corresponding second cantilever, and the connecting portion is connected to the body.

[0039] According to one embodiment of the present disclosure, the number of each of the first cantilevers and the second cantilevers is two, the two first cantilevers are arranged opposite to each other, and the two second cantilevers are arranged opposite to each other.

[0040] According to one embodiment of the present disclosure, the first snap-fit port and the second snap-fit port are arranged up and down.

[0041] According to one embodiment of the present disclosure, the body includes a substrate, on which the snap-fit unit is disposed.

[0042] According to one embodiment of the present disclosure, the structure further includes a pair of reeds disposed on the substrate.

[0043] According to one embodiment of the present disclosure, the structure further includes a side plate and a bottom plate, which have ends connected to each other, and the bottom plate and the substrate are connected together.

[0044] According to one aspect of the present disclosure, a relay socket includes a seat, a clip spring, a leading-out member and an inner wire. The clip spring and the leading-out member are respectively arranged in the seat, and both ends of the inner wire are electrically connected to the clip spring and the leading-out member, respectively. The clip spring and/or the leading-out member has the structure with reliable connection, which has a snap-fit unit snapping the inner wire by the first snap-fit port and the second snap-fit port, according to the present disclosure.

[0045] According to one embodiment of the present disclosure, the relay socket further includes a spring sheet, which is arranged in the seat and cooperates with the leading-out member to press the inserted external wire against the leading-out member.

[0046] Compared with the structure in the prior art, the present disclosure has following advantageous effects:

1. The snap-fit unit includes the first snap-fit port and the second snap-fit port, which are formed for snapping the same inner wire and into which the inner wire is laterally pressed. The first snap-fit port has a diameter that gradually increases in a direction from the first snap-fit port to the second snap-fit port, and the second snap-fit port has a diameter that gradually increases in a direction from the second snap-fit port to the first snap-fit port; alternatively, the first snap-fit port has a diameter that gradually decreases in a direction from the first snap-fit port to the second snap-fit port, and the second snap-fit port has a diameter that gradually decreases in a direction from the second snap-fit port to the first snap-fit port, so that the first snap-fit port and the second snap-fit port of the present disclosure can limit the inner wire bi-directionally, form interlocking to limit the wire from being pulled or pushed, thereby firmly snapping the wire. In addition, the snap-fit unit of the present disclosure snaps the wire by using the two snap-fit ports (i.e., the first snap-fit port and the second snap-fit port), such that snap-fit points are multiplied to make the electrical connection between the structure and the wire more reliable, in comparison with the way of using single snap-fit port in the prior art.
2. The snap-fit unit preferably includes the at least two first cantilevers and at least two second cantilevers, and the first snap-fit port is formed by using at least two first cantilevers arranged opposite to each other; the second snap-fit port is formed by at least two second cantilevers arranged opposite to each other, which not only facilitate saving the cost of the materials, but also improve the snap-fit effect and make the structure of the snap-fit unit simpler and easy to be produced.

[0047] The present disclosure will be further described in detail below in conjunction with the accompanying

drawings and embodiments; however, the structure with reliable connection and relay socket of the present disclosure are not limited to the embodiments.

[0048] Referring to Fig. 8 to Fig. 10, a structure with reliable connection of the present disclosure includes a conductive body 41 provided with a snap-fit unit 42 for electrical connection with the inner wire 5. The snap-fit unit 42 includes a first snap-fit port 421 and a second snap-fit port 422, which are formed for snapping the same inner wire 5 and into which the inner wire 5 is laterally pressed. The first snap-fit port 421 has a diameter that gradually increases in a direction from the first snap-fit port 421 to the second snap-fit port 422, and the second snap-fit port 422 has a diameter that gradually increases in a direction from the second snap-fit port 422 to the first snap-fit port 421, but is not limited thereto. In other embodiments, the first snap-fit port has a diameter that gradually decreases in a direction from the first snap-fit port to the second snap-fit port, and the second snap-fit port has a diameter that gradually decreases in a direction from the second snap-fit port to the first snap-fit port. The first snap-fit port 421 and the second snap-fit port 422 are specifically arranged up and down, but are not limited thereto. In other embodiments, the first snap-fit port and the second snap-fit port are arranged in a left-right relationship or in a front-rear relationship, etc. The "laterally" refers to a direction perpendicular to a center line of the first snap-fit port 421/second snap-fit port 422.

[0049] In this embodiment, as shown in Fig. 9, the snap-fit unit 42 includes at least two first cantilevers 423 that are arranged opposite to each other, for example, circumferentially distributed at intervals along a snapped inner wire 5, and at least two second cantilevers 424 arranged opposite to each other, for example, circumferentially distributed at intervals along the snapped inner wire 5. A first snap-fit port 421 is formed between at least two first cantilevers 423, and a second snap-fit port 422 is formed between at least two second cantilevers 424. Specifically, the number of each of the first cantilevers 423 and the second cantilevers 424 is two. Since the first snap-fit port 421 and the second snap-fit port 422 are arranged in an up-down relationship, the two first cantilevers 423 and the two second cantilevers 424 are also arranged in the up-down relationship, and the two first cantilevers 423 are opposite to each other in a left-right direction, and the two second cantilevers 424 are opposite to each other in a left-right direction. The first snap-fit port 421 formed between the two first cantilevers 423 is similar to an inverted V-shape, and the second snap-fit ports 422 formed between the two second cantilevers 424 is similar to an inverted V-shape. The diameter of the first snap-fit port 421 is a distance between the two first cantilevers 423, and the diameter of the second snap-fit port 422 is a distance between the two second cantilevers 424.

[0050] In this embodiment, the first cantilevers 423 and the second cantilevers 424 correspond one to one in the up-down direction. A connecting portion 425 is connected between the first cantilever 423 and the corresponding second cantilever 424. The connecting portion 425 has a rear end in connection (including an integral connection or non-integral connections) with the body 41. The first cantilever 423, the second cantilever 424 and the connecting portion 425 positioned on the same side may be an integral structure. It is convenient for the connecting portion 425 to connect the respective first cantilevers 423 and the corresponding second cantilevers 424 with the body 41.

[0051] In this embodiment, the body 41 includes a vertical substrate 411, on which the snap-fit unit 42 is disposed. The connecting portion 425 between the first cantilevers 423 and the corresponding second cantilevers 424 is respectively connected left and right side surfaces of the substrate 411, such that the first cantilevers 423 and the second cantilevers 424 are positioned on the front side of the substrate 411. For example, the connecting portion 425 may extend from the substrate 411 and may form an included angle of about 90° with the substrate 411, and each of the first cantilevers 423 and the second cantilevers 424 extends from the corresponding connecting portion 425 and may form an included angle of 45° with the connecting portion 425.

[0052] In this embodiment, the body 41 further includes a pair of reeds 412, which are disposed on a top of the substrate 411. A limiting boss 4111 is disposed on the left and right sides of the substrate 411, respectively. The two limiting bosses 4111 are opposite to each other and positioned between the reed 412 and the snap-fit unit 42.

[0053] The structure with reliable connection as shown in Fig. 8 to Fig. 10 of the present disclosure may constitute the clip spring of the relay socket. As shown in Fig. 10, when the inner wire 5 that may be a single-strand hard round copper wire is connected, one end of the inner wire 5 is pressed into the first snap- fit port 421 and the second snap-fit port 422 simultaneously and laterally (specifically in a direction facing backward), while the top ends of the two first cantilevers 423 are embedded in the inner wire 5 under the action of an inherent elastic force of the structure, and have a width D with contact segments of the inner wire; and the bottom ends of the two second cantilevers 424 are embedded in the inner wire 5 under the action of the inherent elastic force of the structure, and also have a width D with the contact segments of the inner wire 5. Therefore, the present disclosure can realize bidirectional positioning of the wire in the up-down direction, form an interlock to restrict the wire from being pulled or pushed, thereby snapping the wire in the structure firmly. In addition, the structure of the present disclosure snaps the wires by using two snap-fit ports (i.e., the first snap-fit port 421 and the second snap-fit port 422), such that snap-fit points are multiplied to make the electrical connection between the structure and the wire more reliable, in comparison with the way of using single snap-fit port in the prior art.

[0054] Referring to Fig. 11, a structure with reliable connection of the present disclosure differs from the

structure shown in Figs. 8 to 10 in that the structure also includes a side plate 21 and a bottom plate 22; and the side plate 21 and the bottom plate 22 have ends connected to each other or are integrally formed to be in an L shape; there is no reed 412 disposed on the substrate 411 of the body 41; and the bottom plate 22 is connected with the top end of the substrate 411. Specifically, the bottom plate 22 is provided with an L-shaped notch 223, in which the substrate 411 and the snap-fit unit 42 thereon are positioned.

[0055] The structure with reliable connection of Fig. 11 of the present disclosure may constitute a leading-out member of the relay socket. A limiting block 211 extending and inclining outward is disposed on the top end of the side plate 21, for the installation limit of the entire structure. A limiting block 213 extending and inclining downward is disposed on the top of the inner side of the side plate 21, for improving the pulling-out resistance capacity of the inserted external wires. A protruding strip for separating the two inserted external wires may be further disposed on the inner side surface of the side plate 21.

[0056] According to the structure with reliable connection of the present disclosure, the first snap-fit port 421 and the second snap-fit port 422 can also limit the inner wire 5 in the up and down direction, form an interlock, thereby restricting the inner wire 5 from being pulled or pushed.

[0057] Referring to Fig. 12 and Fig. 13, a relay socket of the present disclosure includes a seat 1, a clip spring 4, a leading-out member 2, and an inner wire 5. The clip spring 5 and the leading-out member 2 are respectively installed in seat 1. The inner wire 5 is a single-strand hard round copper wire, and has two ends electrically connected to the clip spring 5 and the leading-out member 2. The clip spring 4 and/or the leading-out member 2 has the snap-fit unit 42 in the above-mentioned embodiments of Figs. 8 to 10 or the second embodiment of Fig. 11, which snaps the inner wire 5 by the first snap-fit port 421 and the second snap-fit port 422. Specifically, the clip spring 5 adopts the structure with reliable connection described in the above-mentioned embodiments of Fig. 8 to Fig. 10; and the leading-out member 2 adopts the structure with reliable connection described in the above-mentioned embodiment of Fig. 11 .

[0058] In this embodiment, the present disclosure further includes a spring sheet 7, which is arranged in the seat 1 and cooperates with the leading-out member 2 to press the inserted external wire against the side plate 21 of the leading-out member 2, as such, the relay socket of the present disclosure constitutes a direct insertion type relay socket.

[0059] In this embodiment, referring to Fig. 6 and Fig. 7, the number of the seats 1 is at least two, and the at least two seats 1 have the same structure and are engaged together. Specifically, the adjacent seats 1 are engaged through the cooperation of a splicing shaft and a splicing hole. In this embodiment, the number of the seats 1 is specifically two, but is not limited thereto. In other embodiments, the number of the seats 1 is one or more than two. The two seats 1 have basically the same structure and are basically symmetrical.

[0060] As shown in Fig. 6, one of the opposite inner side surfaces of the two seats 1 is provided with a splicing shaft 15, and the other thereof is provided with a splicing hole 16, and the splicing shaft 15 is inserted into the splicing hole 16. The leading-out members 2, the spring sheets 3, the clip springs 4, and the inner wires 5 on the seat 1 each is in plural, and correspond one-to-one. Therefore, the present disclosure is applicable for the two-way relay using only one of the seats 1 and the four-way relay using the two seats 1, and as the number of seats 1 is further increased, the present disclosure is also applicable for the multiple-way relay.

[0061] In this embodiment, as shown in Fig. 7, the present disclosure further includes a casing 6, which covers the two seats 1 engaged together.

[0062] In present relay socket, the clip spring 4, and the leading-out member 2 of the present disclosure snap the inner wire 5 by using the aforementioned first snap-fit port 21 and second snap-fit port 22 respectively, which can form an interlock to restrict the inner wire 5 from being pulled or pushed, such that the electrical connection between the clip spring 4, the leading-out member 2 and the inner wire 5 becomes more reliable.

[0063] In addition, the leading-out part of the existing relay socket generally includes a leading-out member, a spring sheet and a partition that is vertically inserted into the spring sheet and the leading-out member and separates the two inserted outer wires. The partition allows the inserted two outer wires to have an independent installation space respectively. The arrangement of the partition makes the structure and installation process of the relay socket more complicated and at a high cost. In order to save cost, the partition is removed from the relay sockets, but two outer wires close to each other when being inserted may slide to a slit in the middle of the spring sheet, resulting in problems that the spring sheet cannot be effectively engaged and that one of the outer wires slips easily to the other one when being inserted, to interfere the electrical connection with the other outer wire.

[0064] To solve the technical problems presented in the existing outer wire connection structure, the present disclosure also provides the outer wire connection structure of the relay socket and the direct insertion type relay socket in a simple structure and at low cost.

[0065] According to one aspect of the present disclosure, an outer wire connection structure of a relay socket includes a seat, a leading-out member and a spring sheet. The leading-out member and the spring sheet are respectively arranged in a first chamber and a second chamber provided in the seat. The leading-out member includes an inner connecting portion and an outer connecting portion, and the spring sheet cooperates with the outer connecting portion to press the inserted two outer

wires against the outer connecting portion. A protruding strip is integrally formed on the outer connecting portion, corresponds to a slit arranged in the spring sheet and separates two inserted outer wires.

[0066] According to one embodiment of the present disclosure, the outer connecting portion is a side plate, a bottom end of the side plate is integrally connected with the inner connecting portion, and the protruding strip is provided on the inner side surface of the side plate.

[0067] According to one embodiment of the present disclosure, the protruding strip is formed by punching the side plate; alternatively, the protruding strip may be formed by partially cutting an clamping opening in the side plate to be bent.

[0068] According to one embodiment of the present disclosure, two inclined blocks inclined downward are disposed on the inner side surface of the side plate. The two inclined blocks are positioned on two sides of the protruding strip, and the bottom ends of the two inclined blocks are respectively pressed to the two outer wires.

[0069] According to one embodiment of the present disclosure, a limiting portion is disposed on the top end of the side plate, and is snapped into a first limiting groove correspondingly provided on a side wall of the chamber.

[0070] According to one embodiment of the present disclosure, the limiting portion includes a plurality of limiting blocks spaced apart from each other, and each of the limiting blocks extends and inclines to outside of the side plate.

[0071] According to one embodiment of the present disclosure, the inner connecting portion is a bottom plate that is provided with an clamping opening. One end of the bottom plate is connected with the bottom end of the side plate, and a protruding portion is disposed on the top surface and/or the bottom surface of the other end of the bottom plate. The end of the bottom plate and the protruding portion are placed into a second limiting groove correspondingly arranged at the bottom of the side wall of the chamber, and form an interference fit.

[0072] According to one embodiment of the present disclosure, a socket group corresponding to the leading-out member and into which the two outer wires are inserted is disposed on the top of the seat, and the socket group includes two wire sockets. The two wire sockets are spaced apart from each other and connected to the first chamber.

[0073] According to one embodiment of the present disclosure, the spring sheet is in an inverted V-shape, and has one side abutted against the side wall of the first chamber, the other side matched with the outer connecting portion, and in which a slit is provided.

[0074] According to another aspect of the present disclosure, a direct insertion type relay socket includes a clip spring, an inner wire and the outer wire connection structure of and relay socket as described in the present disclosure. The clip spring is arranged in seat and is electrically connected to the inner connecting portion of the leading-out member through the inner wire.

[0075] Compared with the existing outer wire connection structure, the present disclosure has following advantageous effects:

1. Since the outer connecting portion is integrally formed with the protruding strip, the protruding strip corresponds to the slit provided in the spring sheet, and separates the two inserted outer wires, so that there is no need to provide a partition in the present disclosure, to ensure that the two outer wires have independent installation space so as to avoid problems that the outer wires are not pressed by the spring sheet effectively due to the possibility of slipping into the slit in the middle of the spring sheet when the outer wires are inserted, and that unsafe connection is caused by the mutual interference of the outer wires. Compared with the relay socket provided with the partition, it is obvious that the structure and installation procedure of the present disclosure is simple and the cost is low.
2. The protruding strip may be formed preferably by a process of partially cutting the outer connecting portion of the leading-out member to be bent, and a height of the protrusion of the protruding strip is easy to be regulated to ensure that the protrusion of the protruding strip has a sufficient height for a good isolation.
3. The limiting portion is disposed on the top end of the side plate, and snapped into the first limiting groove correspondingly arranged on the side wall of the chamber, to provide a limit to the leading-out member laterally and avoid the shaking of the leading-out member laterally, thereby improving an impact resistance of the leading-out member and improving a working stability of the present disclosure. In particular, the limiting portion includes a plurality of limiting blocks that are spaced apart from each other and are respectively bent to the outside of the side plate, which not only simplifies the process of forming the limiting blocks, but also avoids the outer wire so as to protect the outer wire from being interfered by the limiting blocks.
4. The arrangement of the protruding portion can provide a limit to the leading-out member vertically, avoid a vertical shaking of the leading-out member, thereby improving the impact resistance of the leading-out member and improving the working stability of the present disclosure.

[0076] The present disclosure is further described in detail below in conjunction with the accompanying drawings and embodiments; but the outer wire connection structure and the direct insertion type relay socket of the relay socket of the present disclosure are not limited to the embodiments.

[0077] Referring to Fig. 14 to Fig. 20, an outer wire connection structure of a relay socket of the present disclosure includes a seat 1, a leading-out member 2 and

a spring sheet 3. The seat 1 has a first chamber 11 and a second chamber 12. The leading-out member 2 and the spring sheet 3 are installed in the first chamber 11 and the second chamber 12 provided in the seat 1, respectively. The leading-out member 2 includes an inner connecting portion and an outer connecting portion. The spring sheet 3 is matched with the outer connecting portion to press the two inserted outer wires against the outer connecting portion. An elongated slit 31 is disposed in the spring sheet 3. A protruding strip 212 is integrally formed on the inner side surface of the outer connecting portion, and corresponds to the slit 31 provided in the middle of the spring sheet 3, and separates the two inserted outer wires. The inner connecting portion refers to the portion of the leading-out member 2 for the electrical connection with the clip spring of the relay socket, and the inner side surface of the outer connecting portion refers to a side surface of the outer connecting portion facing the spring sheet 3. Correspondingly, one side surface of the outer connecting portion facing away from the spring sheet 3 is the outer side surface of the outer connecting portion.

[0078] In this embodiment, as shown in Fig. 15 and Fig. 16, the outer connecting portion is a side plate 21, and the bottom end of the side plate 21 is connected to the inner connecting portion, or the bottom end of the side plate 21 and the inner connecting portion are formed as an integral structure. The protruding strip 212 is disposed on the inner side surface of the side plate 21. The protruding strip 212 may be formed by partially cutting the side plate 21 to be bent, so that the height h of the protrusion of the protruding strip 212 is easy to be regulated, which can ensure that the protrusion of the protruding strip 212 has a sufficient height for a good isolation. In other embodiments, the protruding strip 212 is formed by punching the side plate 21, as shown in Fig. 23.

[0079]] In this embodiment, as shown in Fig. 17 and Fig. 18, the spring sheet 3 is generally in an inverted V-shape, and has one side abutted against the side wall of the chamber 11, and the other side matched with the outer connecting portion, and a slit 31 is disposed in the middle of the spring sheet. The slit 31 disposed in the middle of the spring sheet 3 is in a shape of a long strip, so that the other side of the spring sheet 3 is divided into two elastic arms. A width C of the protruding strip 212 is slightly smaller than a width D of the slit 31 of the spring sheet 3, so that the protruding strip 212 can be snapped into inside the end of the slit 31 of the spring sheet 3. A support shaft 14 is arranged in the first chamber 11, and a bending portion of the spring sheet 3 is arc-shaped and bypasses the support shaft 14.

[0080] In this embodiment, two inclined blocks 213 inclined downward are disposed on the inner side surface of the side plate 21, and are positioned on opposite sides of the protruding strip 212, and the bottom ends of the two inclined blocks 213 are respectively pressed to the inserted two outer wires, thereby improving the pulling-out resistance capacity of the two outer wires.

[0081] In this embodiment, a limiting portion is disposed on the top of the side plate 21, and the limiting portion is snapped into the first limiting groove 111 provided on the top of the side wall of the first chamber 11. Specifically, the limiting portion includes two limiting blocks 211 that are spaced apart from each other and extend obliquely upward to the outside of the side plate 21.

[0082] In this present embodiment, the inner connecting portion is a bottom plate 22 provided with an clamping opening 221. One end of the bottom plate 22 is integrally connected with the bottom end of the side plate 21, and a protruding portion 222 is disposed on the top surface of the other end of the bottom plate 2. The protruding portion 222 may also be disposed on the bottom surface of the bottom plate 22, alternatively, the protruding portion 222 may be disposed on the bottom surface and the top surface of the bottom plate 22 simultaneously. The other end of the bottom plate 22 and the protruding portion 222 are disposed in a second limiting groove 112 correspondingly arranged at the bottom of the first chamber 11, and form an interference fit. The above-mentioned limiting blocks 211 and the protruding portion 222 cooperate together to firmly position the leading-out member 2 in the first chamber 11 of the seat 1, thereby improving the impact resistance capacity of the leading-out member and improving the working stability of the present disclosure.

[0083] In this embodiment, a socket group corresponding to the leading-out member 2 and into which the two outer wires are inserted is disposed on the top of the seat 1. The socket group includes two wire sockets 18 that are spaced apart from each other and lead to the first chamber 11. A casing 6 covers the seat 1, and is provided with an outer socket 61 corresponding to the wire socket.

[0084] The outer wire connection structure of relay socket according to the present disclosure, as shown in Fig. 20, when inserted outer wire 7 is a hard wire or a wire with a hard sleeve, the end of the outer wire 7 is inserted into the outer socket 61 of the casing 6 and the wire socket 18 of the seat 1 in sequence, and into the first chamber 11 of the seat 1, as shown in Fig. 19. As the end of the outer wire 7 moves downward, the end of the outer wire 7 comes in touch with the spring sheet 3, and pushes the spring sheet 3 to swing downward to form an abidance; after the end of outer wire 7 is inserted into the place, the spring sheet is elastically reset and exerts a leftward elastic force F on the outer wire 7, so that the outer wire 7 is attached to the side plate 21 of the leading-out member 2, thereby realizing the electrical connection between the outer wire and the leading-out member 2, as shown in Fig. 20. The inserted two outer wires 7 are separated by the protruding strip 212 on the inner side surface of the side plate 21 to ensure that the two outer wires 7 have independent installation spaces respectively, so as to avoid the problems that the spring sheet 3 cannot be pressed effectively due to the possibility that the outer wire 7 when being inserted slips to the slit 31

in the middle of the spring sheet 3, and that the unsafe connection is caused by the mutual interference of the outer wires 7. Compared with the relay socket provided with the partition in the prior art, it is obvious that the structure and installation procedure of the present disclosure is simpler and the cost is low.

[0085] Referring to Fig. 21 and Fig. 22, a direct insertion type relay socket of the present disclosure includes clip spring 4, an inner wire 5, and also includes the outer wire connection structure of the relay socket according to the present disclosure. The clip spring 4 is installed in the seat 1 and is electrically connected to the inner connecting portion (i.e., the bottom plate 22) of the leading-out member 2 through the inner wire 5.

[0086] In this embodiment, the two ends of the inner wire 5 are respectively snapped into the clamping openings 221 and 40 provided on the bottom plate 22 and the clip spring 4, and are fixed by a process of a laser welding, so that the introduction of the welding contamination can be avoided, and the original appearance and properties of the clip spring 4 and the leading-out member 2 can be protected well.

[0087] Referring to Fig. 18 and Fig. 20, in this embodiment, the clip spring 4, the inner wire 5, the leading-out member2, and the spring sheet 3 are respectively multiple in number and correspond one by one.

[0088] The portions not mentioned in the outer wire connection structure of the relay socket and the direct insertion type relay socket according to the present disclosure all are the same as the prior art or can be realized by adopting the prior art.

[0089] It should be understood that this disclosure would never be limited to the detailed construction and arrangement of components as set forth in this specification. The present disclosure has other implementations that are able to be practiced or carried out in various ways. The foregoing variations and modifications fall within the scope of this disclosure. It should be understood that the present disclosure would contain all alternative combination of two or more individual features as mentioned or distinguished from in the text and/or in the drawings. All of these different combinations constitute a number of alternative aspects of the present disclosure. The implementations as illustrated in this specification are the best modes known to achieve the present disclosure and will enable the person skilled in the art to realize the present disclosure.

Claims

1. A direct insertion type relay socket, comprising a seat, a leading-out member, a spring sheet, a clip spring and an inner wire, wherein the seat has a first chamber and a second chamber; the leading-out member and the spring sheet are disposed in the first chamber of the seat; the leading-out member comprises an inner connecting portion and an outer connecting portion; the spring sheet cooperates with the outer connecting portion to press an inserted outer wire against the outer connecting portion; and the clip spring is disposed in the second chamber of the seat, **characterized in that** two ends of the inner wire are electrically connected with the inner connecting portion of the leading-out member and the clip spring by a laser welding.

2. The direct insertion type relay socket according to claim 1, **characterized in that** snap-fit parts are provided on two ends of the inner wire, respectively; clamping openings are provided on the inner connecting portion of the leading-out member and the clip spring, respectively; the snap-fit part at one end of the inner wire is snapped in the clamping opening of the inner connecting portion, and is welded with the inner connecting portion together by the laser welding; the snap-fit part at the other end of the inner wire is snapped in the clamping opening of the clip spring, and is welded with the clip spring together by the laser welding.

3. The direct insertion type relay socket according to claim 2, **characterized in that** the seat is provided with a wire channel that communicates with the first chamber and the second chamber, and the inner wire is disposed in the wire channel.

4. The direct insertion type relay socket according to claim 1, **characterized in that** the spring sheet is provided with a slit; the outer connecting portion of the leading-out member is a side plate, and a bottom end of the side plate is connected to the inner connecting portion; a protruding strip is integrally formed on an inner side surface of the side plate, corresponds to the slit on the spring sheet, and is configured to separate two inserted outer wires.

5. The direct insertion type relay socket according to claim 4, **characterized in that** a first limiting groove is provided on a side wall of the first chamber of the seat; a limiting portion is disposed on a top end of the side plate, and is snapped into the first limiting groove.

6. The direct insertion type relay socket according to claim 5, **characterized in that** the limiting portion comprises several limiting blocks spaced apart from each other, and each of the limiting blocks extends obliquely upward to the outside of the side plate.

7. The direct insertion type relay socket according to claim 4, **characterized in that** two inclined blocks inclined downward are disposed on the inner side surface of the side plate, and positioned on two sides of the protruding strip; and bottom ends of the two inclined blocks are pressed against two inserted out-

er wires, respectively.

8. The direct insertion type relay socket according to claim 2, **characterized in that** a second limiting groove is provided on a bottom of the first chamber of the seat; the inner connecting portion of the leading-out member is a bottom plate, and a protruding portion is disposed on a top surface and/or a bottom surface of the end portion of the bottom plate, and the end portion of the bottom plate and the protruding portion are both disposed in the second limiting groove, and form an interference fit.

9. The direct insertion type relay socket according to claim 1, **characterized in that** the leading-out member, the spring sheet, the clip spring and the inner wire is multiple in number, and correspond one by one.

10. The direct insertion type relay socket according to claim 1, **characterized in that** the spring sheet is in an inverted V shape, and has one side abutted against the side wall of the first chamber and the other side matched with the outer connecting portion.

11. The direct insertion type relay socket according to claim 1, **characterized in that** the direct insertion type relay socket further comprises a casing that covers the seat.

12. The direct insertion type relay socket according to any one of claims 1-11, **characterized in that** a number of the seats is at least two, and the at least two seats have a same structure and are engaged together.

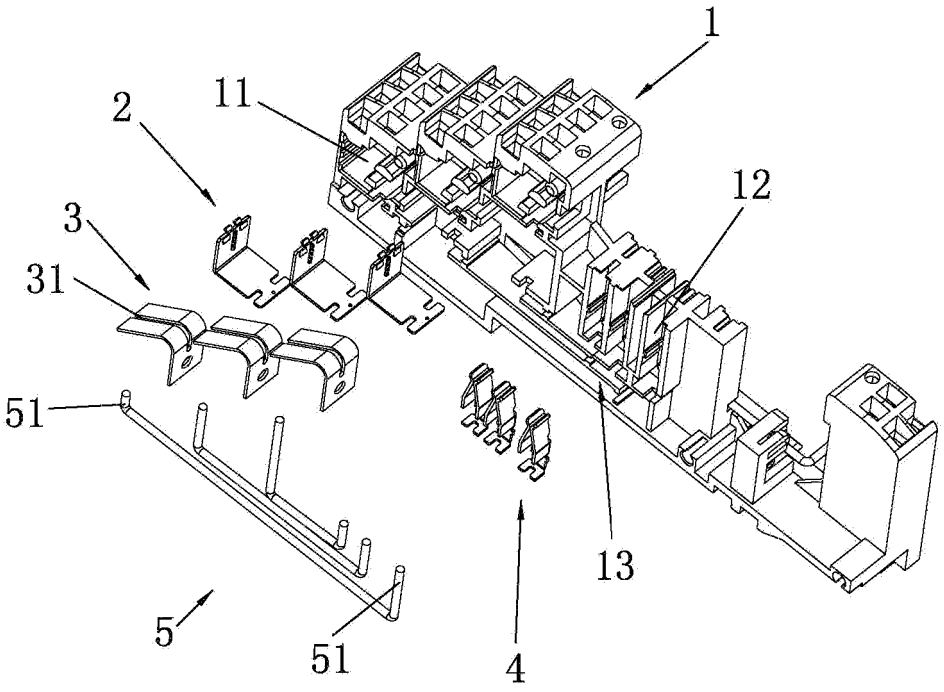

Fig. 1

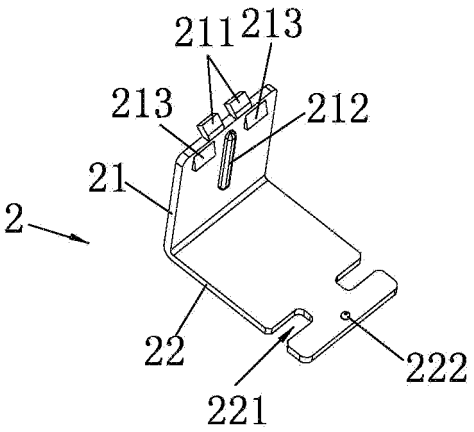

Fig. 2

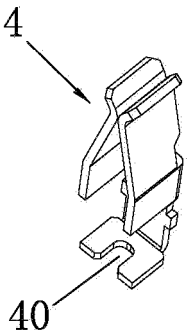

Fig. 3

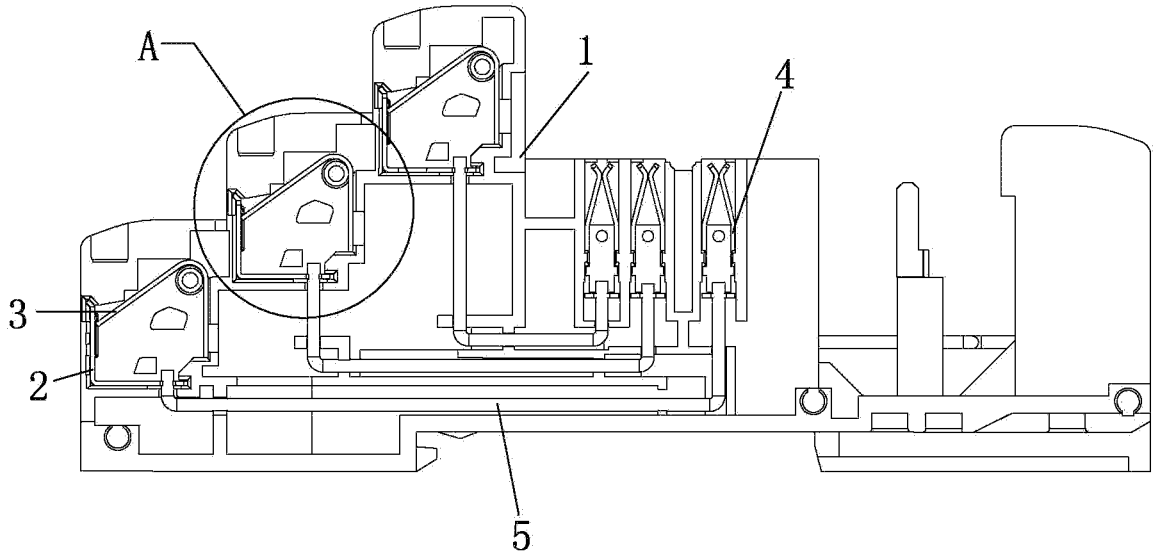

Fig. 4

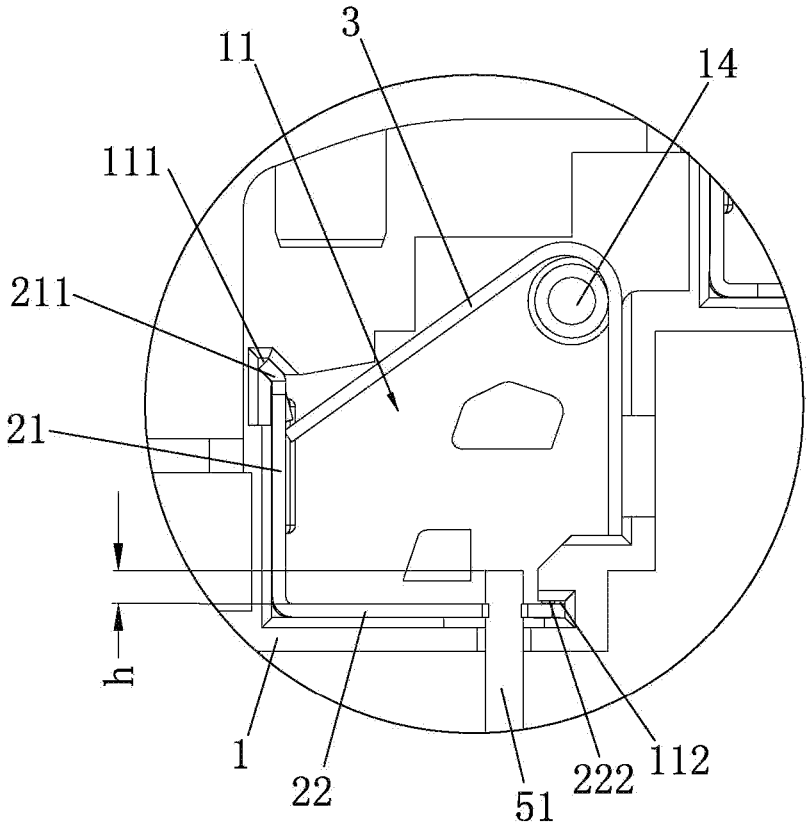

Fig. 5

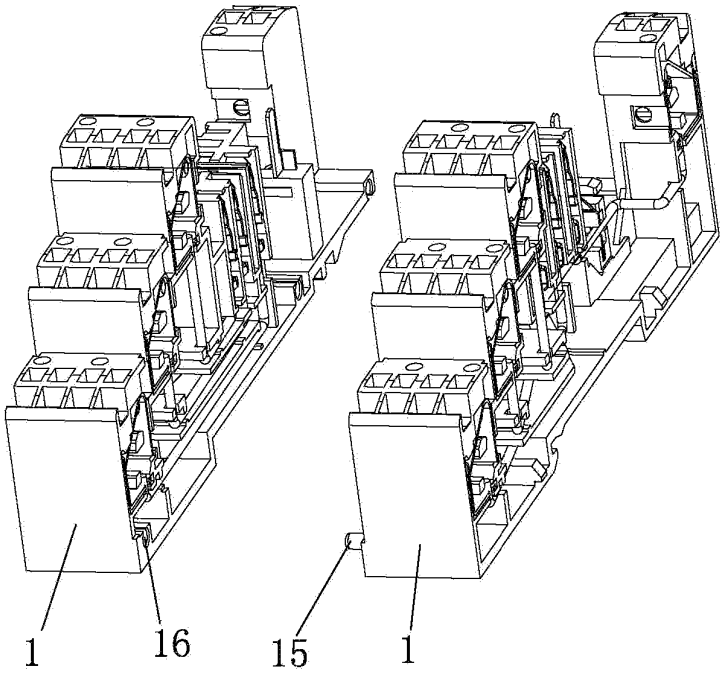

Fig. 6

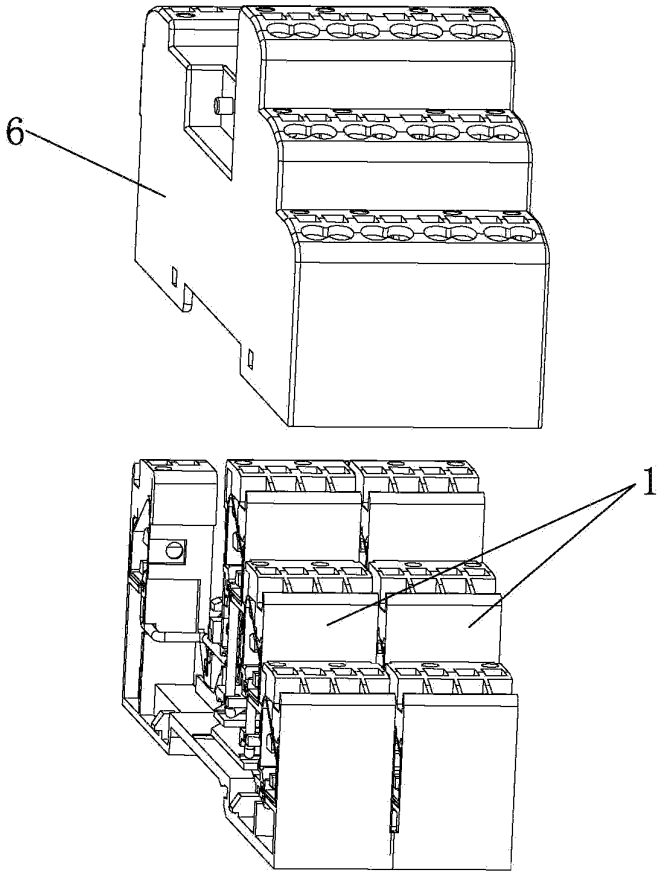

Fig. 7

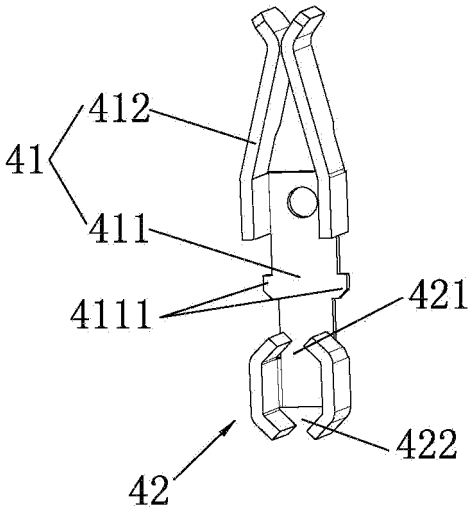

Fig. 8

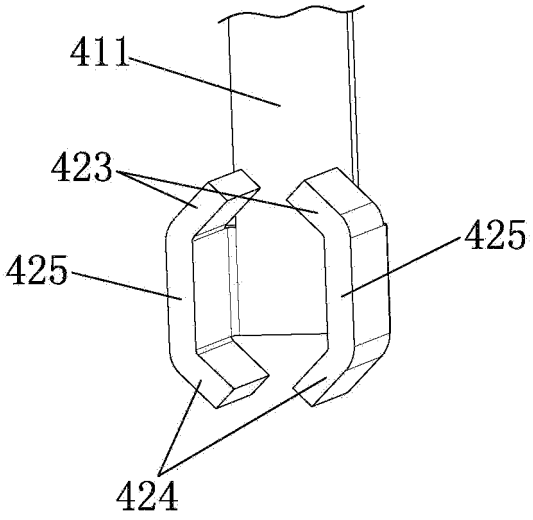

Fig. 9

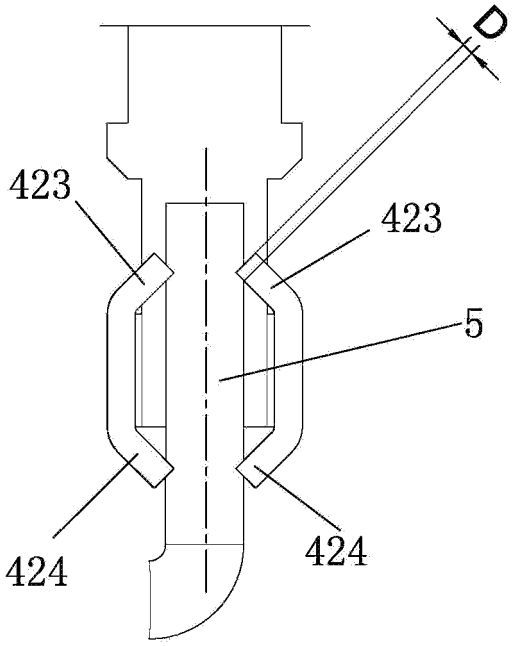

Fig. 10

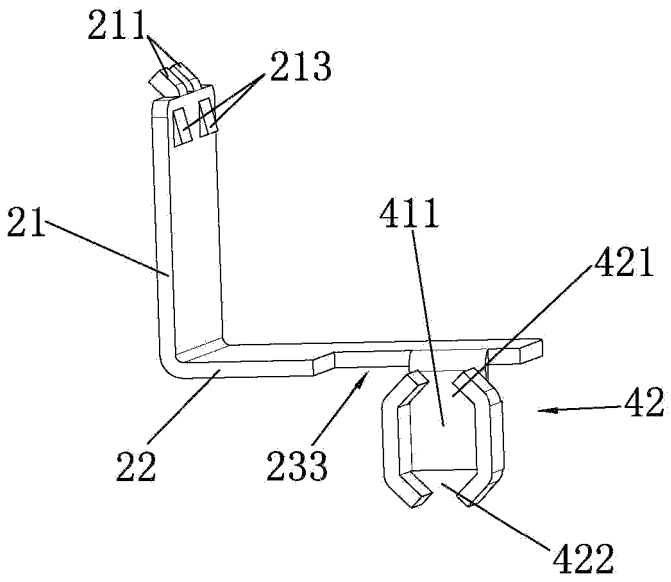

Fig. 11

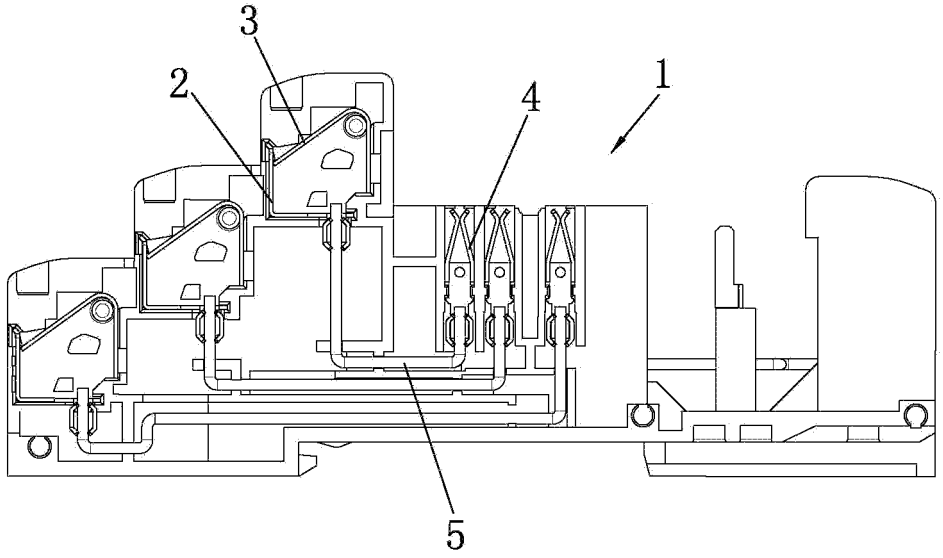

Fig. 12

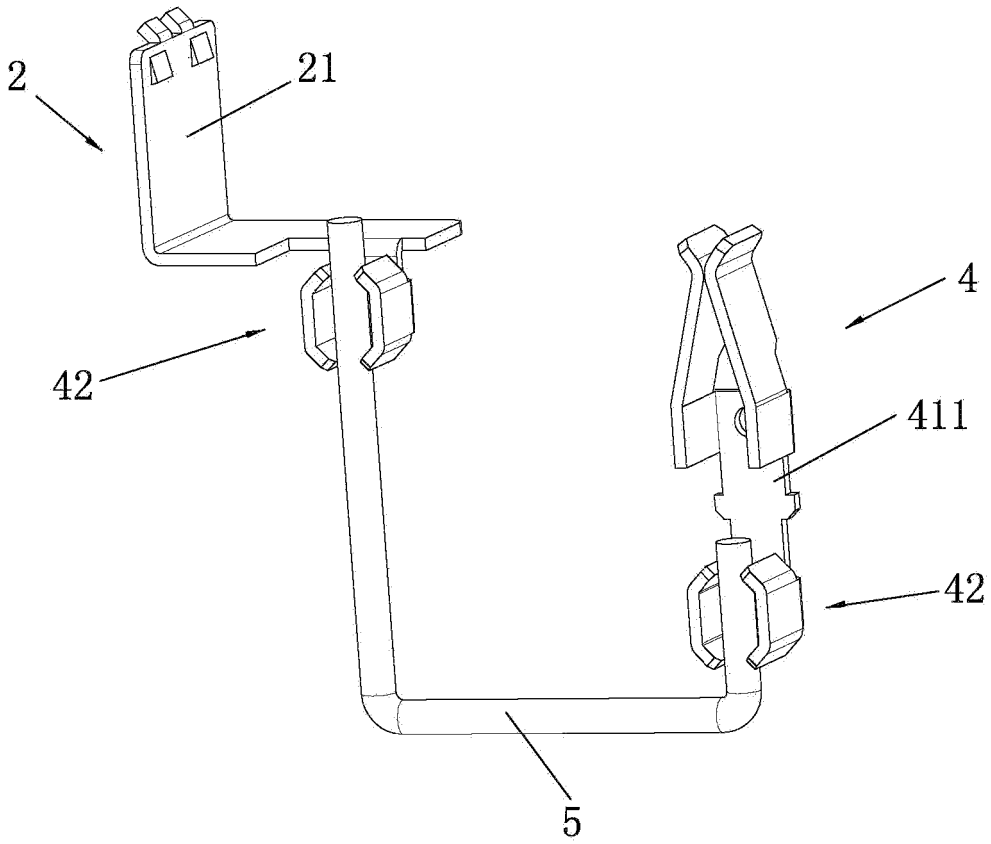

Fig. 13

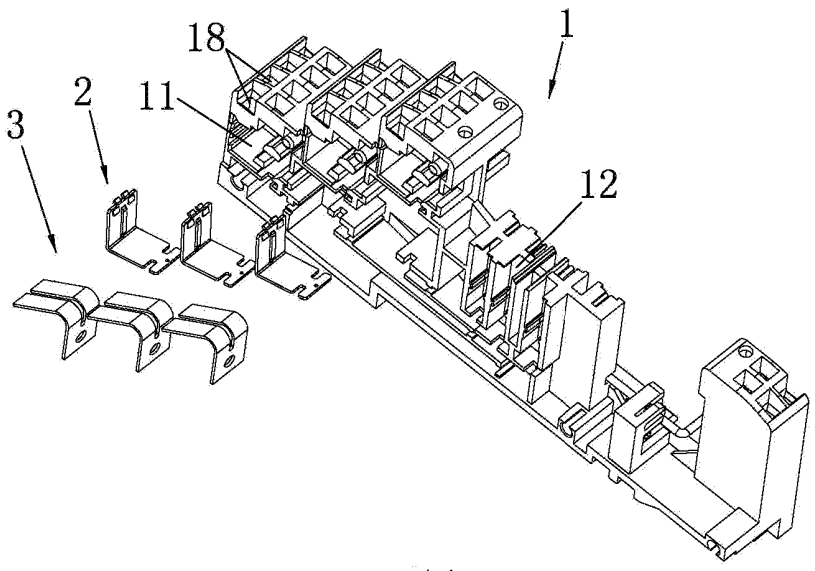

Fig. 14

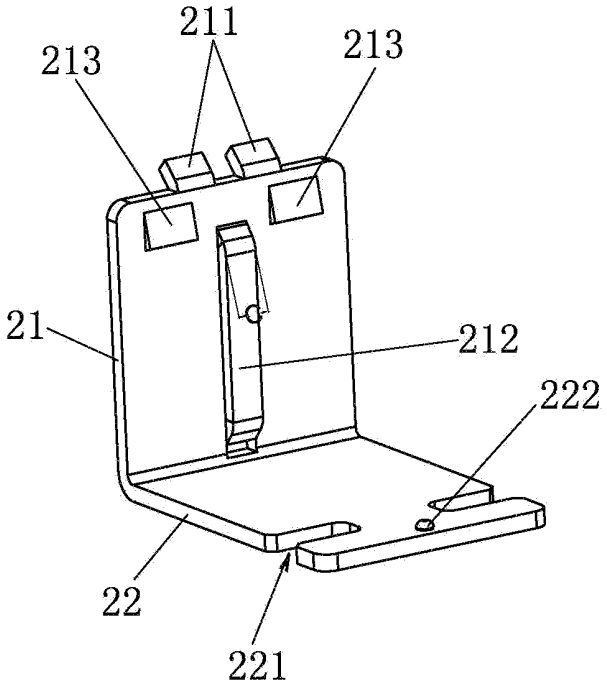

Fig. 15

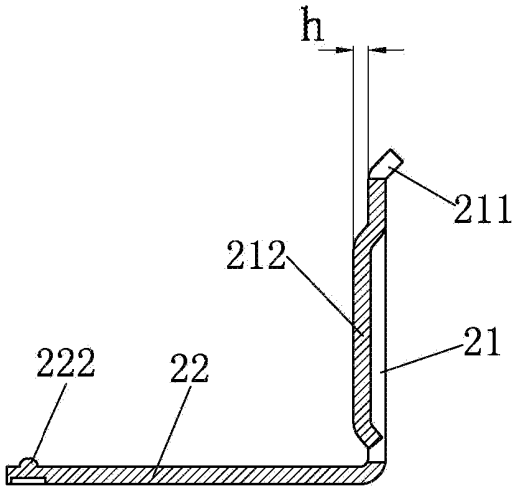

Fig. 16

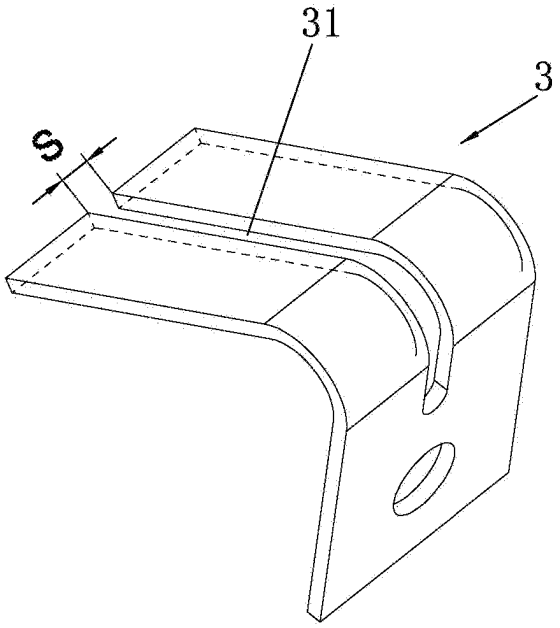

Fig.17

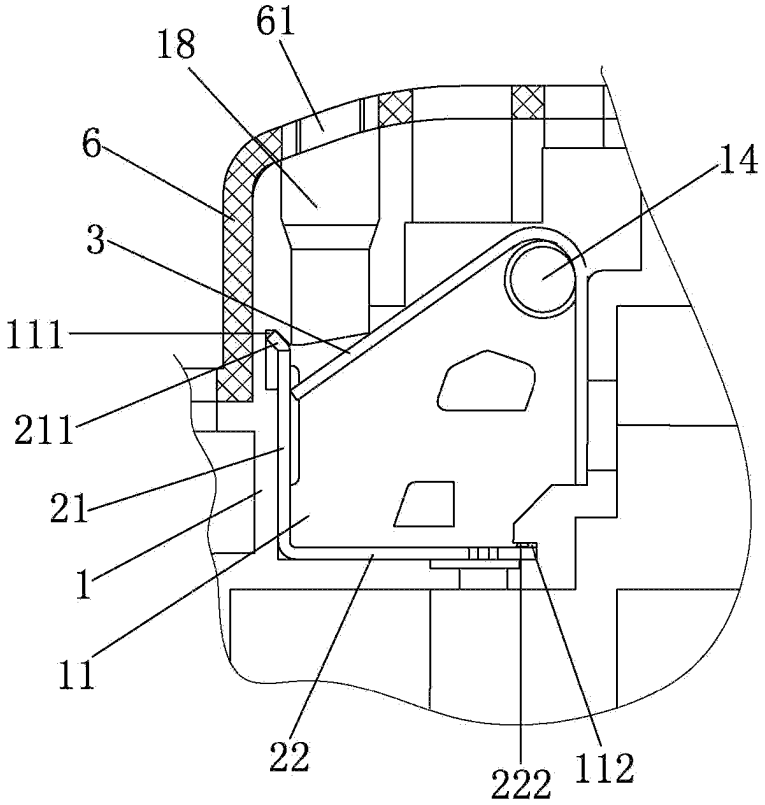

Fig. 18

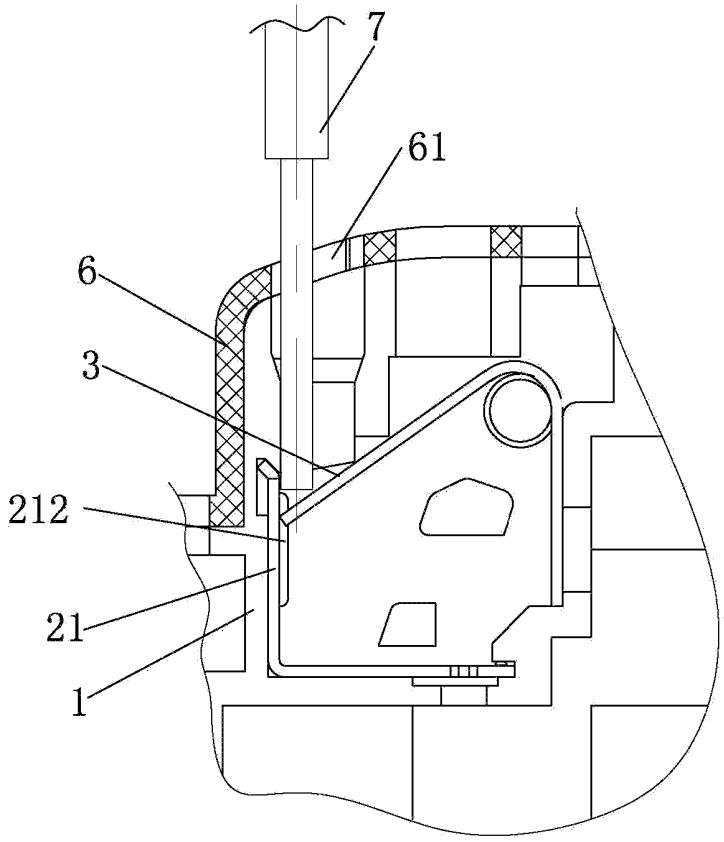

Fig. 19

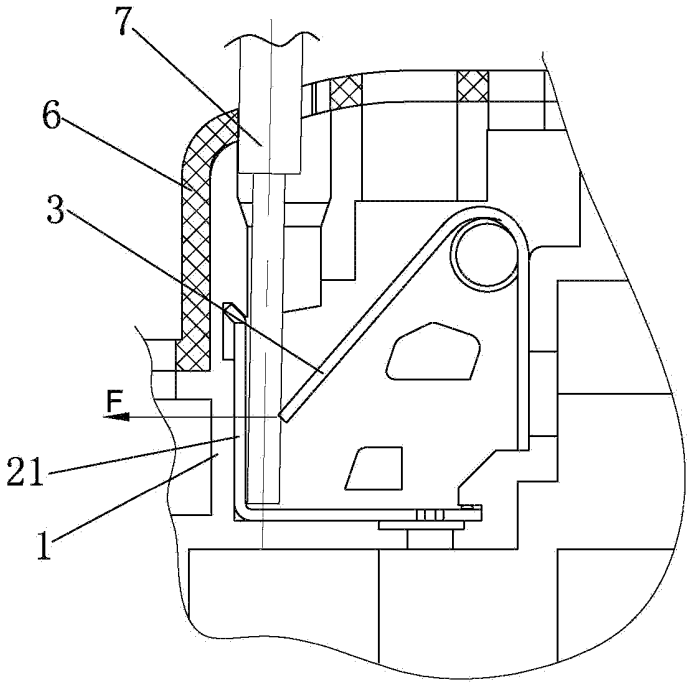

Fig. 20

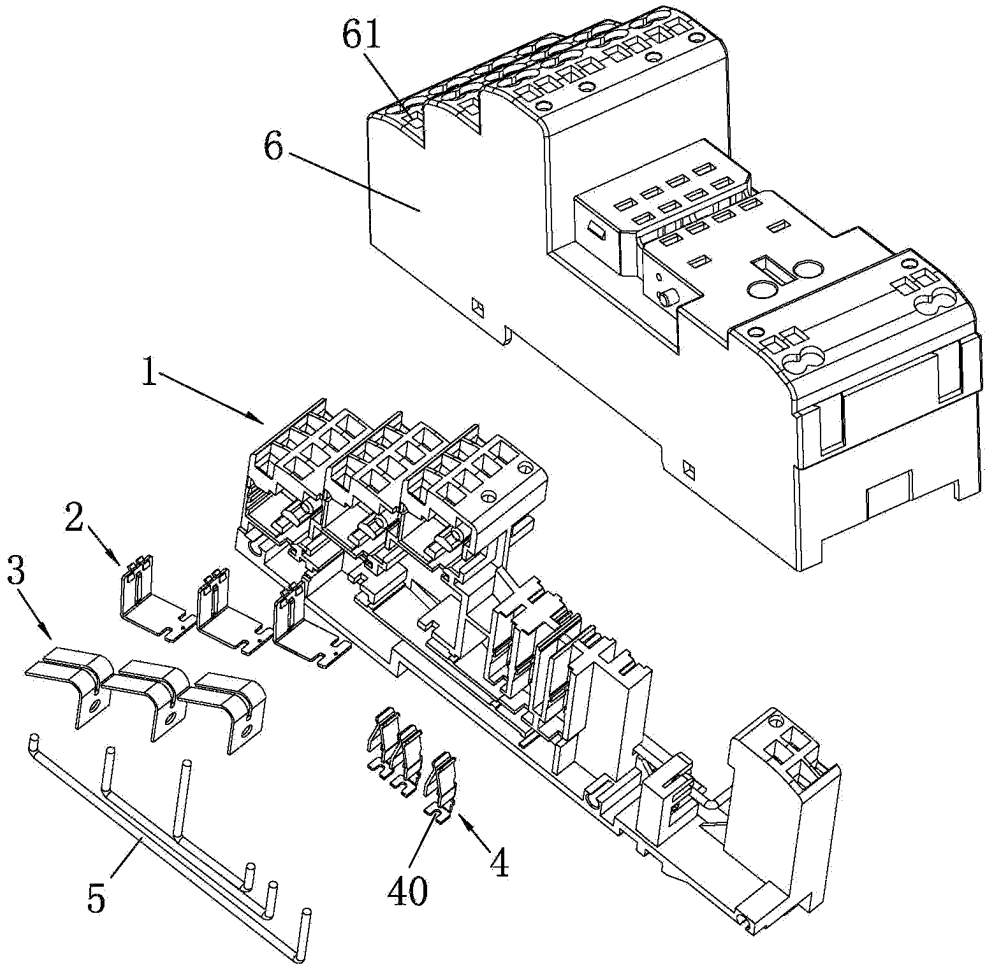

Fig. 21

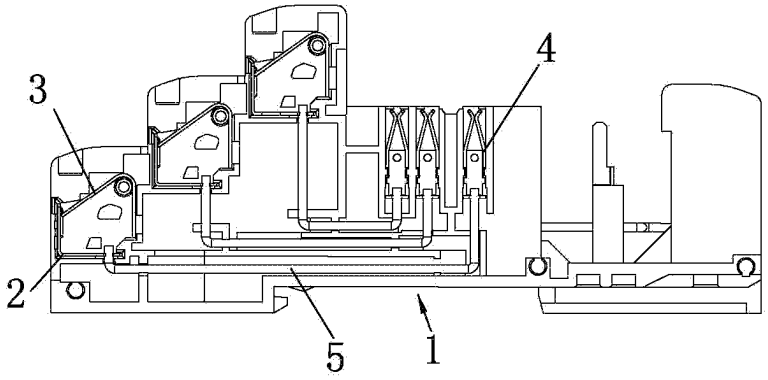

Fig. 22

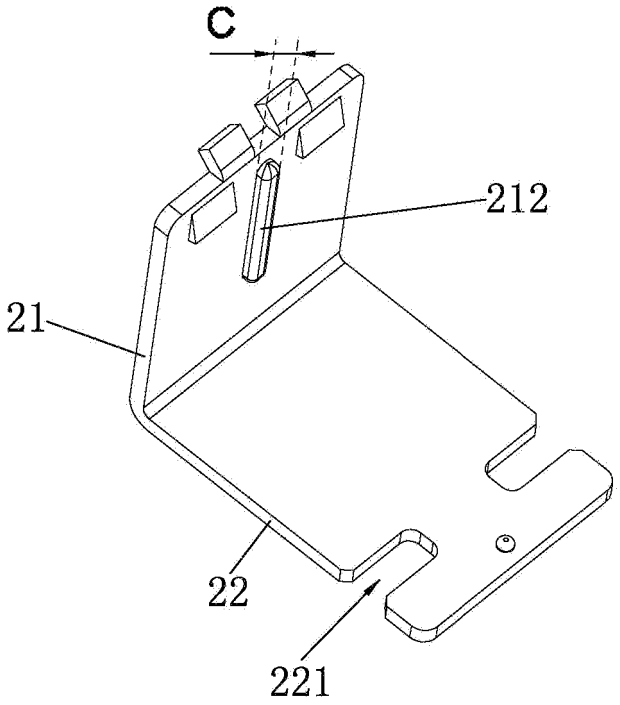

Fig. 23

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/082110

A. CLASSIFICATION OF SUBJECT MATTER

H01R 13/02(2006.01)i; H01R 13/502(2006.01)i; H01R 4/02(2006.01)i; H01R 4/48(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)

H01R

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)

CNABS, CNTXT, SIPOABS, DWPI, CNKI: 继电器, 插座, 连接器, 弹簧, 夹簧, 输出, 外接, 引出, 导线, 引线, relay, connector, socket, spring, outer, external, lead

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 208723142 U (XIAMEN HONGYUANDA ELECTRIC APPLIANCE CO., LTD.) 09 April 2019 (2019-04-09) description, paragraphs [0030]-[0036], and figures 1-6	1-12
PX	CN 111463602 A (XIAMEN HONGYUANDA ELECTRIC APPLIANCE CO., LTD.) 28 July 2020 (2020-07-28) entire document	1-12
PX	CN 111293498 A (XIAMEN HONGYUANDA ELECTRIC APPLIANCE CO., LTD.) 16 June 2020 (2020-06-16) entire document	1-12
PX	CN 111293457 A (XIAMEN HONGYUANDA ELECTRIC APPLIANCE CO., LTD.) 16 June 2020 (2020-06-16) entire document	1-12
A	US 2013130537 A1 (IDEAL IND.) 23 May 2013 (2013-05-23) entire document	1-12
A	CN 209747842 U (XIAMEN HONGYUANDA ELECTRIC APPLIANCE CO., LTD.) 06 December 2019 (2019-12-06) entire document	1-12

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

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"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
16 June 2021	**23 June 2021**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088** **China**	Authorized officer
Facsimile No. **(86-10)62019451**	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/082110

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 208093773 U (XIAMEN HONGYUANDA ELECTRIC APPLIANCE CO., LTD.) 13 November 2018 (2018-11-13) entire document	1-12

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2021/082110

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 208723142 U	09 April 2019	None	
CN 111463602 A	28 July 2020	CN 211480338 U	11 September 2020
CN 111293498 A	16 June 2020	CN 211480376 U	11 September 2020
CN 111293457 A	16 June 2020	CN 211480337 U	11 September 2020
US 2013130537 A1	23 May 2013	US 8951064 B2	10 February 2015
CN 209747842 U	06 December 2019	None	
CN 208093773 U	13 November 2018	None	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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- CN 202010218318 **[0001]**
- CN 202010218344 **[0001]**
- CN 202010218966 **[0001]**