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(54) **BOBBIN THAT FACILITATES AUTOMATIC WINDING, COIL AND LATCHING RELAY**

(57) A bobbin that facilitates automatic winding includes a first flange part (1), a second flange part (2), a third flange part (3), a first winding part (4) and a second winding part (5), the first winding part (4) is provided between the first flange part (1) and the second flange part (2), the second winding part (5) is provided between the second flange part (2) and the third flange part (3); the first flange part (1) is provided with a plurality of terminal holes, the plurality of terminal holes includes a first terminal hole (11) for inserting a start terminal (8) and a second terminal hole (13) for inserting an end terminal (9); the first flange part (1) is provided with a wire hanging portion, and a bottom end of the wire hanging portion is lower than a top end of the first flange part (1), and the second flange part (2) is provided with a first wire guide portion for guiding a enameled wire (7) from the second winding part (5) to the wire hanging portion. In the present disclosure, a manual winding of enameled wire is avoided, and the wire hanging portion is used to hang the wire to reduce the height of the end wire part of the enameled wire (7) located between the first flange part (1) and the second flange part (2), at the same time, an effective isolation between the enameled wire layers of the second winding part (5) and the first winding part (4) can be ensured, and the risk of interlayer breakdown can be avoided, thereby avoiding the use of a wire crimping mechanism to crimp the wire and ensuring safety at the same time.

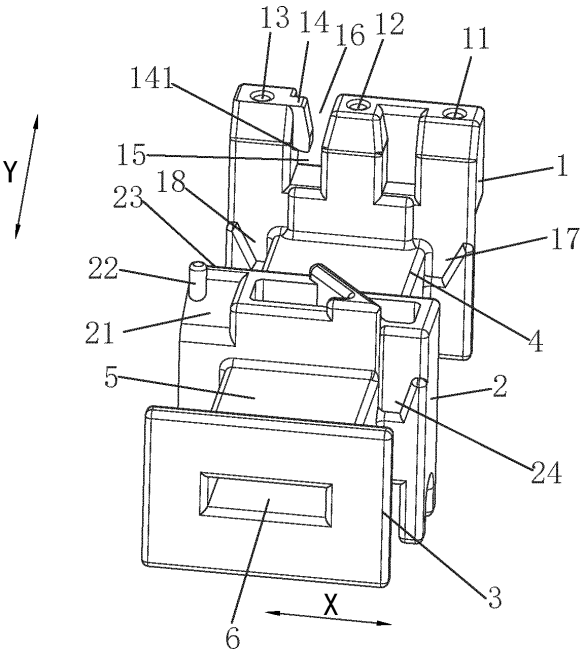

FIG.1

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to the technical field of relays, and in particular, to a bobbin that facilitates automatic winding, a coil, a latching relay and a movable spring terminal limiting structure.

BACKGROUND

[0002] The bobbin of the latching relay includes three flange parts and two winding parts, the three flange parts are sequentially distributed along the length direction of the bobbin, and each winding part is respectively arranged between two adjacent flange parts. Because several coil terminals of the latching relay are located on the same flange part, it is easy to cause the start and end wires of the enameled wire to overlap together, which is easy to form a voltage difference, causing a short circuit of the coil and then resulting in the loss of relay function. In order to solve the above problems, there are some technical solutions in which bridging terminals are provided on the middle flange part, the end wire of the enameled wire is wound on the bridging terminal and then connected to the end terminal, so that the start wire and the end wire of the enameled wire are spaced apart. However, this way is not convenient for automatic winding. This is because it is currently impossible to use an automatic winding method to wind the end wire of the enameled wire on the bridge terminal, and only a manual winding method can be used. In addition, the height difference between the position of the bridge terminal and the position of the end terminal is large, when the end wire of the enameled wire is led from the bridge terminal to the end terminal, a crimping mechanism must be used to crimp the end wire between the bridge terminal and the end terminal to reduce its height and avoid interference with the base of the relay. However, the use of a crimping mechanism for crimping processing is not only complicated, but also requires manual assistance.

[0003] In addition, the movable spring part of the latching relay includes a movable spring and a movable spring terminal, which are riveted together and inserted into a cavity provided at the bottom of the base of the latching relay. The movable spring terminal includes a main sheet body and a lead-out pin arranged on the main sheet body, and the main sheet body is used for riveting with the movable spring. Because there is a certain gap between the main sheet body of the movable spring terminal and the top surface of the cavity where it is located, when the latching relay is dropped or impacted by an external force, the movable spring terminal is prone to shake up and down, which affects the contact gap, contact over-travel and contact pressure, etc., so that the consistency of the mechanical properties of the product cannot be guaranteed.

SUMMARY

[0004] According to one aspect of the present disclosure, a bobbin that facilitates automatic winding, a coil, a latching relay are provided.

[0005] The technical solutions adopted by the present disclosure to solve its technical problems are as follows: A bobbin that facilitates automatic winding includes a first flange part, a second flange part, a third flange part, a first winding part and a second winding part, the first flange part, the second flange part and the third flange part is sequentially distributed along a length direction of the bobbin, the first winding part is provided between the first flange part and the second flange part, the second winding part is provided between the second flange part and the third flange part; the first flange part is provided with a plurality of terminal holes, the plurality of terminal holes includes a first terminal hole for inserting a start terminal and a second terminal hole for inserting an end terminal, the first flange part is provided with a wire hanging portion, and a bottom end of the wire hanging portion is lower than a top end of the first flange part, and the second flange part is provided with a first wire guide portion for guiding a enameled wire from the second winding part to the wire hanging portion.

[0006] Further, the first flange part is provided with a groove which is located at an inner side of a part where the second terminal hole is located, the groove is configured to penetrate both sides of the first flange part in a thickness direction thereof; and the wire hanging portion is located on a groove wall of the groove at a side close to the second terminal hole.

[0007] Further, the wire hanging portion is an upside-down boss, a bottom end of the upside-down boss is higher than a bottom end of the groove wall where the upside-down boss is located.

[0008] Further, a bottom surface of the upside-down boss is an inclined plane, and an end of the inclined plane connected to the groove wall where the upside-down boss is located is a higher end, the other end of the inclined plane away from the groove wall where the upside-down boss is located is a lower end; an enameled wire introduction port with a wide top and a narrow bottom is formed between the upside-down boss and a groove wall on the other side of the groove.

[0009] Further, the first wire guide portion is a wire guide groove, the wire guide groove is open at one end close to the second winding part, a bottom surface of the wire guide groove is an inclined surface, and a lower end of the inclined surface is close to the second winding part and is provided with a rounded corner, a higher end of the inclined surface is close to the first winding part.

[0010] Further, the bottom surface of the wire guide groove is provided with a protruding column extending upward, an end of the wire guide groove close to an outside of the second flange part is open, the protruding column is located at the end of the wire guide groove.

[0011] Further, one end of the wire guide groove close

to the first winding part is provided with a rib extending along a width direction of the bobbin, a top end of the rib is higher than a height of the enameled wire after being wound on the first winding part; the rib and a higher end of the bottom surface of the wire guide groove are in a circular arc transition.

[0012] Further, the plurality of terminal holes further comprises a third terminal hole for inserting a common terminal, the third terminal hole is located between the first terminal hole and the second terminal hole.

[0013] Further, the first flange part is provided with a plurality of vent holes, the plurality of terminal holes are respectively communicated with at least one vent hole.

[0014] Further, the plurality of terminal holes are respectively arranged up and down corresponding to corresponding vent holes, and an aperture of the vent hole is smaller than an aperture of a terminal hole.

[0015] Further, the second flange part is provided with a second wire guide portion for guiding the enameled wire from the first winding part to the second winding part, the second wire guide portion is an oblique retaining wall; a side of the first flange part facing the first winding part is provided with a first wire passing notch and a second wire passing notch, the first wire passing notch and the second wire passing notch are located at opposite sides of the first winding part; a side of the second flange part facing the second winding part is provided with a third wire passing notch corresponding to the second wire guide portion; the second flange part is provided with a magnetic steel slot, the magnetic steel slot is connected to an core mounting hole penetrating the first flange part, the second flange part, the third flange part, the first winding part and the second winding part; two limiting bosses are respectively provided on both sides of the magnetic steel slot, and the two limiting bosses are respectively provided with arc-shaped notches that cooperate with a rotating shaft of an armature.

[0016] According to another aspect of the present disclosure, a coil is provided. The coil includes an enameled wire, a plurality of terminals and bobbin that facilitates automatic winding of the present disclosure as described above, each terminal is inserted into a cooperating terminal hole, the enameled wire is started from a terminal inserted into a first terminal hole, and is guided to a wire hanging portion through a wire guide groove after being wound, and is connected to a terminal inserted into a second terminal hole after an wire is hung on the wire hanging portion.

[0017] According to another aspect of the present disclosure, a latching relay is provided. The latching relay includes the coil of the present disclosure described above.

[0018] Compared with related art, the present disclosure has the following beneficial effects.

1. The present disclosure adopts the first wire guide portion instead of the bridge terminal to avoid manual winding of enameled wire, and reduce costs and avoid wire disconnection, at the same time, the present disclosure is provided with a wire hanging portion on the first flange part, the bottom end of the wire hanging portion is lower than the top end of the first flange part, the wire hanging portion is used to hang the wire to reduce the height of the end wire part of the enameled wire located between the first flange part and the second flange part, thereby avoiding the use of a wire crimping mechanism to perform crimping processing. At the same time, an effective isolation between the enameled wire layers of the second winding part and the first winding part can be ensured, and the risk of interlayer breakdown can be avoided. Therefore, the bobbin of the present disclosure is convenient to realize automatic winding and greatly improves the winding efficiency.

2. The present disclosure further provides the groove, the wire hanging portion is located on the groove wall of the groove at the side close to the second terminal hole, which not only does not affect the automatic wire hanging, but also prevents the wire hanging portion from being located at the periphery of the first flange part and interfering with the base of the relay.

3. The wire hanging portion is preferably an upside-down boss, so that its structure is very simple. In particular, a bottom surface of the upside-down boss is an inclined plane, and the end of the inclined plane connected to the groove wall where the upside-down boss is located is the higher end, the other end of the inclined plane away from the groove wall where the upside-down boss is located is the lower end, which is beneficial to tilt the enameled wire to the side where the second terminal hole is located after being hung on the upside-down boss, so as to prevent the enameled wire from falling out of the upside-down boss; the enameled wire introduction port facilitates the introduction of the enameled wire for hanging upside down at the bottom of the upside-down boss.

4. The first wire guide portion is a wire guide groove, the bottom surface of the wire guide groove is an inclined surface, which is convenient for guiding the enameled wire and reducing the tension of the enameled wire, so that the enameled wire is more difficult to break.

5. The arrangement of the protruding column can not only restrict the enameled wire from coming out of the wire guide groove, but also can be used as a winding fixing point of the enameled wire when needed.

6. The arrangement of the vent holes 19 can allow the heated and expanded air in the terminal holes to circulate freely with the outside of the terminal hole when the start terminal, the common terminal and the end terminal are heated with tin, so as to avoid air expansion in the terminal holes and affect the initial plug-in position of the terminal, which may

cause problems such as terminal skew and change in the length of the terminal.

7. Each vent hole is arranged up and down corresponding to the corresponding vent hole, and the aperture of the vent hole is smaller than the aperture of the terminal hole, so that the vent hole can be easily formed without causing the corresponding terminal to fall out.

[0019] According to another aspect of the present disclosure, a movable spring terminal limiting structure and a latching relay are provided.

[0020] The technical solutions adopted by the present disclosure to solve its technical problems are as follows: a movable spring terminal limiting structure of the present disclosure includes a base of the relay and a movable spring terminal, the bottom of the base is provided with a first cavity, the movable spring terminal is inserted into the first cavity from a side of the base; the movable spring terminal 200 includes a lead-out pin and a main sheet body for connecting with the movable spring, the lead-out pin is provided at the main sheet body; the main sheet body is provided with a limiting portion, the base is provided with a limiting slot, the limiting slot is in communication with the first cavity; the limiting portion is inserted into the limiting slot along the insertion direction of the movable spring terminal, so that the limiting portion is not move up and down.

[0021] Further, the first cavity is provided with a boss for supporting the main sheet body, the lead-out pin is located outside the boss and its bottom end extends below the base; the limiting portion and the tail of the movable spring connected to the main sheet body are located on the same side of the main sheet body, the limiting portion extends downward and bend, the bottom surface of the limiting slot is lower than the boss.

[0022] Further, the limiting portion is in a shape of "Z", and the higher end of the limiting portion is connected to the main sheet body, the bottom end of the limiting portion faces the middle of the first cavity; the shape of the limiting slot is adapted to the shape of the limiting portion, or, the limiting slot is in a shape of "L", and the width of the vertical portion thereof is greater than or equal to the width of the top of the limiting portion

[0023] Further, the corners of the limiting portion are respectively designed as rounded corners, the top of the ends of the main sheet body and the limiting portion are respectively provided with chamfers; the top surface of the boss is provided with a relief groove, and the relief groove is far away from the limiting slot, an end of the top surface of the boss close to the lead-out pin is provided with a chamfer.

[0024] Further, the lead-out pin is L-shaped, and its horizontal portion is connected to the main sheet body, and its vertical portion extends downward; the first cavity is provided with a retaining wall located at an inner side of the lead-out pin, the retaining wall is provided with a limiting protrusion for limiting the movement of the lead-out pin upward and/or toward the middle of the first cavity; the limiting protrusion is an L-shaped limiting rib fitted at the outer corner of the lead-out pin; the limiting slot is located between the boss and the retaining wall.

[0025] Further, the movable spring terminal is inserted into the first cavity from the side of the base in the width direction, the limiting portion is located at one end of the main sheet body in the length direction of the base, the lead-out pin is arranged at one end of the main sheet body in the width direction of the base, and is fitted to the opening of the first cavity into which the movable spring terminal is inserted.

[0026] Further, the first cavity is provided with a blocking portion, the blocking portion abuts against the side surface of the other end of the main sheet body in the length direction of the base; the blocking portion cooperates with the limiting slot to limit the degree of freedom of the main sheet body and the limiting portion in the length direction of the base 1; an end of the blocking portion close to the lead-out pin is chamfered, the blocking portion is a baffle or a barrier strip.

[0027] Further, the top surface of the first cavity is provided with a pressure contact portion, the bottom end of the pressure contact portion abuts the top surface of the other end of the main sheet body in the length direction of the base; the pressure contact portion is a pressure plate or a pressure strip.

[0028] Further, the side surface of the main sheet body at the other end in the length direction of the base is provided with a plurality of snap-fit barbs, the corner of each snap-fit barb is respectively arranged as rounded corner; a process notch is provided at one end of the main sheet body where the lead-out pin are provided; the main sheet body is provided with a plurality of riveting holes or riveting columns for riveting with the movable spring; the base is also provided with a second cavity for mounting the magnetic circuit part of the relay.

[0029] According to another aspect of the present disclosure, a latching relay is provided, the latching relay includes a movable spring terminal limiting structure of the present disclosure described above.

[0030] Compared with related art, the present disclosure has the following beneficial effects.

1. The main sheet body of the present disclosure is provided with a limiting portion which is inserted into the cooperating limiting slot of the base, and can't move up and down, thereby limiting the degree of freedom of the main sheet body of the movable spring terminal in the up and down direction, preventing the main sheet body of the movable spring terminal from shaking up and down when the latching relay is dropped or impacted by an external force, and helping to improve the consistency of the product's mechanical properties.

2. The limiting portion and the tail of the movable spring connected to the main sheet body are located on the same side of the main sheet body, the limiting

portion extends downward and bend, the bottom surface of the limiting slot is lower than the boss, which can prevent the limiting portion from limiting the movable spring connected to the main sheet body or interfering with the movable spring connected to the main sheet body, thereby avoiding affecting the elasticity of the movable spring and also ensuring that the movable spring has sufficient space for movement.

3. The limiting portion is in a shape of "Z", and thus has the characteristics of easy forming, easy insertion, and good limiting effects in up and down direction.

4. The corners of the limiting portion are respectively designed as rounded corners, the top of the ends of the main sheet body and the limiting portion away from the lead-out pin are respectively provided with chamfers, so as to avoid scraping and generating plastic scraps when the movable spring terminal 200 is installed in the base 1.

5. The arrangement of the retaining wall and its limiting protrusion can limit the lead-out pin and prevent the lead-out pin from being forced during the product production process and product application process to cause changes in the relevant mechanical parameters of the relay product and affecting the performance of the relay.

6. The blocking portion abuts against the other side surface of the main sheet body in the length direction of the base, and cooperate with the limiting slot to limit the degree of freedom of the main sheet body and the limiting portion in the length direction of the base, so that the technical solution of the present disclosure can limit the degree of freedom of the main sheet body of the movable spring terminal in the length direction of the base, prevent the main sheet body of the movable spring terminal from lateral shaking when the latching relay is dropped or impacted by an external force, and help to improve the consistency of the product's mechanical properties.

7. The arrangement of the pressure contact portion 116 is combined with the cooperation of the limiting portion and the limiting slot, which achieves bilateral limiting of the main sheet body 210 in the up and down direction, and greatly improves the limiting effect of the main sheet body in the up and down direction, thereby helping to further improve the consistency of the mechanical properties of the product.

[0031] The disclosure will be further described in detail below in conjunction with the drawings and embodiments. However, the bobbin that facilitates automatic winding, the coil, the a movable spring terminal limiting structure and the latching relay of the present disclosure are not limited to the embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032]

FIG. 1 is a first structural diagram of the bobbin of the present disclosure.

FIG. 2 is a second structural diagram of the bobbin of the present disclosure.

FIG. 3 is a third structural diagram of the bobbin of the present disclosure.

FIG. 4 is a side view of the bobbin of the present disclosure.

FIG. 5 is a front view of the bobbin of the present disclosure.

FIG. 6 is a first schematic diagram of the bobbin of the present disclosure being wound in a single-coil winding manner.

FIG. 7 is a second schematic diagram of the bobbin of the present disclosure being wound in a single-coil winding manner.

FIG. 8 is a third schematic diagram of the bobbin of the present disclosure being wound in a single-coil winding manner.

FIG. 9 is a first schematic diagram of the bobbin of the present disclosure being wound in a double-coil winding manner.

FIG. 10 is a second schematic diagram of the bobbin of the present disclosure being wound in a double -coil winding manner.

FIG. 11 is a third schematic diagram of the bobbin of the present disclosure being wound in a double -coil winding manner.

FIG. 12 is a fourth schematic diagram of the bobbin of the present disclosure being wound in a double -coil winding manner.

FIG. 13 is a fifth schematic diagram of the bobbin of the present disclosure being wound in a double -coil winding manner.

FIG. 14 is a front view of the coil of the present disclosure.

FIG. 15 is an exploded schematic diagram of the movable spring terminal limiting structure of the present disclosure.

FIG. 16 is a schematic diagram of the three-dimensional structure of the movable spring terminal of the present disclosure.

FIG.17 is a top view of the movable spring terminal of the present disclosure.

FIG. 18 is an A-A cross-sectional view of the movable spring terminal of the present disclosure.

FIG.19 is a schematic diagram of the three-dimensional structure of the base of the present disclosure.

FIG. 20 is a front view of the base of the present disclosure.

FIG. 21 is a cross-sectional view of the base of the present disclosure.

FIG. 22 is a schematic diagram of the three-dimensional structure of the movable spring terminal of the

present disclosure after the movable spring terminal is installed in the base.

FIG. 23 is a cross-sectional view of the movable spring terminal limiting structure of the present disclosure after the movable spring terminal is installed in the base.

DETAILED DESCRIPTION

The first embodiment

[0033] Please refer to FIG. 1 to FIG. 14, a bobbin of the present disclosure that facilitates automatic winding includes a first flange part 1, a second flange part 2, a third flange part 3, a first winding part 4 and a second winding part 5, the first flange part 1, the second flange part 2 and the third flange part 3 are sequentially distributed along the length direction Y of the bobbin, the first winding part 4 is provided between the first flange part 1 and the second flange part 2, the second winding part 5 is provided between the second flange part 2 and the third flange part 3, the first flange part 1 is provided with a plurality of terminal holes, and the plurality of terminals are distributed along the width direction X of the bobbin, the plurality of terminal holes include a first terminal hole 11 for inserting a start terminal, a second terminal hole 13 for inserting an end terminal, and a third terminal hole 12 for inserting a common terminal, the third terminal hole 12 is located between the first terminal hole 11 and the second terminal hole 13. In other embodiments, the plurality of terminal holes includes the first terminal hole and the second terminal hole, but does not include the third terminal hole. The first flange part 1 is provided with a wire hanging portion, and the bottom end of the wire hanging portion is lower than the top end of the first flange part 1, and the second flange part 2 is provided with a first wire guide portion for guiding the enameled wire from the second winding part 5 to the wire hanging portion.

[0034] In the embodiment, as shown in FIG. 1, the first flange part 1 is provided with a groove 15 which is located at the inner side of the part where the second terminal hole 13 is located, the groove 15 penetrates both sides of the first flange part 1 in the thickness direction thereof, and the wire hanging portion is located on the groove wall of the groove 15 at the side close to the second terminal hole 13. Specifically, the groove 15 is located between the second terminal hole 13 and the third terminal hole 12. When the first flange portion only includes the first terminal hole and the second terminal hole, the groove is located between the first terminal hole and the second terminal hole.

[0035] In the embodiment, as shown in FIG. 1 and FIG. 4, the wire hanging portion is an upside-down boss 14, the bottom end of the upside-down boss 14 is higher than the bottom end of the groove wall where it is located. A bottom surface 141 of the upside-down boss 14 is an inclined plane, and the end of the inclined plane connected to the groove wall where the upside-down boss 14 is located is the higher end, the other end of the inclined plane away from the groove wall where the upside-down boss 14 is located is the lower end, as shown in FIG. 4, the angle α between the inclined plane and the vertical direction is 70°-80°. As shown in FIG. 1, an enameled wire introduction port 16 with a wide top and a narrow bottom is formed between the upside-down boss 14 and the groove wall on the other side of the groove 15 to facilitate the introduction of enameled wires 7. As shown in FIG. 4, the width W1 of the upside-down boss 14 is smaller than the width W2 of the groove 15.

[0036] In the embodiment, as shown in FIG. 1, the first wire guide portion is a wire guide groove 21, but is not limited to this, in other embodiments, the first wire guide portion is a wire retaining wall or a wire rib or the like. The wire guide groove 21 is open at one end close to the second winding part 5, the bottom surface of the wire guide groove 21 is an inclined surface, and the lower end of the inclined surface is close to the second winding part 5 and is provided with a rounded corner, the higher end of the inclined surface is close to the first winding part 4. The bottom surface of the wire guide groove 21 is provided with a protruding column 22 extending upward, the end of the wire guide groove 21 close to the outside of the second flange part 2 is open, the protruding column 22 is integrally formed with the second flange part 2 and is located at the end of the wire guide groove 21. As shown in FIGS. 4 and 5, the height difference a2 between the top end of the protruding column 22 and the top end of the first flange part 1 is greater than the height difference a1 between the bottom end of the upside-down boss 14 and the top end of the first flange part 1, which can prevent the enameled wire at the end terminal and the enameled wire at the common terminal from being overlapped when the enameled wires are wound by using the double-coil method, so as to avoid when the coil is powered off, the reverse voltage breaks down the overlap portion (when the wires at the end terminal and the common terminal are overlapped together, it is easy to form a voltage difference), resulting in a short circuit of the coil and loss of the relay function. As shown in FIG. 1, one end of the wire guide groove 21 close to the first winding part 4 is provided with a rib 23 extending along the width direction X of the bobbin, the top end of the rib 23 is higher than the height of the enameled wire 7 after being wound on the first winding part 4; the rib 23 and the higher end of the bottom surface of the groove are in a circular arc transition.

[0037] In the embodiment, as shown in FIG. 3, the first flange part 1 is provided with a plurality of vent holes 19, the three terminal holes (that is, the first terminal hole 11, the second terminal hole 13 and the third terminal hole 12) are respectively communicated with at least one vent hole 19. The number of the vent holes 19 is specifically three, and the three vent holes 19 correspond to the three terminal holes one by one, the three terminal holes are respectively arranged up and down corresponding to the corresponding vent holes 19, and the aperture of the vent

hole 19 is smaller than the aperture of the terminal hole. Specifically, the portion where the vent hole 19 is located is opposite to the portion where the terminal hole is located. In other embodiments, the vent hole is located on the side of the first flange part. The arrangement of the vent holes 19 can allow the heated and expanded air in the terminal holes to circulate freely with the outside of the terminal holes when the start terminal, the common terminal and the end terminal are heated with tin, so as to avoid air expansion in the terminal holes and affect the initial plug-in position of the terminal, which may cause problems such as terminal skew and change in the length of the terminal.

[0038] In the embodiment, as shown in FIG. 2, the second flange part 2 is provided with a second wire guide portion for guiding the enameled wire from the first winding part 4 to the second winding part 5, the second wire guide portion is an oblique retaining wall 25, and the oblique retaining wall 25 forms a certain angle with the center line of the bobbin, the oblique retaining wall 25 and the wire guide groove 21 are distributed along the width direction X of the bobbin.

[0039] In the embodiment, as shown in FIGS. 1 and 2, the side of the first flange part 1 facing the first winding part 4 is provided with a first wire passing notch 17 and a second wire passing notch 18, the first wire passing notch 17 and the second wire passing notch 18 are located at opposite sides of the first winding part 4. The side of the second flange part 2 facing the second winding part 5 is provided with a third wire passing notch 24 corresponding to the second wire guide portion. The second flange part 2 is provided with a magnetic steel slot 26 which is located on the bottom surface of the second flange part 2, the magnetic steel slot 26 is connected to an core mounting hole 16 penetrating the first flange part 1, the second flange part 2, the third flange part 3, the first winding part 4 and the second winding part 5. Two limiting bosses 27 are respectively provided on both sides of the magnetic steel slot 26, and the two limiting bosses 27 are respectively provided with arc-shaped notches 271 that cooperate with the rotating shaft of the armature.

[0040] The bobbin that facilitates automatic winding of the present disclosure, when winding the wire on the bobbin, either a single-coil winding method or a double-coil winding method can be used. When a single-coil winding method is performed, it is only necessary to insert the start terminal 8 and the end terminal 9 into the terminal holes on both sides of the first flange part 1 (that is, the first terminal hole 11 and the second terminal hole 13), respectively. As shown in FIGS. 6-8, the enameled wire 7 is started from the start terminal 8, and after passing through the first wire passing notch 17 and completing the winding of the first set of coil 71 at the first winding part 4, the enameled wire 7 is directly entered the third wire passing notch 24 along the oblique retaining wall 25, and then the winding of the second set of coils 72 at the second winding part 5 is completed; then, the enameled wire 7 is climbed from the lower end to the higher end of the bottom surface of the wire guide groove 21 at the inner side of the protruding column 22, and then is guided straight across the rib 23 to the bottom of the upside-down boss 14. After being hung on the upside-down boss 14, the enameled wire 7 is pulled up to the end terminal 9, and is wound clockwise on the end terminal 9 for 2-3 turns to complete the single-coil winding.

[0041] When a double-coil winding method is performed, in additional to the start terminal 8 and the end terminal 9 are inserted into the terminal holds (i.e., the first terminal hole 11 and the second terminal hole 13) on both sides, the common terminal 10 is also inserted into the middle terminal hole (i.e., the third terminal hole 12). As shown in FIGS. 9-13, the enameled wire 7 is started from the start terminal 8, and after passing through the first wire passing notch 17 and completing the winding of the first set of coils 71 at the first winding part 4, the enameled wire 7 is returned to the common terminal 10 and is wound clockwise on the common terminal 10 for 2-3 turns, then is returned to the first winding part 4 along the second wire passing notch 18, after being wound a few turns on the first winding part 4 at a relatively large interval, the enameled wire 7 is entered the third wire passing notch 24 along the oblique retaining wall 25, then the winding of the second set of coil 72 in the second winding part 5 is completed; then the enameled wire 7 is climbed from the lower end to the higher end of the bottom surface of the wire guide groove 21 at the inner side of the protruding column 22, and is guided straight across the rib 23 to the bottom of the upside-down boss 14. After being hung on the upside-down boss 14, the enameled wire 7 is pulled up to the end terminal 9, and is wound clockwise on the end terminal 9 for 2-3 turns to complete the double-coil winding.

[0042] Regardless of whether it is a single-coil or double-coil winding method, the top end of the rib 23 is higher than the height of the first set of coils 71, which can avoid the spanned enameled wire 73 and the enameled wire of the first set of coils 71 from touching and overlapping together, as shown in FIG. 14, so as to avoid when the coil is powered off, the reverse voltage breaks down the overlap portion (when the wires at the start and end terminals are overlapped together, it is easy to form a voltage difference), resulting in a short circuit of the coil and loss of the relay function.

[0043] The bobbin that facilitates automatic winding of the present disclosure adopts the first wire guide portion instead of the bridge terminal to avoid manual winding of enameled wire, at the same time, the wire hanging portion is used to hang the wire to reduce the height of the end wire part of the enameled wire (that is, the spanned enameled wire 73) located between the first flange part and the second flange part, thereby avoiding the use of a wire crimping mechanism to perform crimping processing. At the same time, an effective isolation between the enameled wire layers of the second winding part and the first winding part can be ensured, and the

risk of interlayer breakdown can be avoided, Through the design of the bobbin structure, the present disclosure can reduce the potential failure risk during the winding process, and can better guide the fixing and limiting of the enameled wire 7, so as to facilitate the realization of automatic winding.

[0044] Please refer to FIGS. 1-14, a coil provided by the present disclosure includes an enameled wire 7 and several terminals. The several terminals specifically include a start terminal 8, a common terminal 10 and an end terminal 9. The coil of the present disclosure also includes a bobbin that facilitates automatic winding as described in the present disclosure, and the common terminal 10 can be selectively inserted into the middle terminal hole (that is, the third terminal hole 12), the start terminal 8 and the end terminal 9 are respectively inserted into the other two terminal holes (namely, the first terminal hole 11 and the second terminal hole 13), the enameled wire 7 is started from the start terminal 8 and is wound by a single-coil winding method or a double-coil winding method, and is led to the wire hanging portion by the wire guide groove 21, and connected to the end terminal 9 after the wire is hooked in the wire hanging portion. The common terminal 10 can be selectively inserted into the middle terminal hole 12, which means that when a single-coil winding method is adopted, only the terminal holes 11, 13 on both sides of the first flange portion 1 need to be inserted into the start terminal 8 and the end terminal 9 respectively, and the middle terminal hole 12 does not need to be inserted into the common terminal 10; when the double-coil winding method is adopted, the three terminals 11, 12, and 13 of the first flange part 1 are respectively inserted into the start terminal 8, the common terminal 10, and the end terminal 9 respectively.

[0045] The coil of the present disclosure can adopt a single-coil winding method or a double-coil winding method. The two coil winding methods are as described above, and will not be repeated here. When the plurality of terminal holes of the first flange part only includes the first terminal hole and the second terminal hole, but does not include the third terminal hole, the several terminals only include the start terminal and the end terminal, and do not include the common terminal, in this case, the present disclosure can only adopt the single-coil winding method.

[0046] A latching relay disclosed in the present disclosure includes the coil of the present disclosure as described above.

The second embodiment

[0047] Please refer to FIGS. 15-23, a movable spring terminal limiting structure of the present disclosure includes a base 100 of the relay and a movable spring terminal 200, the bottom of the base 1 is provided with a first cavity 110, and the first cavity 110 is provided with an opening to the outside in the width direction W of the base 100, the movable spring terminal 200 is inserted into the first cavity 110 from the side of the base 100. Specifically, the movable spring terminal 200 is inserted into the first cavity 110 from the side of the base 100 in the width direction W. The base 100 and the movable spring lead-out sheet 200 are specifically the base and movable spring lead-out sheet of a magnetic latching relay, but are not limited thereto. The base 100 is also provided with a second cavity 120 for mounting the magnetic circuit part of the relay, and the second cavity 120 and the first cavity 110 are substantially arranged up and down. The movable spring terminal 200 includes a lead-out pin 220 and a main sheet body 210 for connecting with the movable spring 300, the lead-out pin 220 is provided at one end of the main sheet body 210 in the width direction of the base 100, the lead-out pin 220 is fitted in the opening of the first cavity 110 for the movable spring terminal 200 to be inserted. One end of the main sheet body 210 in the length direction Z of the base 100 is provided with a limiting portion 230, the limiting portion 230 and the tail of the movable spring 300 connected to the main sheet body 210 are located at the same side of the main sheet body 210; the bottom of the base 100 is also provided with a limiting slot 112 communicating with the outside along the width direction W of the base 100, the limiting slot 112 is in communication with the first cavity 110; the limiting portion 230 is inserted into the limiting slot 112 along the insertion direction of the movable spring terminal 200, so that the limiting portion is not move up and down.

[0048] In the embodiment, the first cavity 110 is provided with a boss 111 for supporting the main sheet body 210, the lead-out pin 220 is located outside the boss 111 and its bottom end extends below the base 100. The limiting portion 230 extends downward and is bent, and the bottom surface of the limiting slot 112 is lower than the boss 111.

[0049] In the embodiment, as shown in FIG. 16, the limiting portion 230 is in a shape of "Z", and the higher end of the limiting portion 230 is connected to the main sheet body 210, the bottom end of the limiting portion 230 faces the middle of the first cavity 110, and the width at the top of the limiting portion 230 is smaller than the width at the bottom. As shown in FIGS. 17 and 18, the bending angles α and β at the upper and lower positions of the limiting portion 230 are both 90°, the bending angles α and β at the upper and lower positions of the limiting portion 230 are both 90°, the sum of the width of the top of the limiting portion 230 and the width of the main sheet body 210 is ci, the height of the vertical portion of the limiting portion 230 is bi, and the width of the bottom of the limiting portion 230 is L1. aand β can be adjusted according to the adaptability of the key dimensions ci and bi and the manufacturability of the parts, so as to obtain a better relative position for fixing the movable spring terminal 200. The limiting slot 112 is L-shaped, and the width of the vertical portion thereof is slightly larger than the width of the top of the limiting portion 230, the width

L2 of the bottom of the limiting slot 112 is slightly larger than the width L1 of the bottom of the limiting portion 230, so that the bottom of the limiting portion 230 can be completely accommodated, in the case of a better molding process, the limitation of the degree of freedom is not affected. As shown in FIG. 21, the height difference between the upper end of the horizontal part of the limiting slot 112 and the top surface of the boss 111 is b2, which is adapted to the bi. In other embodiments, the shape of the limiting slot is adapted to the shape of the limiting portion. The shape of the limiting portion 230 is not limited to the shape of "Z".

[0050] In the embodiment, as shown in FIG. 18, the corners of the limiting portion 230 are respectively designed as rounded corners, the top of the ends of the main sheet body 210 and its limiting portion 230 located in the length direction of the base 100 and away from the lead-out pin 220 are respectively provided with chamfers 214. In this way, it is possible to avoid scraping and generating plastic scraps when the movable spring terminal 200 is installed in the base 1.

[0051] In the embodiment, as shown in FIG. 16, the lead-out pin 220 is L-shaped, and its horizontal portion is connected to the main sheet body 210, and its vertical portion extends downward; as shown in FIG. 19, the first cavity 110 is provided with a retaining wall 113 located at the inner side of the lead-out pin 220 to restrict the lead-out pin 220 from moving to the inside of the first cavity 110, the retaining wall 113 is provided with a limiting protrusion for limiting the movement of the lead-out pin 220 upward and/or toward the middle of the first cavity 110. The limiting protrusion is specifically an L-shaped limiting rib 114 fitted at the outer corner of the lead-out pin 220, but it is not limited thereto. The limiting slot 112 is located between the boss 111 and the retaining wall 113. The top surface of the horizontal portion of the lead-out pin 220 is provided with two notches, the notch 221 on the left side is semicircular, which is convenient for mold forming with a 90° bending angle, the notch 222 on the right is rectangular and is used to fit the retaining wall 113 of the base 1.

[0052] In the embodiment, as shown in FIGS. 19-23, the first cavity 11 is provided with a blocking portion 115 on the side surface of one end in the length direction Z of the base 1, the blocking portion 115 abuts against the side surface of the other end of the main sheet body 210 in the length direction Z of the base 1; the blocking portion 115 cooperates with the limiting slot 112 to limit the degree of freedom of the main sheet body 210 and its limiting portion 230 in the length direction of the base 1, specifically, as shown in FIG. 21, the distance between the blocking portion 115 and the right side wall of the vertical portion of the limiting groove 112 is C2, which is adapted to the ci, thereby restricting the degree of freedom of the main sheet body 210 and the limiting portion 230 in the length direction Z of the base 1. An end of the blocking portion 115 close to the lead-out pin 220 is chamfered, so that the main sheet body 210 of the movable spring terminal 200 can smoothly enter the first cavity 110. The blocking portion 115 is a baffle or a barrier strip.

[0053] In the embodiment, as shown in FIG. 19, the top surface of the boss 111 is provided with a relief groove 117 at one end in the length direction Z of the base 100, and the relief groove 117 is far away from the limiting slot 112. The relief groove 117 can make way for the position of the burr of the movable spring terminal 200 to reduce the occurrence of plastic debris from scraping the base 100 by the burr surface. An end of the top surface of the boss 111 in the width direction W of the base and close to the lead-out pin 220 is provided with a chamfer 1111, so that the main sheet body 210 of the movable spring lead-out sheet 200 can smoothly enter the first cavity 110. In the embodiment, the top surface of the first cavity 110 is provided with a pressure contact portion 116 located above the boss 111, the bottom end of the pressure contact portion 116 abuts the top surface of the other end of the main sheet body 210 in the length direction Z of the base 100; The pressure contact portion 116 is a pressure plate or a pressure strip.

[0054] In the embodiment, as shown in FIG. 16, the side surface of the main sheet body 210 at the other end in the length direction Z of the base 100 is provided with a plurality of snap-fit barbs 211, the corner of each snap-fit barb 211 is respectively arranged as rounded corner to reduce the generation of foreign matter (plastic scraps) during insertion. A process notch 212 is provided at one end of the main sheet body 210 where the lead-out pin 220 are provided. The process notch 212 serves as the action point of the manipulator when the movable spring lead-out sheet 200 is installed in the base 100. The main sheet body 210 is provided with a plurality of riveting columns 213 for riveting with the movable spring 300, and the plurality of riveting posts 213 are distributed along the width direction W of the base 100. The number of the riveting columns 213 is specifically two, but it is not limited thereto. The riveting columns 213 can be replaced by riveting holes.

[0055] When the movable spring terminal limiting structure of the present disclosure is installed, after the main sheet body 210 of the movable spring terminal 200 is connected to the movable spring 300, the whole is inserted from the corresponding position of the opening of the first cavity 110 of the base, so that the movable spring lead-out sheet 200 and the movable spring 300 are limited in the first Cavity 110. During the installation process, as the main sheet body 210 is inserted into the first cavity 110, its limiting portion 230 is also inserted into the limiting slot 112, thereby limiting the degree of freedom of the main sheet body of the movable spring lead-out sheet 200 in the up and down direction, preventing the main sheet body 210 of the movable spring terminal 200 from shaking up and down when the magnetic latching relay is dropped or impacted by an external force, and helping to improve the consistency of the product's mechanical properties. The pressure contact portion 116

is combined with the cooperation of the limiting portion 230 and the limiting slot 112, which achieves bilateral limiting of the main sheet body 210 in the up and down direction, and greatly improves the limiting effect of the main sheet body 210 in the up and down direction, thereby helping to further improve the consistency of the mechanical properties of the product.

[0056] The limiting portion 230 and the tail of the movable spring 300 connected to the main sheet body 210 are located at the same side of the main sheet body 210 and extend downward and bend, the bottom surface of the limiting slot 112 is lower than the boss 111, which can prevent the limiting portion 230 from limiting or interfering with the movable spring 300 connected to the main sheet body 210, thereby avoiding affecting the elasticity of the movable spring 300 and also ensuring that the movable spring 300 has sufficient space for movement. The arrangement of the retaining wall 113 and its limiting protrusion can limit the lead-out pin 220 and prevent the lead-out pin 220 from being forced during the product production process and product application process to cause changes in the relevant mechanical parameters of the relay product and affecting the performance of the relay. The blocking portion 115 abuts against the other side surface of the main sheet body 210 in the length direction Z of the base 1, and cooperate with the limiting slot 112 to limit the degree of freedom of the main sheet body 210 and the limiting portion 230 in the length direction of the base 100, so that the technical solution of the present disclosure can limit the degree of freedom of the main sheet body 210 of the movable spring terminal 200 in the length direction Z of the base 100, prevent the main sheet body 210 of the movable spring lead-out sheet 200 from lateral shaking when the magnetic latching relay is dropped or impacted by an external force, and help to improve the consistency of the product's mechanical properties.

[0057] The movable spring terminal limiting structure of the present disclosure, through the structural design of the movable spring lead-out sheet and the base adapted to it, the movable spring terminal can be limited in multiple dimensions, thereby reducing the degree of freedom of the movable spring lead-out sheet, the movable spring lead-out sheet can only move in the opposite direction of its insertion direction after the movable spring lead-out sheet is installed on the base, and ensuring the stability and robustness of the position of the movable spring, and further improving the stability of the contact gap, the contact over-travel, and the contact pressure of the relay product. At the same time, there is also a separate limit for the lead-out pin of the movable spring terminal to prevent the lead-out pin 220 from being forced during the production process and application process to cause changes in the relevant mechanical parameters of the relay product and affecting the performance of the relay.

[0058] The present disclosure provides a latching relay, which includes the movable spring terminal limiting structure of the present disclosure as described above.

[0059] In the latching relay provided by the present disclosure, the parts not involved are the same as the related technology or can be realized by using the related technology.

[0060] The above-mentioned embodiments are only used to further illustrate a bobbin facilitates automatic winding, a coil, a latching relay and a movable spring terminal limiting structure, but the present disclosure is not limited to the embodiments, any simple amendments, equivalent changes and modifications made to the above embodiments based on the technical essence of the present disclosure fall within the protection scope of the technical solutions of the present disclosure.

Claims

1. A bobbin that facilitates automatic winding, comprising a first flange part (1), a second flange part (2), a third flange part (3), a first winding part (4) and a second winding part (5), the first flange part (1), the second flange part (2) and the third flange part (3) being sequentially distributed along a length direction of the bobbin, the first winding part (4) being provided between the first flange part (1) and the second flange part (2), the second winding part (5) being provided between the second flange part (2) and the third flange part (3); the first flange part (1) being provided with a plurality of terminal holes, the plurality of terminal holes comprising a first terminal hole (11) for inserting a start terminal (8) and a second terminal hole (13) for inserting an end terminal (9), **characterized in that**, the first flange part (1) is provided with a wire hanging portion, and a bottom end of the wire hanging portion is lower than a top end of the first flange part (1), and the second flange part (2) is provided with a first wire guide portion for guiding a enameled wire (7) from the second winding part (5) to the wire hanging portion.

2. The bobbin that facilitates automatic winding according to the claim 1, **characterized in that**, the first flange part (1) is provided with a groove (15) which is located at an inner side of a part where the second terminal hole (13) is located, the groove (15) is configured to penetrate both sides of the first flange part (1) in a thickness direction thereof; and the wire hanging portion is located on a groove wall of the groove (15) at a side close to the second terminal hole (13).

3. The bobbin that facilitates automatic winding according to the claim 2, **characterized in that**, the wire hanging portion is an upside-down boss (14), a bottom end of the upside-down boss (14) is higher than a bottom end of the groove wall where the upside-down boss (14) is located.

4. The bobbin that facilitates automatic winding according to the claim 3, **characterized in that**, a bottom surface (141) of the upside-down boss (14) is an inclined plane, and an end of the inclined plane connected to the groove wall where the upside-down boss (14) is located is a higher end, the other end of the inclined plane away from the groove wall where the upside-down boss (14) is located is a lower end; an enameled wire introduction port (16) with a wide top and a narrow bottom is formed between the upside-down boss (14) and a groove wall on the other side of the groove(15).

5. The bobbin that facilitates automatic winding according to the claim 1, **characterized in that**, the first wire guide portion is a wire guide groove (21), the wire guide groove (21) is open at one end close to the second winding part (5), a bottom surface of the wire guide groove (21) is an inclined surface, and a lower end of the inclined surface is close to the second winding part (5) and is provided with a rounded corner, a higher end of the inclined surface is close to the first winding part (4).

6. The bobbin that facilitates automatic winding according to the claim 5, **characterized in that**, the bottom surface of the wire guide groove (21) is provided with a protruding column (22) extending upward, an end of the wire guide groove (21) close to an outside of the second flange part (2) is open, the protruding column (22) is located at the end of the wire guide groove (21).

7. The bobbin that facilitates automatic winding according to the claim 5, **characterized in that**, one end of the wire guide groove (21) close to the first winding part (4) is provided with a rib (23) extending along a width direction (X) of the bobbin, a top end of the rib (23) is higher than a height of the enameled wire (7) after being wound on the first winding part (4); the rib (23) and a higher end of the bottom surface of the wire guide groove (21) are in a circular arc transition.

8. The bobbin that facilitates automatic winding according to the claim 1, **characterized in that**, the plurality of terminal holes further comprises a third terminal hole (12) for inserting a common terminal (10), the third terminal hole (12) is located between the first terminal hole (11) and the second terminal hole (13).

9. The bobbin that facilitates automatic winding according to the claim 1 or 8, **characterized in that**, the first flange part (1) is provided with a plurality of vent holes (19), the plurality of terminal holes are respectively communicated with at least one vent hole (19).

10. The bobbin that facilitates automatic winding according to the claim 9, **characterized in that**, the plurality of terminal holes are respectively arranged up and down corresponding to corresponding vent holes (19), and an aperture of the vent hole (19) is smaller than an aperture of a terminal hole.

11. The bobbin that facilitates automatic winding according to the claim 1, **characterized in that**, the second flange part (2) is provided with a second wire guide portion for guiding the enameled wire (7) from the first winding part (4) to the second winding part (5), the second wire guide portion is an oblique retaining wall (25); a side of the first flange part (1) facing the first winding part (4) is provided with a first wire passing notch (17) and a second wire passing notch (18), the first wire passing notch (17) and the second wire passing notch (18) are located at opposite sides of the first winding part (4); a side of the second flange part (2) facing the second winding part (5) is provided with a third wire passing notch (24) corresponding to the second wire guide portion; the second flange part (2) is provided with a magnetic steel slot (26), the magnetic steel slot (26) is connected to an core mounting hole (16) penetrating the first flange part (1), the second flange part (2), the third flange part (3), the first winding part (4) and the second winding part (5); two limiting bosses (27) are respectively provided on both sides of the magnetic steel slot (26), and the two limiting bosses (27) are respectively provided with arc-shaped notches (271) that cooperate with a rotating shaft of an armature.

12. A coil, comprising an enameled wire (7) and a plurality of terminals, **characterized in that**, the coil further comprises a bobbin that facilitates automatic winding of any one of claims 1 to 11, each terminal is inserted into a cooperating terminal hole, the enameled wire (7) is started from a terminal inserted into a first terminal hole (11), and is guided to a wire hanging portion through a wire guide groove (21) after being wound, and is connected to a terminal inserted into a second terminal hole (13) after an wire is hung on the wire hanging portion.

13. A latching relay, **characterized in that**, the latching relay comprises a coil of the claim 12.

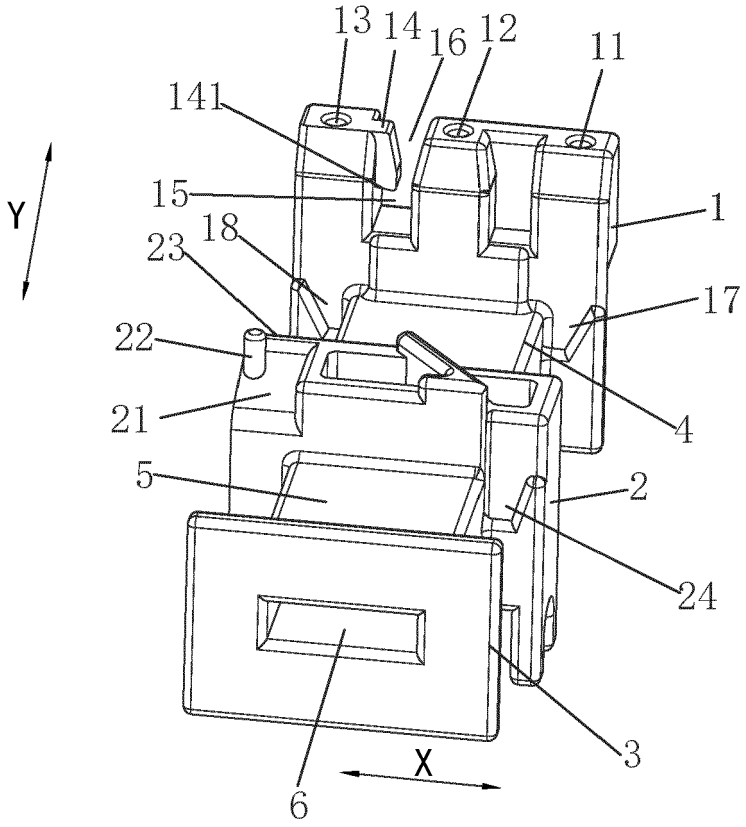
13
14
16
12
11
141
15
1
18
23
17
22
21
4
5
2
24
3
X
6
Y

FIG.1

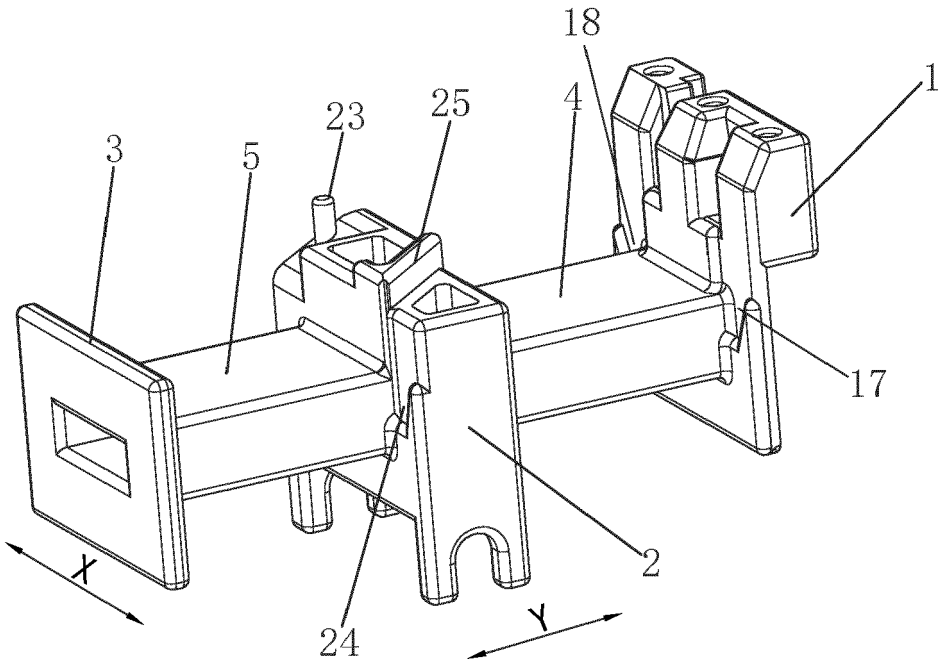
18
1
4
25
23
3
5
17
2
X
24
Y

FIG.2

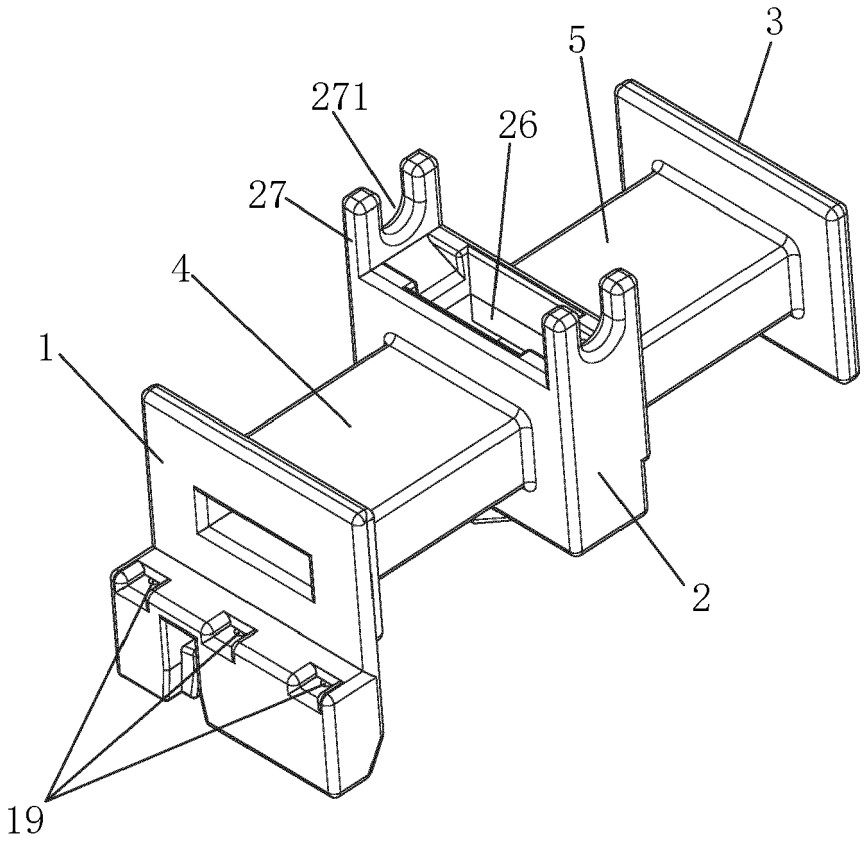

FIG.3

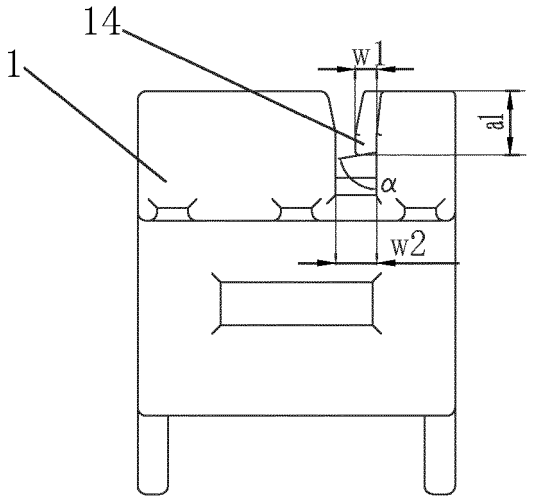

FIG.4

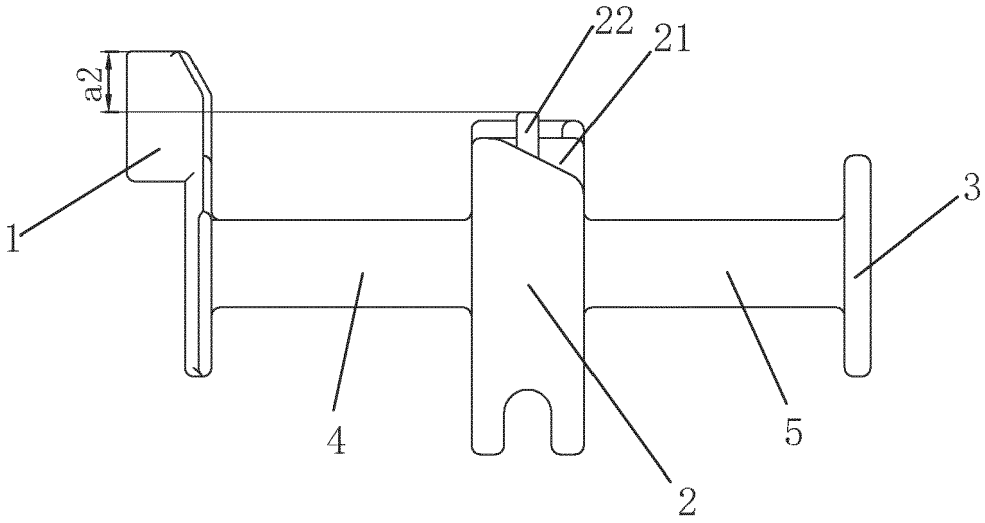

FIG.5

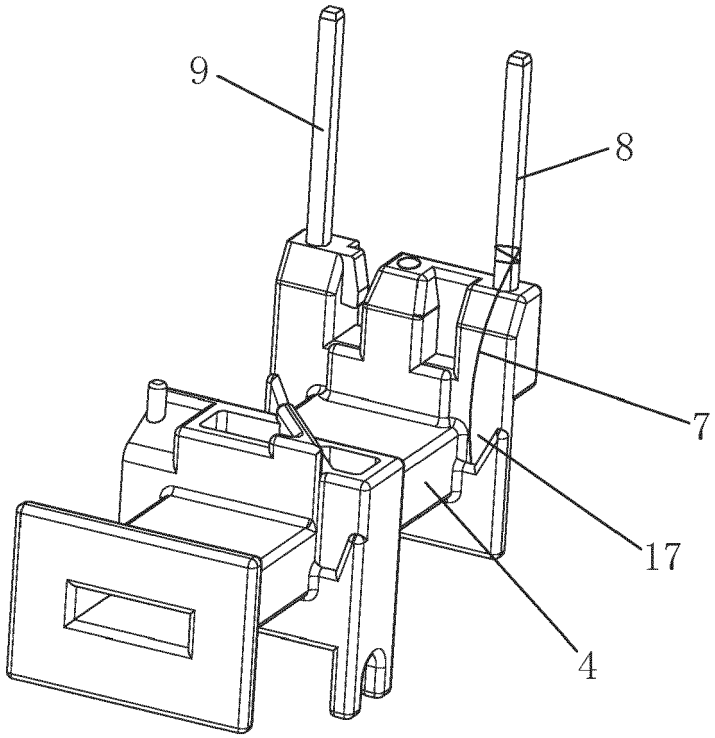

FIG.6

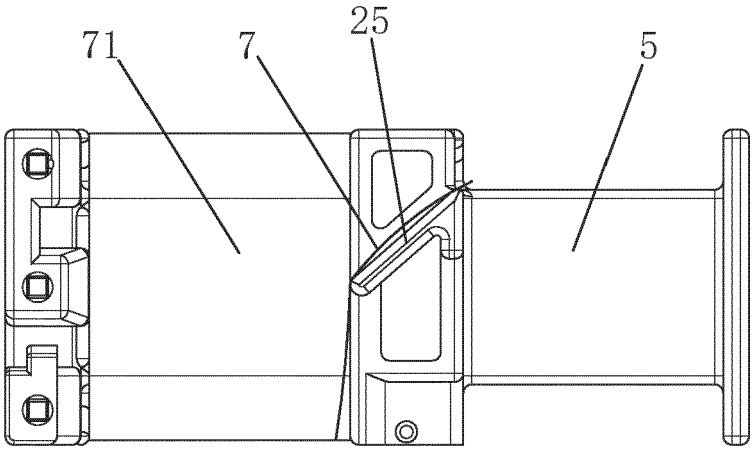

FIG.7

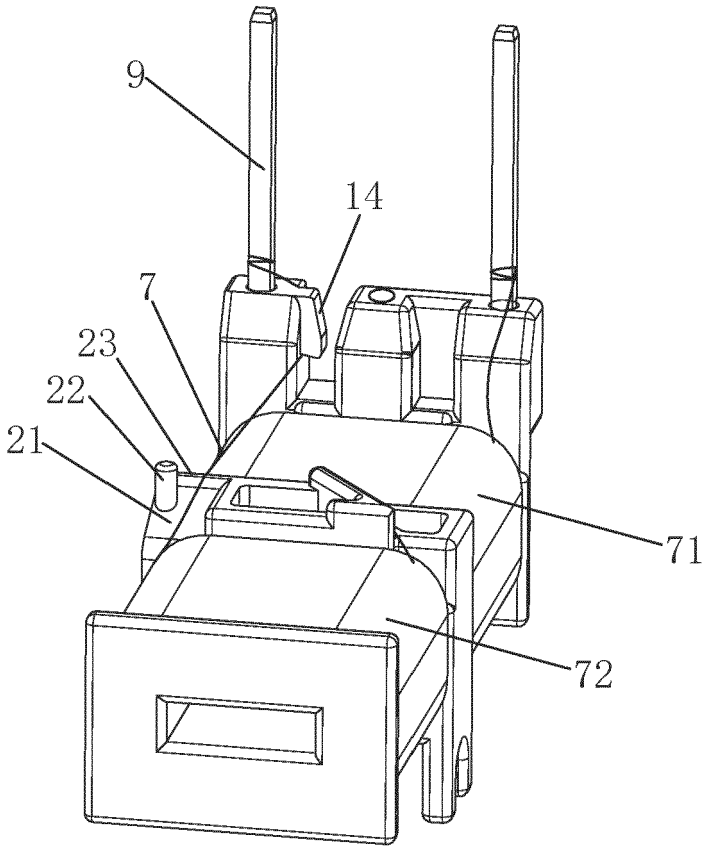

FIG.8

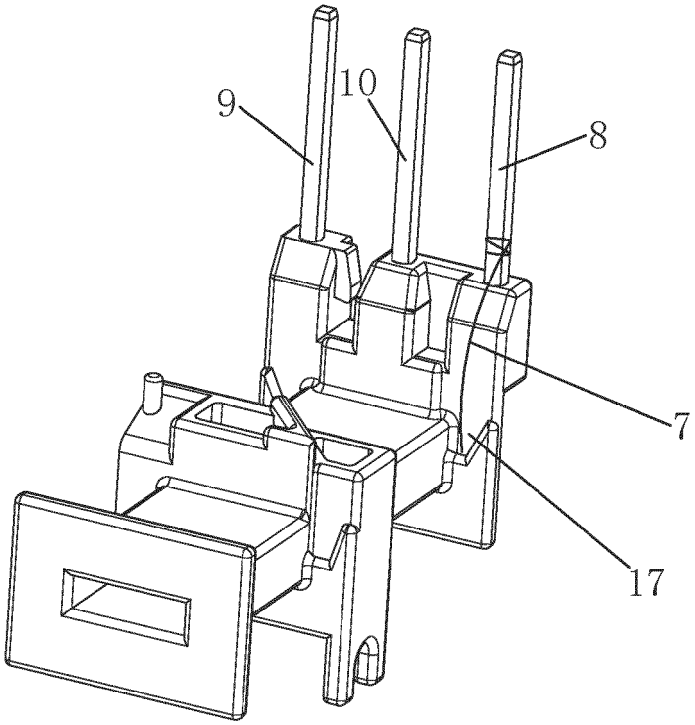

FIG.9

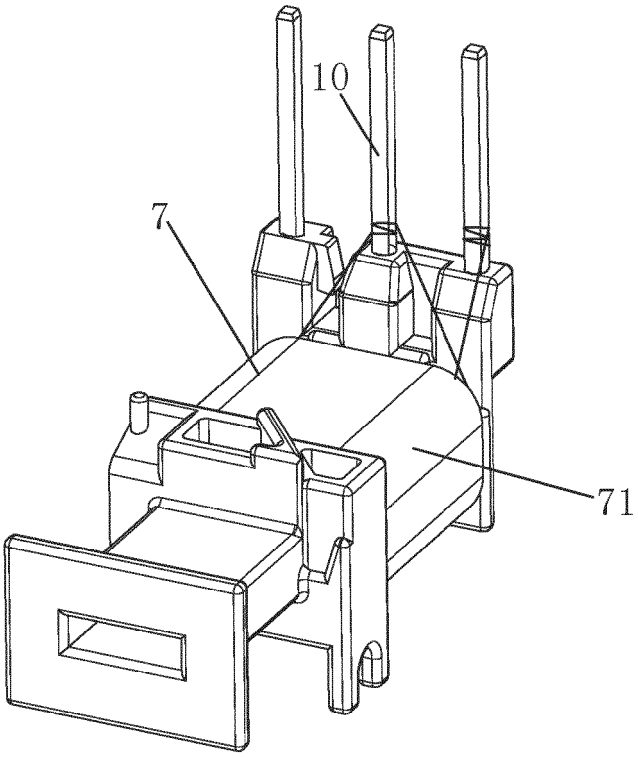

FIG.10

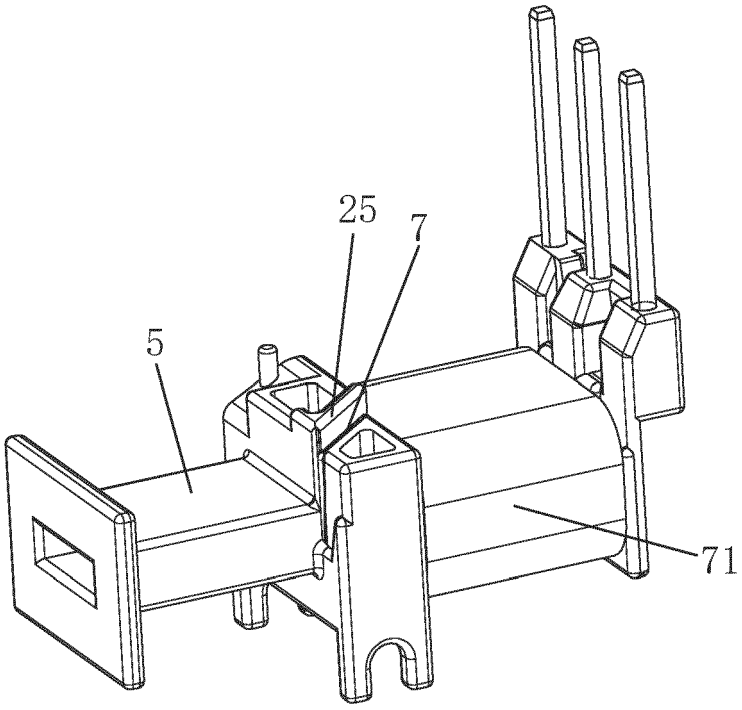

FIG.11

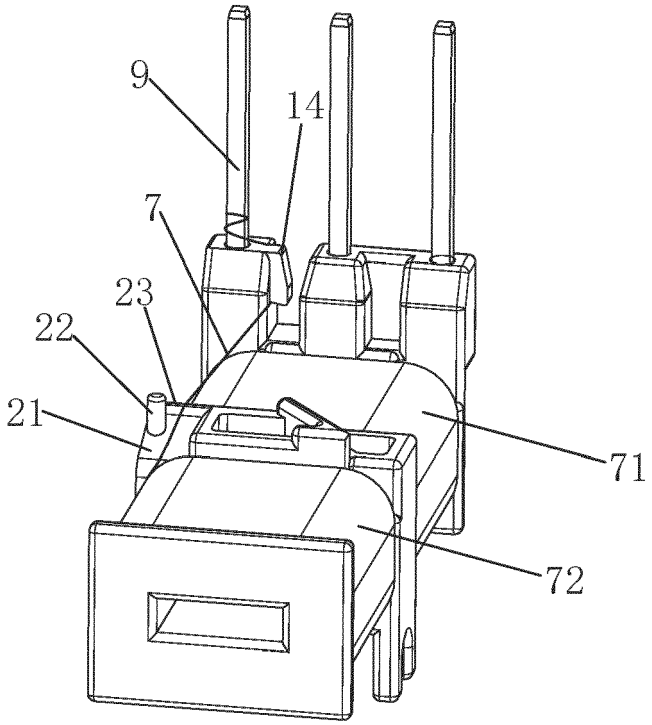

FIG.12

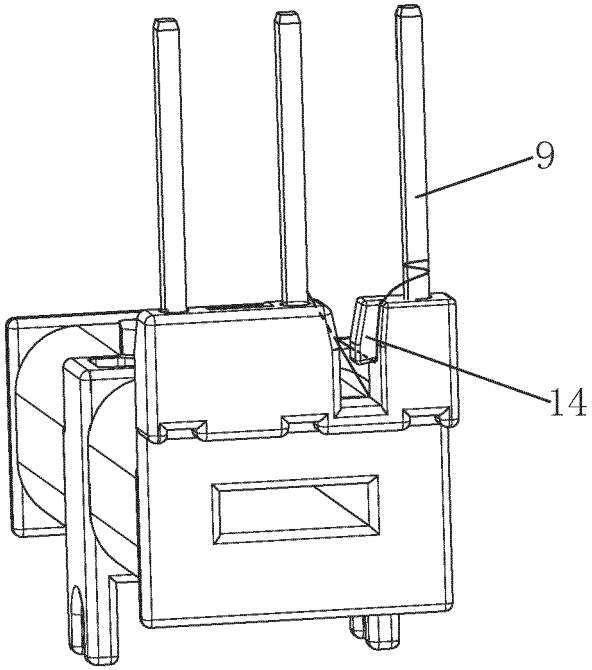

FIG.13

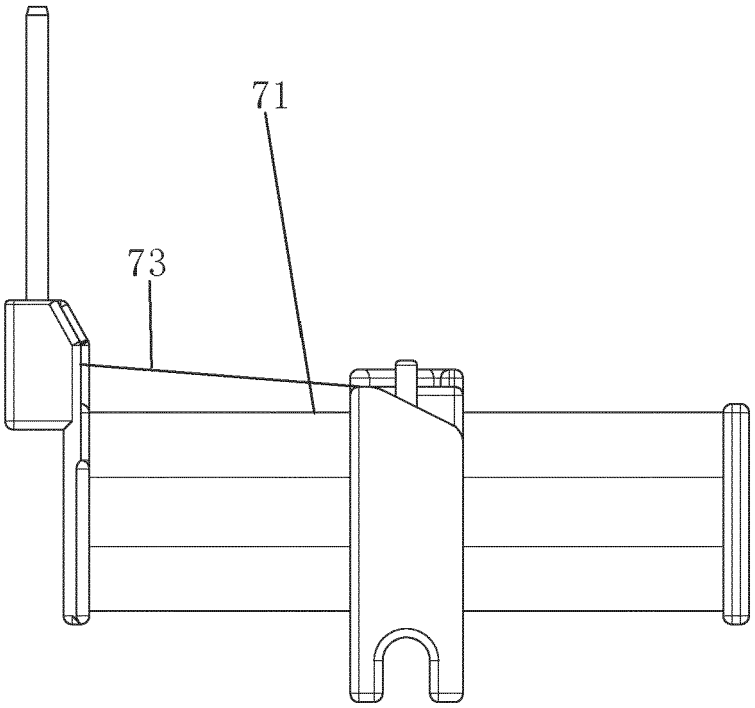

FIG.14

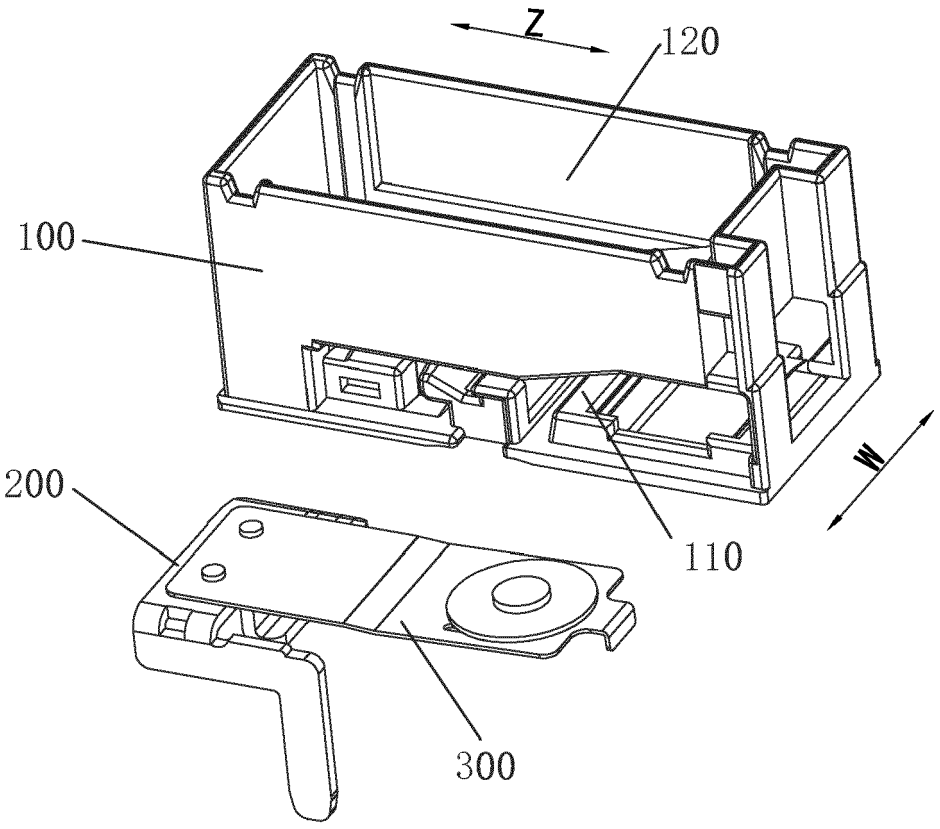

FIG.15

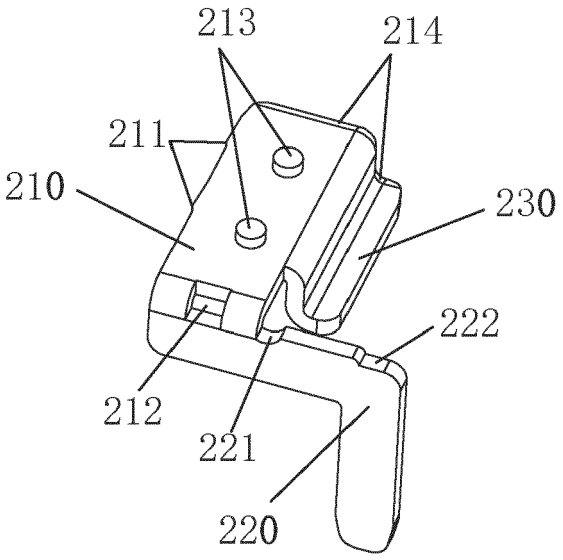

FIG.16

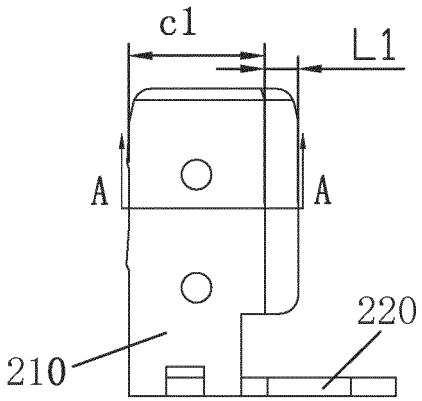

FIG.17

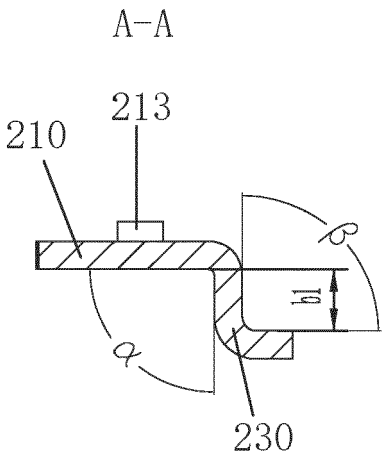

FIG.18

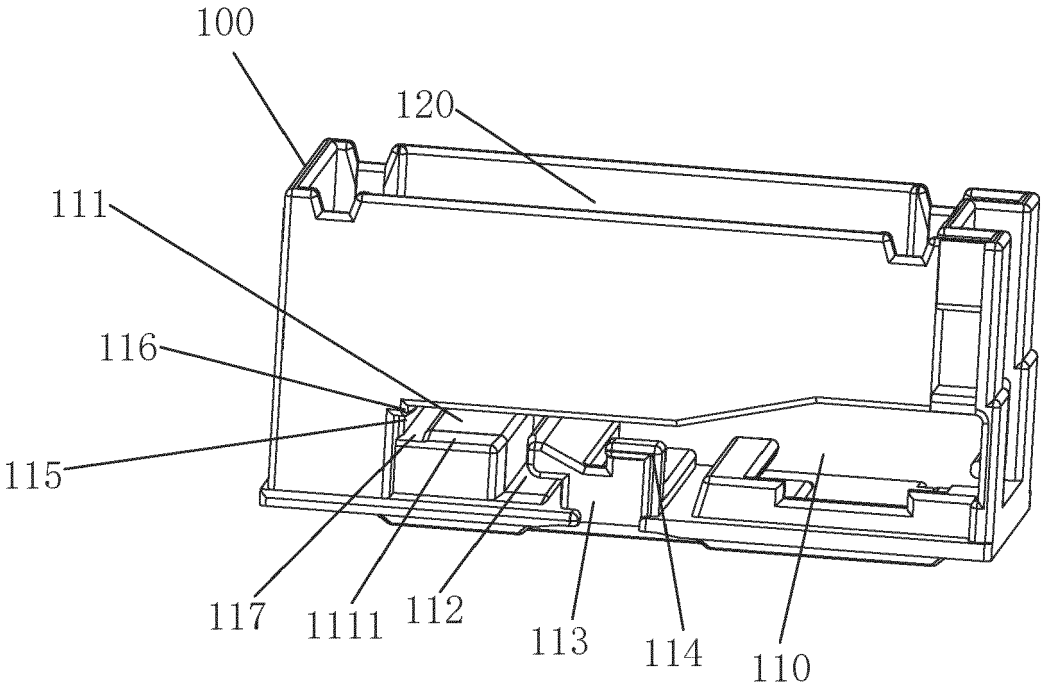

FIG.19

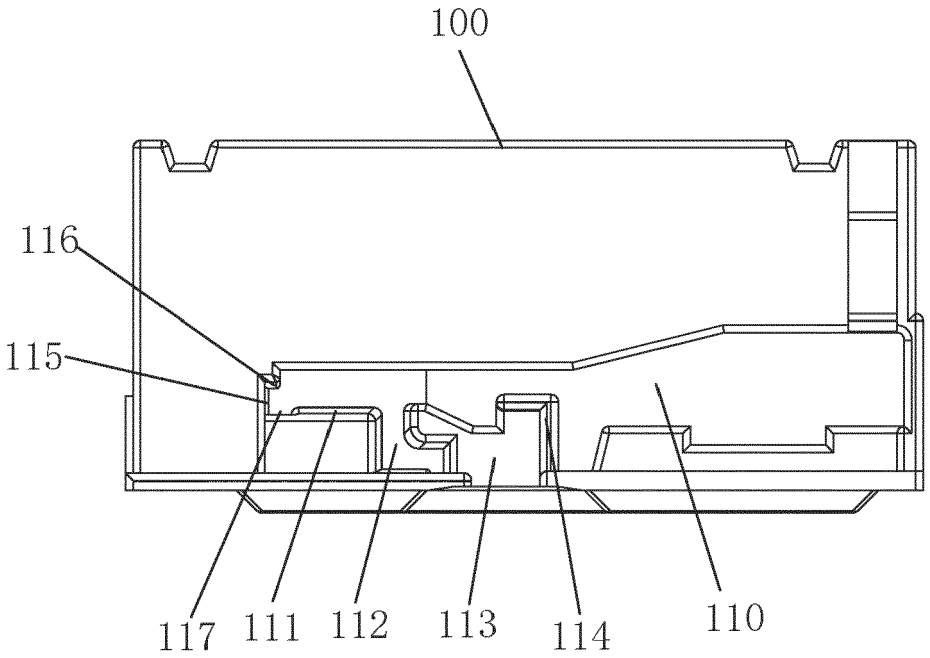

FIG.20

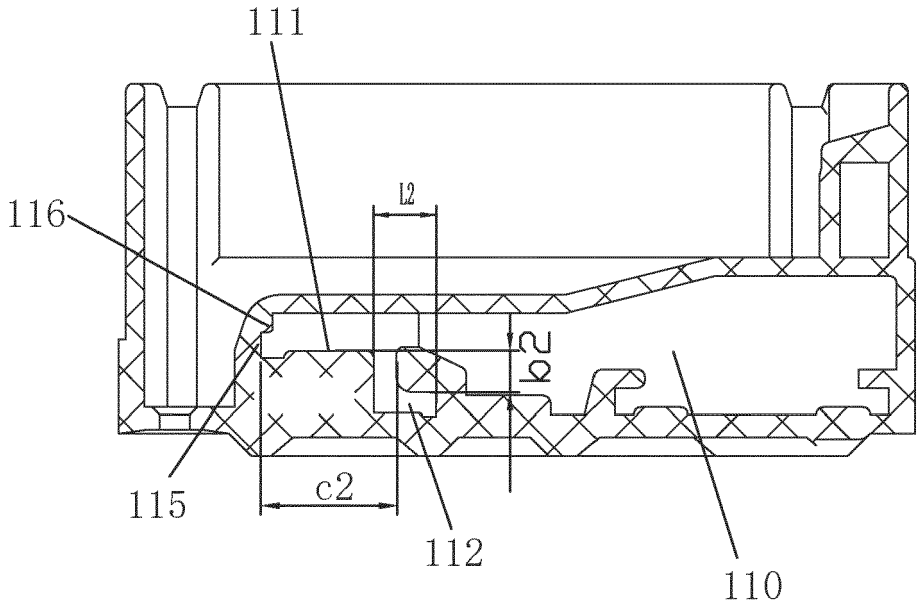

FIG.21

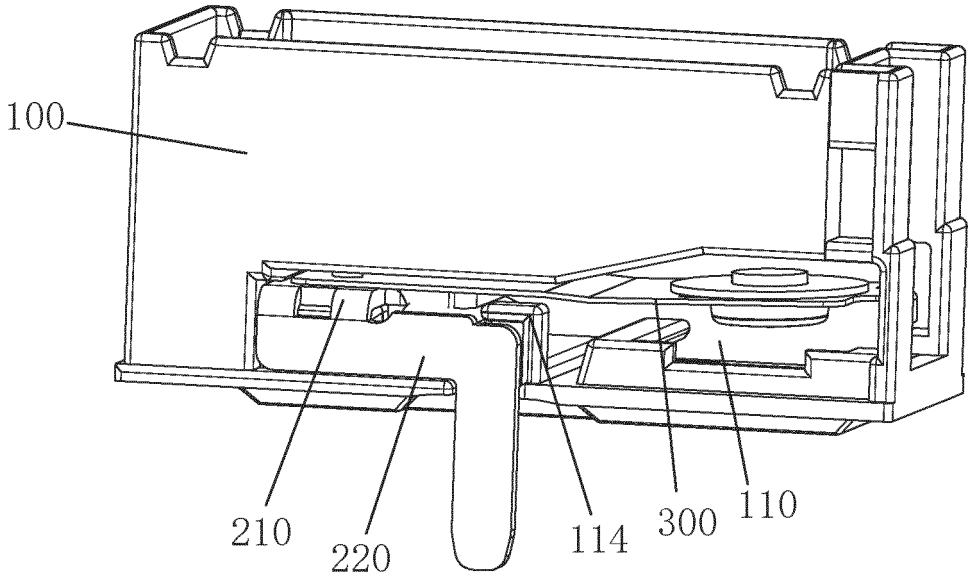

FIG.22

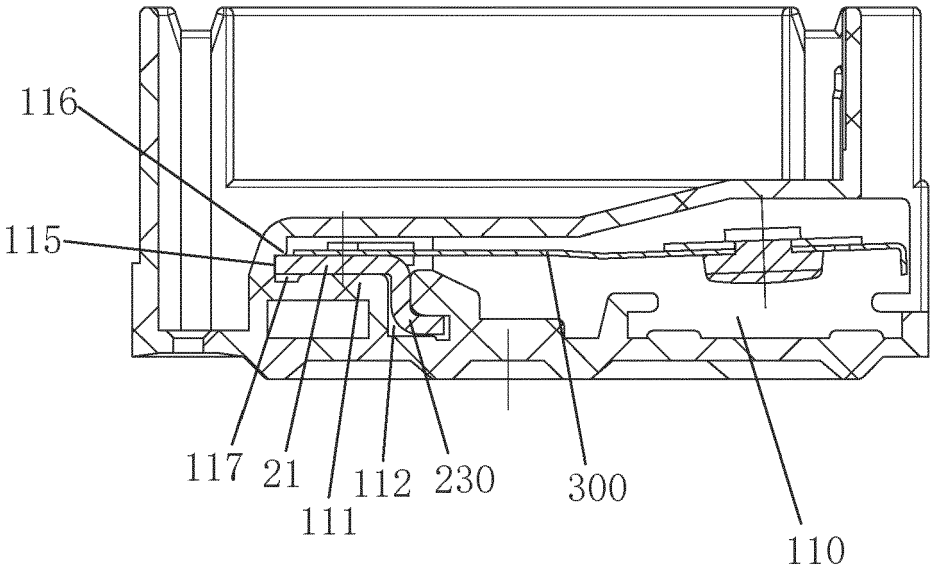

FIG.23