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Auto Hammer

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Abstract

An auto hammer, comprising a housing, a grip portion and a striking device 6 protruding forwardly. The striking device has a striking rod that can strike the nail or other elements by a liner reciprocating motion. The striking device also comprises a clamping mechanism for clamping the nail or other elements. The clamping mechanism comprises a clamping member, a driving part and a sliding member, wherein the clamping member is pivotally arranged in the sliding member and connected to the driving part, and the driving part can rotate relative to the sliding member so as to bring the clamping member to rotate pivotally in the sliding member. The clamping mechanism may firmly clamp the nail or other elements, and is convenient for the users.

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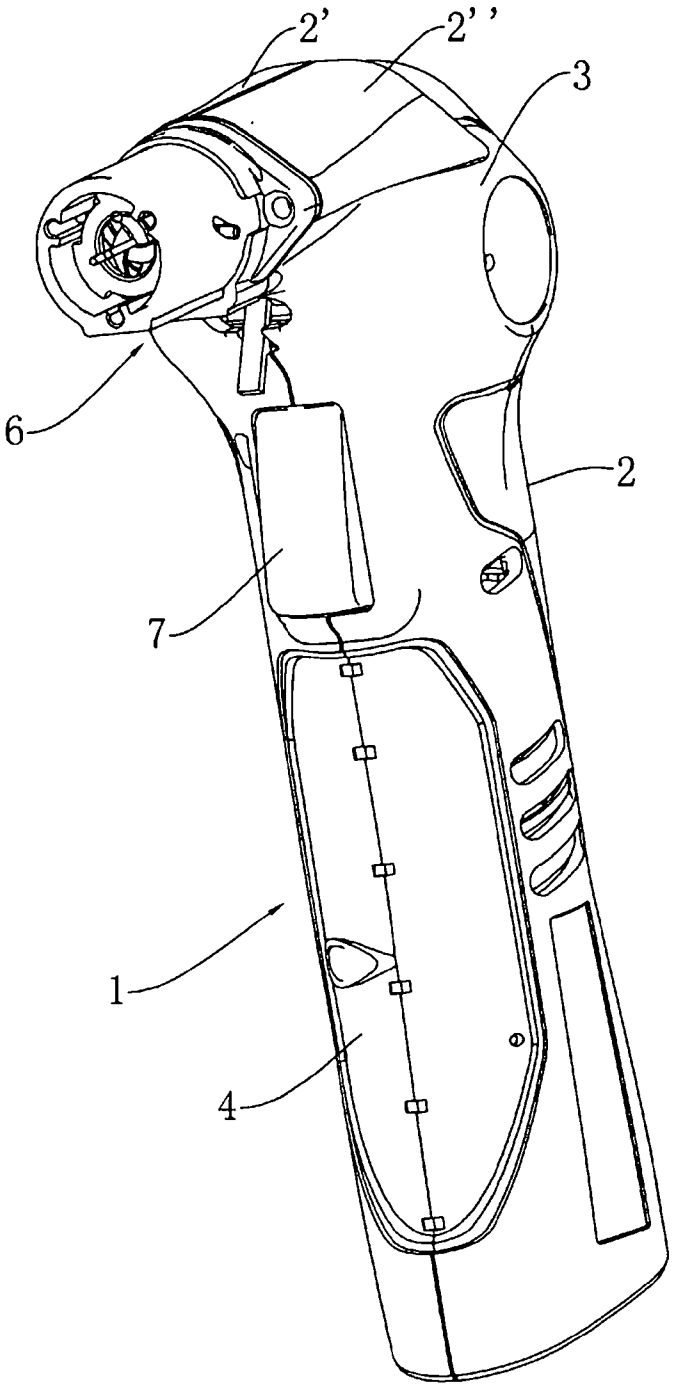

Fig. 1

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AUSTRALIA

ORIGINAL

COMPLETE SPECIFICATION

INNOVATION PATENT

Invention Title: Auto Hammer

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The following statement is a full description of this invention, including the best method of performing it known to me:-

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Auto Hammer

Field of the Invention

This invention relates to an auto hammer and more specifically to an auto hammer with a clamping mechanism.

Background Art

Each document, reference, patent application or patent cited in this text is expressly incorporated herein in their entirety by reference, which means that it should be read and considered by the reader as part of this text. That the document, reference, patent application, or patent cited in this text is not repeated in this text is merely for reasons of conciseness.

The following discussion of the background to the invention is intended to facilitate an understanding of the present invention only. It should be appreciated that the discussion is not an acknowledgement or admission that any of the material referred to was published, known or part of the common general knowledge of the person skilled in the art in any jurisdiction as at the priority date of the invention.

In the fitment and decoration fields, the auto hammer is a commonly used tool. For example, Chinese patent application No. 200820161342.1 discloses an auto hammer, which comprises a housing and a nozzle portion connected to the housing. The nozzle portion is generally formed of a hollow cylindrical sleeve. A hole for receiving a magnet is drilled in the sleeve, and the magnet engages into the hole so as to attract a nail arranged in the striking device for clamping the nail. The disadvantages of this auto hammer are: the magnet is arranged on the edge of the sleeve, thus the nail cannot be located in the centre of the sleeve and not parallel to the centre line of the sleeve (that is to say, the nail is inclined after being attracted), and the magnet cannot clamp other non-magnetic materials, for example, the wooden tenons and the like.

Disclosure of the Invention

An embodiment of this invention seeks to provide an auto hammer aiming at the problems existing in the prior art, wherein the nail or other elements can be firmly clamped in the striking device, so that it is convenient for the users.

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In accordance with a broad aspect of the present invention, there is provided an auto hammer, comprising a striking device with a clamping mechanism, the clamping mechanism comprises at least one clamping member, driving part and a sliding member, wherein at least one clamping member is pivotally arranged in the sliding member and connected to the driving part, and the driving part can rotate relative to the sliding member so as to bring at least one clamping member to rotate pivotally in the sliding member.

To this end, an auto hammer in accordance with an embodiment of the invention, with simple manipulation, good visibility and compact structure is provided, which comprises a striking device with a clamping mechanism. The clamping mechanism comprises at least one clamping member, driving part and a sliding member, wherein at least one clamping member is pivotally arranged in the sliding member and connected to the driving part, and the driving part can rotate relative to the sliding member so as to bring the clamping member to rotate pivotally in the sliding member. The clamping member can grip the handle of the nail in a larger area, so that a good effect for gripping may be obtained.

Further, the sliding member or element may be provided with inclined slot, a pin may pass through the inclined slot and the driving part, and move along the inclined slot.

Further, the clamping member can be any one or any combinations in the group of chuck jaw, spring, magnet, bolt and chuck for retaining an element.

Further, the striking device may also have a striking rod, a releasing area may be formed when the clamping member is located at the opened position, and the striking rod may pass through the releasing area.

Further, the clamping mechanism may comprise a bush and a bracket, and the bush may engage with the bracket.

Further, the clamping mechanism may comprise a first biasing device for biasing the sliding member towards the workpiece.

Further, the clamping mechanism may comprise a second biasing device for biasing the bush towards the workpiece.

Further, the clamping mechanism may comprise three clamping members, and each two clamping members can be interlocked with each other.

Further, the clamping mechanism may comprise a locking mechanism which may include a projection and a spanner. The clamping member(s) may be located at the opened position when the projection is locked or interlocked with the spanner. The striking rod may be emerged out of the sliding member when the projection is locked or interlocked with the spanner at another position.

Further, the sliding member may be made of transparent material.

Further, the striking rod may apply a striking force to the element to move it, and a transmitting mechanism may be used to convert the rotation motion of a motor into the liner reciprocating motion of the striking rod.

Further, the striking rod may strike the element many times so that the element can be gradually inserted into the workpiece.

Further, the transmitting mechanism may comprise an impact wheel with at least one projection, and the projection may apply a periodically impact motion to the striking rod.

Brief Description of the Drawings

In order that the invention may be more fully described and put into practice, preferred embodiments thereof will now be described with reference to the following accompanying drawings, wherein:

Fig. 1 is a perspective view illustrating an auto hammer according to one embodiment of the present invention;

Fig. 2 is a sectional view of the auto hammer in Fig. 1 taken along the combination surface of the two half housings;

Fig. 3 is a sectional view of the auto hammer in Fig. 1 taken along a surface which is vertical to the combination surface of the two half housings;

Fig. 4 is a partial exploded view of a transmitting device of the auto hammer in Fig. 1;

Fig. 5 is a sectional view of the auto hammer in Fig.2 taken along the axial line A-A;

Fig. 6 is a perspective view of a clamping mechanism of the auto hammer in Fig. 1, wherein the clamping members are located at the closed position;

Fig. 7 is a sectional view of the clamping mechanism in Fig. 6 taken along the combination surface of the two half housings;

Fig. 8 is a perspective view of the clamping mechanism of the auto hammer in Fig. 1, wherein the clamping members are located at the opened position;

FIG. 9 is a sectional view of the clamping mechanism in Fig. 8 taken along the combination surface of the two half housings;

Fig. 10 is a left view of the clamping mechanism in Fig.6;

Fig. 11 is a left view of the clamping mechanism in Fig.8;

Fig. 12 is a view illustrating the auto hammer in Fig.1 is positioned on the workpiece;

Fig. 13 is a view illustrating the bracket of the clamping mechanism of the auto hammer in Fig.1 engages with the workpiece;

Fig. 14 is a view illustrating the element is completely inserted into the workpiece; and

Fig. 15 is a view illustrating the striking rod is emerged out of the sliding member.

Best Mode(s) for Carrying out the Invention

As shown in Figs. 1-4, the auto hammer 1 of the present embodiment comprises a housing 2 which accommodates a motor M therein and a striking device 6. The housing 2 is composed of two half housings, i.e., the left and right half housings 2' and 2". The main body of the housing 2 forms a substantially vertical grip portion 4, and the housing 2 comprises a head assembly 3 on its upper end. The head assembly comprises a transmission mechanism and the striking device 6 formed by protruding forward.

In this embodiment, the auto hammer 1 has a battery pack (not shown) for supplying the motor M. However, the auto hammer need not be restricted to the use of a DC power supply and may be equally powered by a source of AC power. A switch 7 is arranged on the housing 2 for controlling the motor (not shown). The striking device 6 comprises a striking rod 61 which is substantially horizontal and arranged in the striking device 6 by a spring and can move in linear reciprocating manner therein. During operation, the end surface of the striking end 611 of the striking rod 61 may act on the elements, for example, the fasteners such as nails, wooden tenons or objects such as bricks. The striking device 6 also has a receiving cavity 63 that is designed as a retractable configuration and may contact the surface of the workpiece to be processed. Furthermore, the receiving cavity 63 has a larger inner diameter than a general fastener so that fasteners with different sizes may be positioned into the receiving cavity.

As shown in Figs. 3-4, a rotary-linear movement transmission mechanism is arranged in the housing 2 for converting the rotation movement of the motor M into the impact movement of the striking rod 61. The motor M is vertically arranged in the housing 2. The upward motor shaft X' thereof transmitting the rotation power to a rotating shaft 35 by means of a multistage gear transmission including bevel gears, the rotating shaft 35 is supported on the upper portion of the housing by bearings on two ends. The rotating shaft 35 is provided with a pair of inclined slots 36, and each of them is formed as a "V" shape with opening backwards. An impact wheel 31 surrounds the rotating shaft 35 and is generally a hollow cylinder, with a pair of circular-arc guiding slots 37 arranged in the inner cylindrical surface thereof and opposite to the two inclined slots 36 respectively. The bottoms of the inclined slots 36 and the guiding slots 37 are semi-circular-arc. A pair of steel balls 38 are respectively positioned in the chambers formed between the inclined slots 36 and the guiding slots 37, and may move relatively along the inclined slots 36 and the guiding slots 37. Thus, when the rotation shaft 35 rotates, the impact wheel 31 may be driven to rotate by the steel balls 38 in the inclined slots 36. A pair of projections 32, which is disposed oppositely along the diameter direction of the impact wheel 31, is provided on the outer circumference of the impact wheel 31. After turning on the switch 7, the motor M is powered to drive the rotating shaft 35 to rotate by the multistage gear transmission, and then the impact wheel 31 is driven to rotate together therewith by the steel balls 38.

As shown in Fig.4, an energy storing spring 40 is arranged between the impact wheel 31 and the rotating shaft 35 in such a manner that one end of the energy storing spring 40 bears against the shoulder 351 of the rotating shaft 35 and the other end bears against the impact wheel 31. With the axial force of the energy storing spring 40, the impact wheel 31 is located in a first axial position relative to the rotating shaft 35. In the first axial position, the impact wheel 31 moves in a circle under the action of the rotating shaft 35 and steel balls 38. When the impact wheel 31 rotates to a position where the projection 32 may contact the striking rod 61, the striking rod 61 encounters a large resistance force that cannot be overcome for the moment, thus the striking rod 61 stops the impact wheel 31 rotating temporarily, and then the impact wheel 31 gradually compresses the energy storing spring 40 and moves from the first axial position to a second axial position. In the second axial position, the projection 32 of the impact wheel 31 departs from the striking rod 61, and the stopping is released. The energy storing spring 40 starts to release its elastic potential energy. Under a function of rebound axial force of the energy storing

spring 40, the impact wheel 31 is pressed back to the first position, and is moved at a higher speed than that of the rotating shaft 35 with the cooperation of the inclined slots 36, the guiding slots 37 and the steel balls 38. As a result, the projection 32 of the impact wheel 31 impacts the stricken end 612 of the striking rod 61, and the striking rod 61 moves at a high speed in a linear movement, thereby one impact is achieved. After the first impact is finished, the second impact cycle starts when the impact wheel 31 is driven to rotate to be stopped by the striking rod 61 again, and the following impact process will be completed in the same manner.

As shown in Figs 2, 5 and 6, a clamping mechanism 5 is provided in the striking device 6 for clamping the nail or other elements. The clamping mechanism 5 is in the form of clamping members 52a, 52b and 52c. One end of each clamping member is pivotally arranged on the sliding member 8 and these clamping members are interlocked with each other, so that three clamping members can be opened or closed simultaneously. Each clamping member has two projections 521 and 522, wherein the projection 521 is arranged in the bracket 9 and the projection 522 is arranged in the main body 51. When the main body 51 rotates relative to the sliding member 8, each clamping member rotates together with the main body. The clamping members 52a, 52b and 52c have a first position, as shown in Figs. 6 and 7, three clamping members are closed from each other to form a clamping area, thereby the nail or other elements can be engaged with the clamping members and retained in this area. The clamping members 52a, 52b and 52c have a second position, as shown in Figs. 8 and 9, three clamping members are entirely opened from each other to form a releasing area, the nail or other elements can be disengaged from the clamping members, and the striking rod may pass through this releasing area to continuously strike the nail till the nail is completely nailed into the workpiece. When the clamping members are located at the second position (i.e. completely opened position), the nail or other elements can be placed in the receiving cavity 63, and then the clamping members may be closed, thus the nail or other elements may be retained in the clamping area. The clamping member is adjustable, so the nail or other elements with different sizes could be retained independently by the clamping members.

The person skilled in the art may obviously conceive that said clamping members may be any one or any combinations in the group of chuck jaw, spring, magnet, bolt and chuck for retaining elements.

As shown in Figs. 2, 6 and 7, when assembling, a bush 10 may be movably nested on the striking rod 61. The main body 51 as a driving part is movably arranged on the stationary bush 11. The projections 522 of three clamping members are respectively arranged on the main body 51. Then, the bracket 9 is installed on the projections 522 of three clamping members. Three grooves 8a are provided in the sliding member 8, and the angle between each two grooves is 120°in the circumference direction of the sliding member. One end of each clamping member is respectively arranged in each of three grooves 8a, so that the sliding member can slide relative to the clamping members in the grooves. The sliding member 8 is further provided with an inclined slot 12 and another inclined slot (not shown) in the position that rotates by 180°in the circumference direction of the sliding member. A pin (not shown) passes through the inclined slot 12 and is installed on the main body 51. The pin may slide relative to the inclined slot 12, and with the sliding of the sliding member 8, the pin slides relative to the inclined slot 12, thereby the main body 51 may be driven to rotate by the pin relative to the sliding member 8, and the rotation of the main body 51 can drive the clamping members installed thereon to rotate. As a result, three clamping members can be gradually opened till they rotate to the completely opened position. A projection 8b is provided in the lower end of the sliding member 8. After the nail is completely nailed into the workpiece, the sliding member 8 is locked, and the clamping members are located at the completely opened position at the moment.

A first biasing device is in the form of a spring 13 for biasing the sliding member 8 towards the workpiece, so that the clamping members are located at the closed position. One end of the spring 13 is installed on the sliding member 8, and the other end is installed on the gearbox. When the sliding member 8 contacts the workpiece, the user has to overcome the pressure of the first biasing device to open the clamping members. A second biasing device is in the form of a spring 14 for biasing the bush 10 towards the workpiece. One end of the spring 14 is installed on the end of the bush10, and the other end is installed on the stationary bush 11. When the bush 10 contacts the workpiece, the user has to overcome the pressure of the second biasing device to move. At this moment, the clamping members are completely opened, and the bush 10 may pass through the releasing area for preventing the nail from being blocked in the gap between the clamping members.

As shown in Figs. 12 to 15, during the operation, if the clamping members are located at the closed position, the user has to overcome the pressure of the first biasing device 13 to push the sliding member 8 to move rightwards. The user may push the sliding member 8 directly, or push a spanner (not shown) provided on the housing 2 and engaging with the sliding member, so as to overcome the spring force to open the clamping members, and the nail may be positioned in the receiving cavity 63. The clamping mechanism 5 also has a locking mechanism, the projection 8b is provided in the lower end of the sliding member. When the projection 8b is locked with the spanner, the clamping members are located at the opened position, then the spanner 15 is released and the nail can be retained independently by the clamping members, subsequently, the auto hammer is positioned in this way that the nail is adjacent to the workpiece, as shown in Fig. 12. Then the switch 7 is pressed to power the motor M and make the striking rod 61 to move in reciprocating manner. When the user pushes the auto hammer to the workpiece, the head of the nail is struck by the striking rod continuously so that the nail may be inserted into the workpiece gradually. During the gradually insertion of the nail, the user has to overcome the pressure of the spring 13 to open the clamping members when the sliding member 8 engages with the workpiece. This allows the nail to be partially inserted into the workpiece before being released. As shown in Fig. 13, when the end surface of the bracket 9 contacts the workpiece, the clamping members are located at the completely opened position, the sliding member 8 moves together with the main body 51 rightwards, and the projection 8b of the sliding member 8 pushes out the spanner 15 such that the sliding member 8 continues to move rightward. When the bush 10 contacts the bracket 9, the user has to overcome the pressure of the spring 14 to ensure that the bush 10 is always near the head of the nail so as to prevent the head of the nail being blocked in the gap formed between the clamping members located at the completely opened position. Then, the nail is struck continuously till the nail is completely inserted into the workpiece.

After the nail is completely inserted into the workpiece, the sliding member 8 is locked in the position where the clamping members are completely opened. Subsequently, another nail can be placed in the receiving cavity 63, and the spanner 15 is pressed such that the clamping members clamp the nail in the receiving cavity 63, the above steps may be repeated for secondly striking the nail. In the locking mechanism of the clamping mechanism 5, the projection 8b in the lower end of the sliding member 8 may lock the sliding member 8 in another position, where the striking rod 61 is emerged out of the sliding member 8 such that the visibility of the striking rod 61 is enhanced. At that

moment, the striking end 611 of the striking rod 61 may be used as the knocking part of the auto hammer for knocking the workpiece to be processed during the operation with the liner reciprocating movement of the striking rod 61, for example, knocking the tenon or the brick and the like, thus the functions of the device may be extended without limiting the function for driving the fasteners into the workpiece. In accordance with the present embodiment, the person skilled in the art could conceive that the sliding member 8 may be formed of transparent materials, such as transparent plastic, which may also enhance the visibility of the striking rod 61. When the user observes the specific position of the striking rod 61, he may use it as an auto hammer to knock the workpiece to be processed.

In conclusion, the auto hammer disclosed in the present invention is not restricted to the contents in the embodiments and the constructions shown in the drawings. Any obvious changes, substitutes and modifications in the configurations and positions of the components according to the spirit of the present invention will be regarded as falling within the range of the present invention.

Modifications and variations such as would be apparent to a skilled addressee are deemed to be within the scope of the present invention.

Throughout the specification, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

Furthermore, throughout the specification, unless the context requires otherwise, the word "include" or variations such as "includes" or "including", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

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The Claims Defining The Invention Are As Follows:

1. An auto hammer, comprising a striking device with a clamping mechanism, the clamping mechanism comprises at least one clamping member, driving part and a sliding member, wherein at least one clamping member is pivotally arranged in the sliding member and connected to the driving part, and the driving part can rotate relative to the sliding member so as to bring at least one clamping member to rotate pivotally in the sliding member.

2. The auto hammer of Claim 1, wherein the sliding element is provided with inclined slot, a pin passes through the inclined slot and the driving part, and moves along the inclined slot.

3. The auto hammer of Claim 1 or 2, wherein the clamping member is any one or any combinations in the group of chuck jaw, spring, magnet, bolt and chuck for retaining an element.

4. The auto hammer of any one of Claims 1 to 3, wherein the striking device also has a striking rod, a releasing area is formed when the clamping member is located at the opened position, and the striking rod may pass through the releasing area.

5. The auto hammer of any one of the preceding Claims, wherein the clamping mechanism comprises a bush and a bracket, and the bush may engage with the bracket.

6. The auto hammer of any one of the preceding Claims, wherein the clamping mechanism comprises a first biasing device for biasing the sliding member towards the workpiece.

7. The auto hammer of Claim 5, wherein the clamping mechanism comprises a second biasing device for biasing the bush towards the workpiece.

8. The auto hammer of any one of the preceding Claims, wherein the clamping mechanism comprises three clamping members, and each two clamping members are interlocked with each other.

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9. The auto hammer of any one of the preceding Claims, wherein the clamping mechanism comprises a locking mechanism.

10. The auto hammer of Claim 9, wherein the locking mechanism comprises a projection and a spanner.

11. The auto hammer of Claim 10, wherein the clamping member is located at the opened position when the projection and the spanner are interlocked.

12. The auto hammer of Claim 4 or 10, wherein the striking rod is emerged out of the sliding member when the projection and the spanner are interlocked.

13. The auto hammer of any one of the preceding Claims, wherein the sliding member is made of transparent material.

14. The auto hammer of Claim 4, wherein the striking rod applies a striking force to the element to move it, and a transmitting mechanism is used to convert the rotation motion of a motor into the liner reciprocating motion of the striking rod.

15. The auto hammer of Claim 14, wherein the striking rod strikes the element many times so that the element is gradually inserted into the workpiece.

16. The auto hammer of Claim 14 or 15, wherein the transmitting mechanism comprises an impact wheel with at least one projection, and the projection applies a periodically impact motion to the striking rod.

17. An auto hammer substantially as hereinbefore described with reference to the accompanying drawings.

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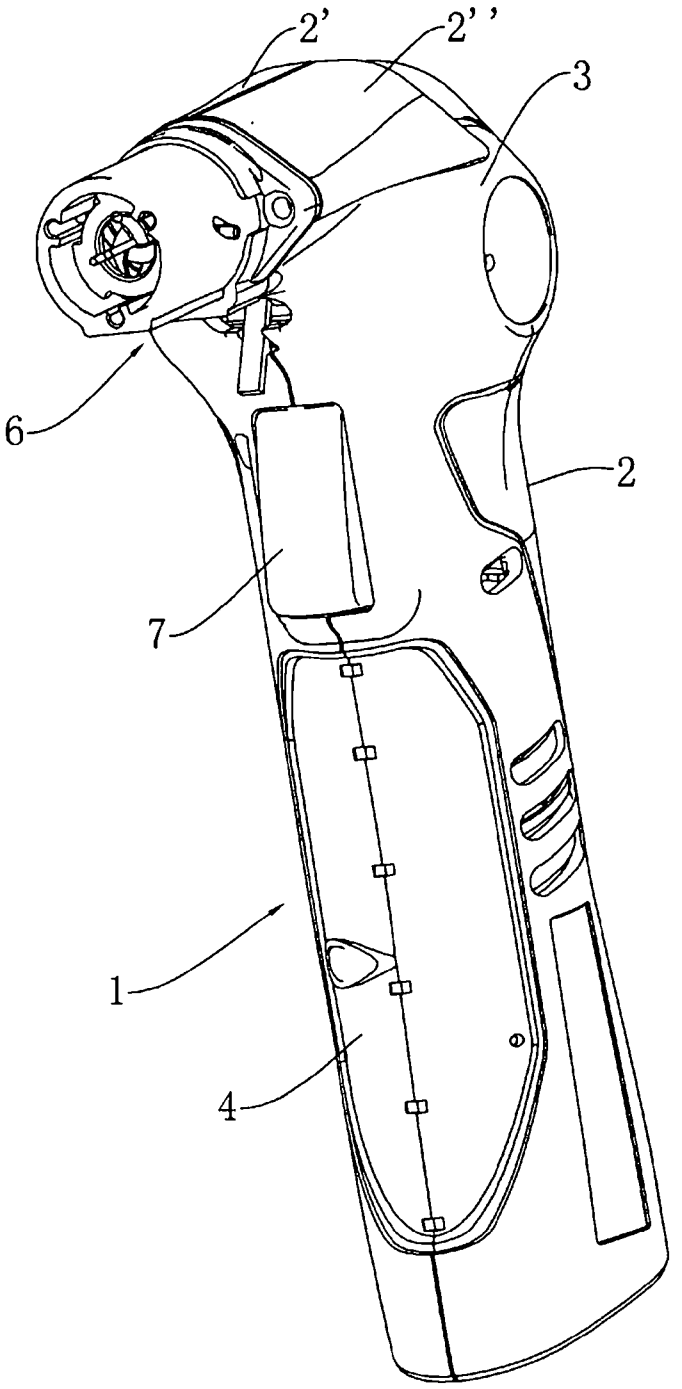

Fig. 1

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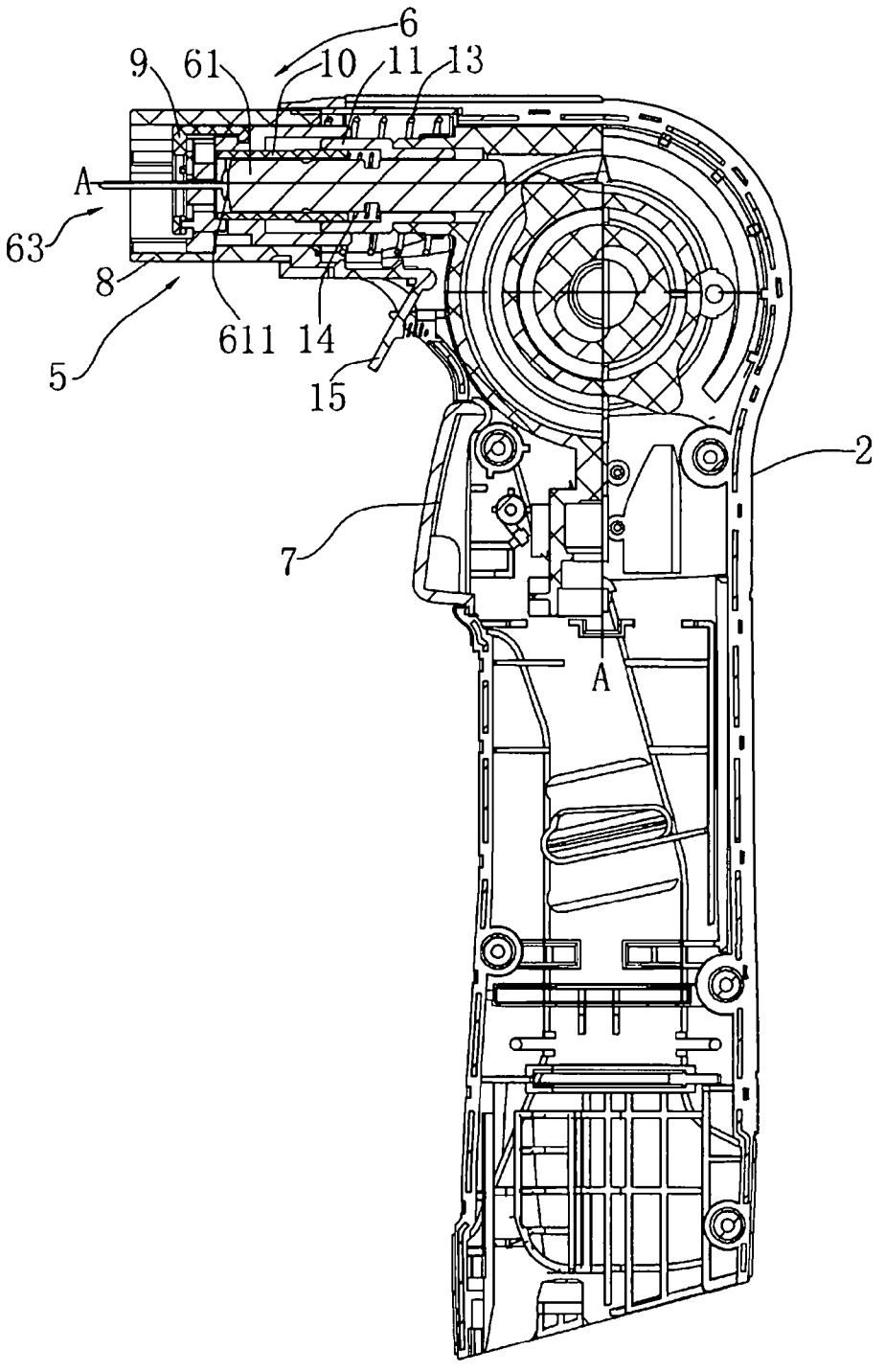

Fig. 2

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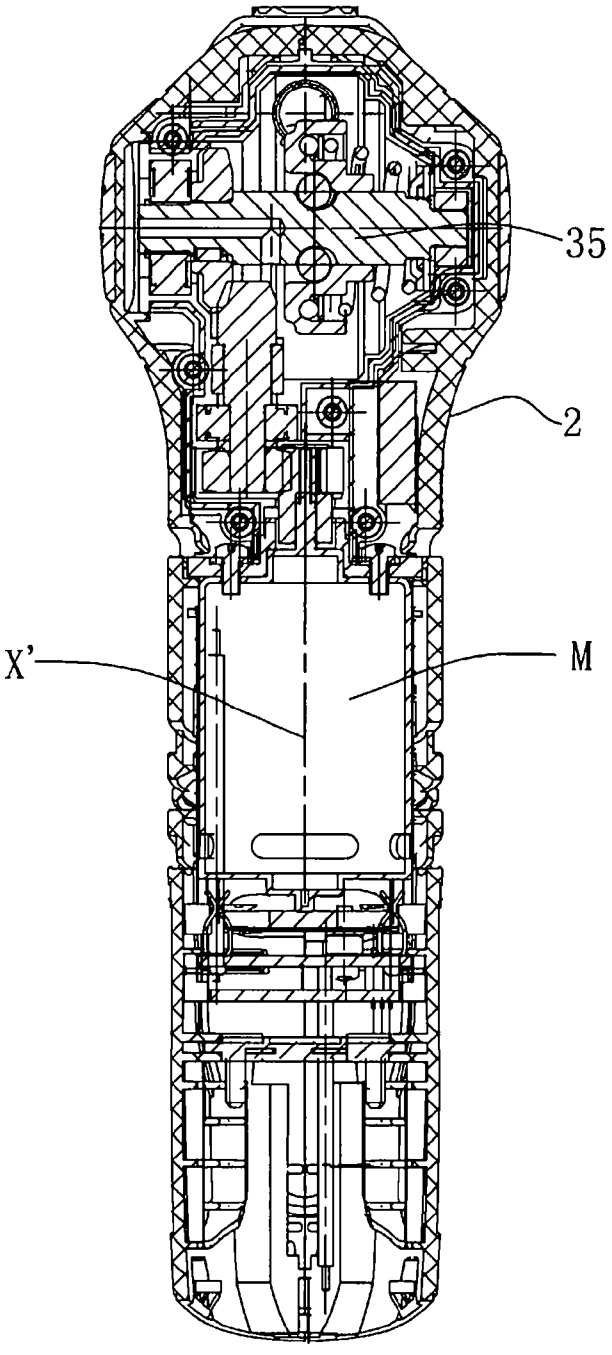

Fig. 3

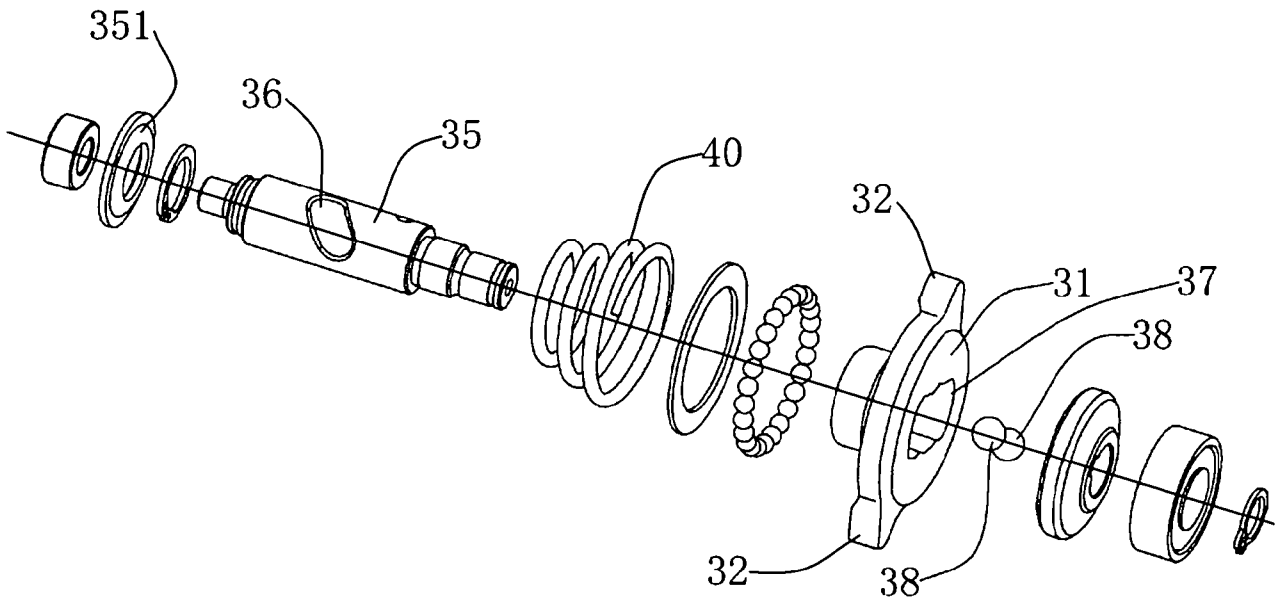

Fig. 4

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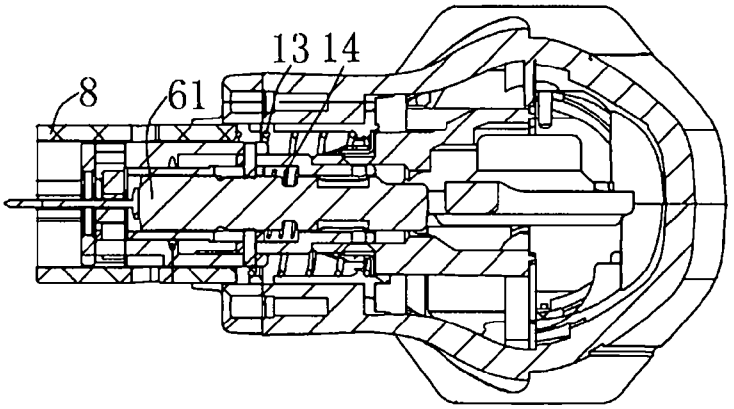

Fig. 5

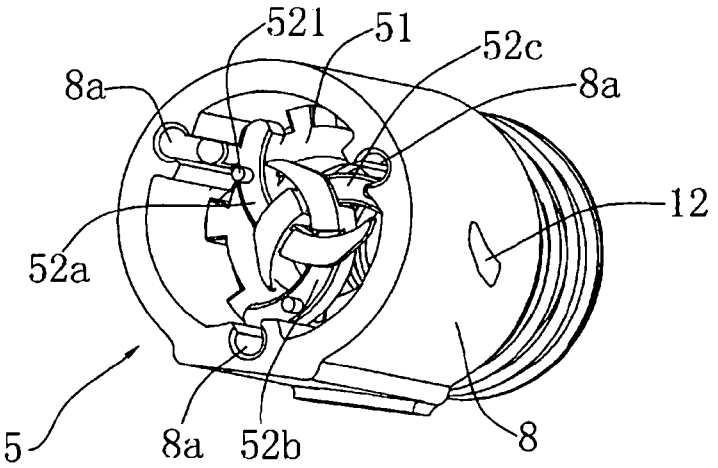

Fig. 6

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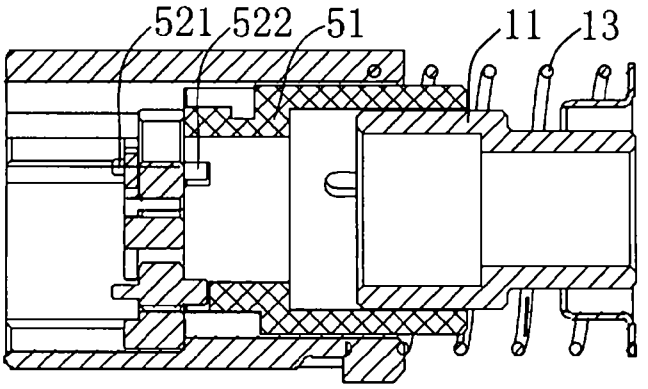

Fig. 7

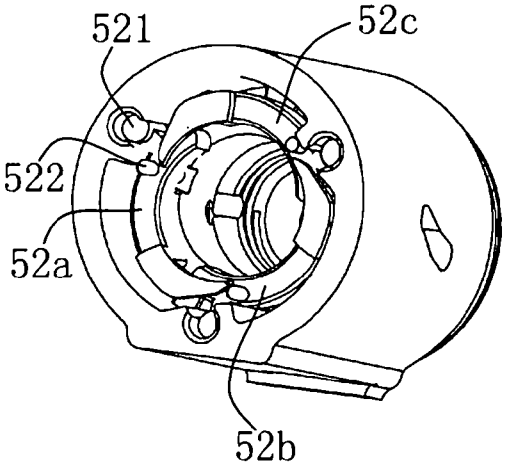

Fig. 8

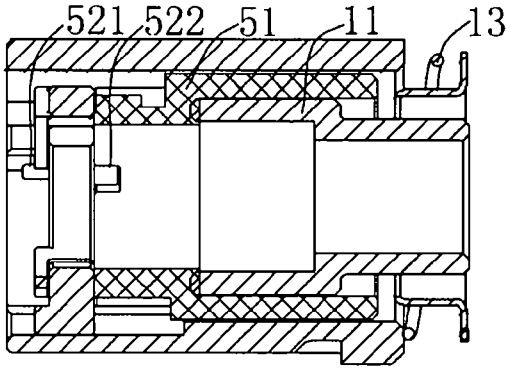

Fig. 9

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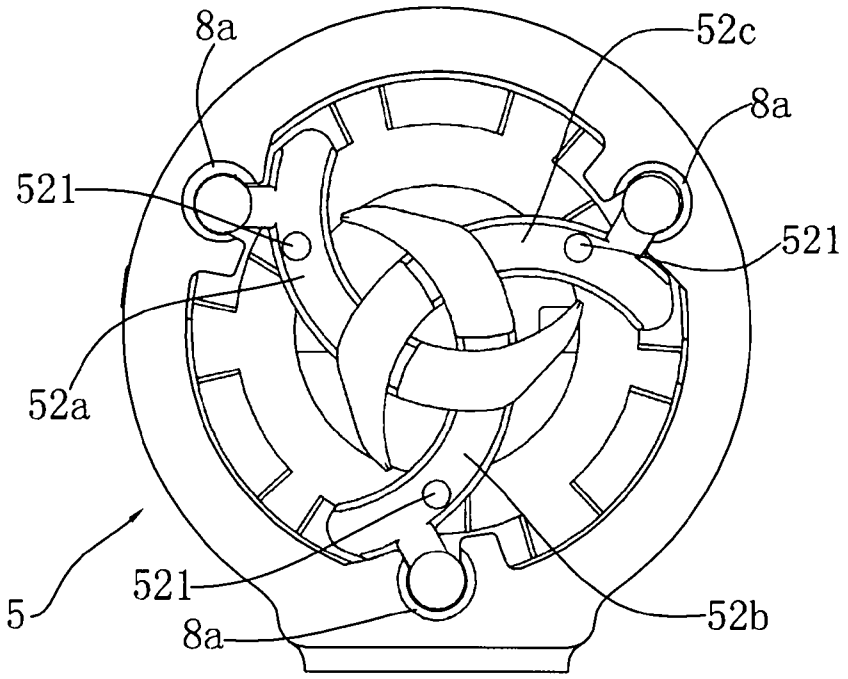

Fig. 10

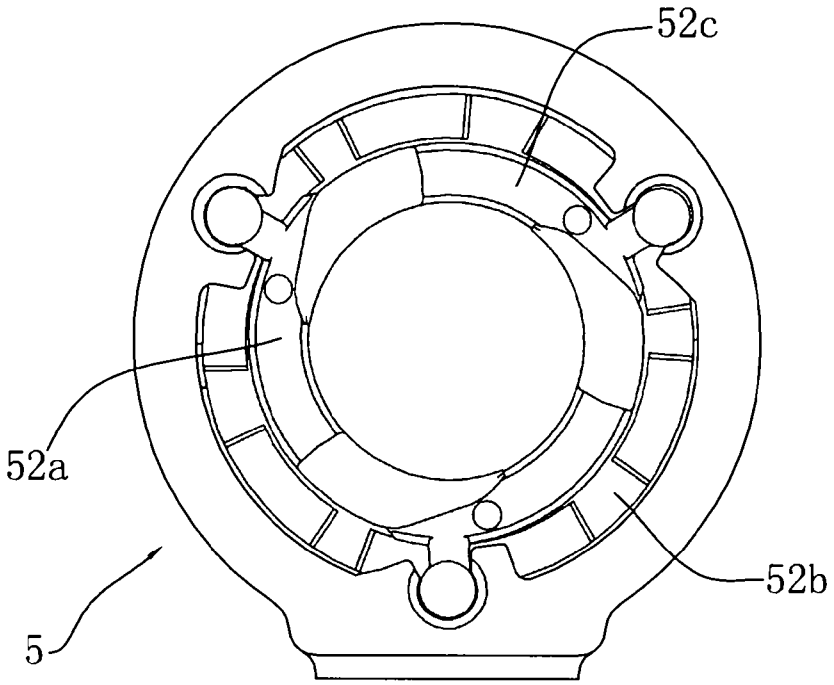

Fig. 11

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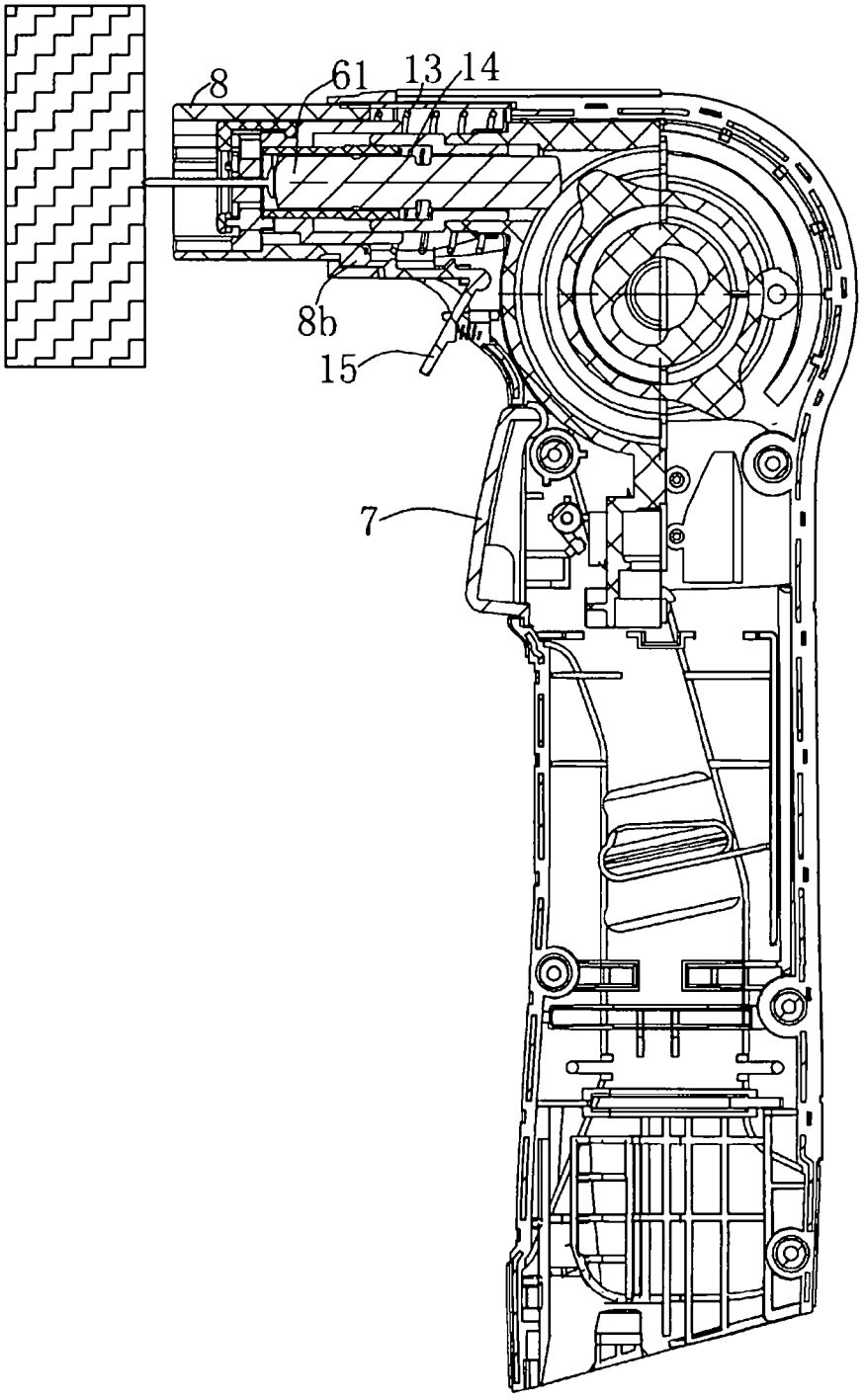

Fig. 12

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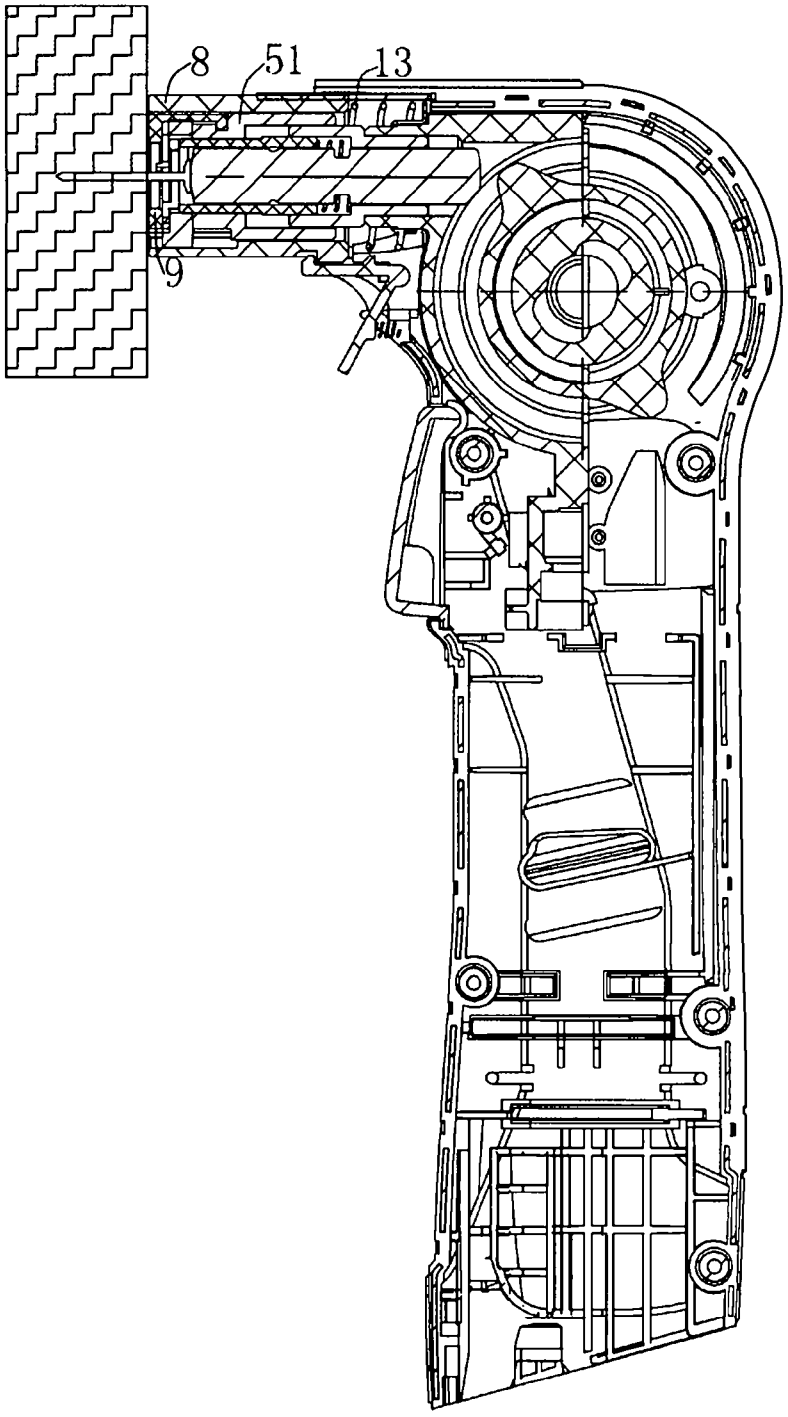

Fig. 13

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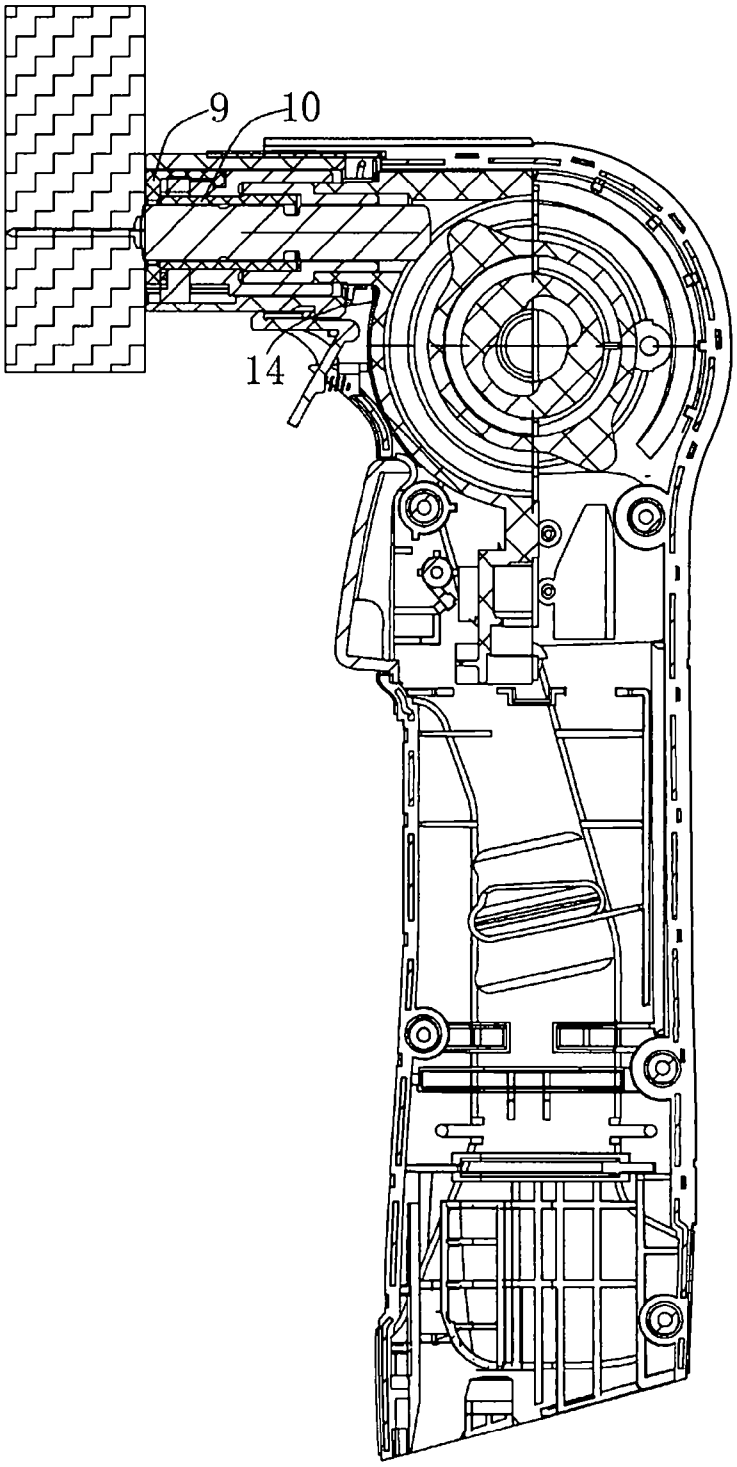

Fig. 14

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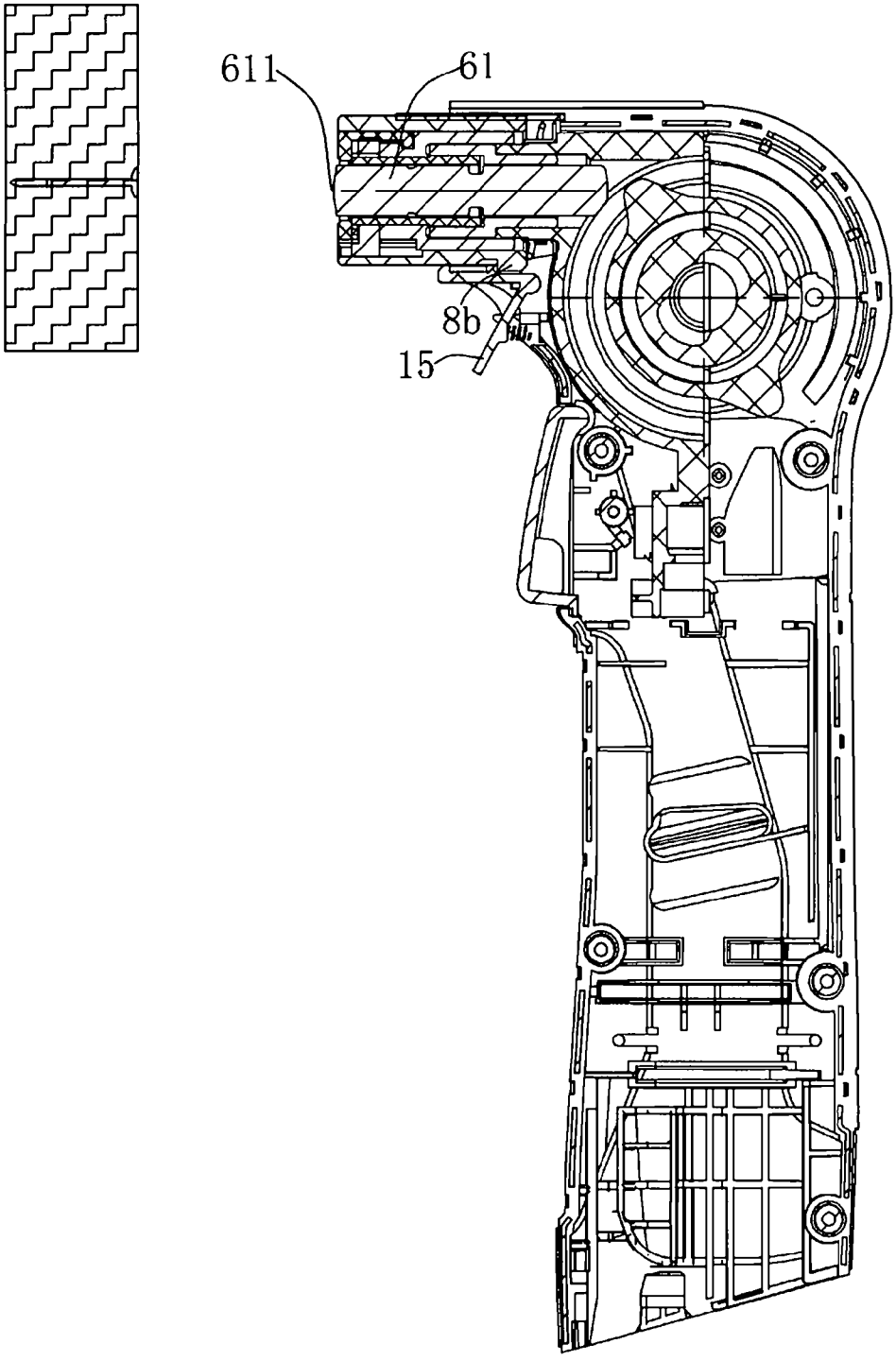

Fig. 15