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(54) LOCK OPENING AND MEASURING TOOL AND METHOD FOR USING SAME

(57) In the present invention, a tool for unlocking and/or measuring a lock and a use method thereof are provided. The tool comprises: a main panel, a support body, a key body, a rotation rod, and at least one swing arm, wherein the support body is fixed at one end to the main panel and is fixed at the other end to the key body, and the rotation rod and the swing arm are connected with the support body, respectively; the rotation of the rotation rod can drive the support body to rotate; the main panel is provided thereon with scale lines; the key body can be inserted into a lock hole of the lock to be measured, and the key body is provided thereon with a via hole corresponding to a resilient tongue of the lock to be measured; the swing arm can move on the support body and is provided at its end with a top hook, the top hook can pass through the via hole on the key body and trigger the resilient tongues of the lock to be measured, and every time when one of the resilient tongues is triggered, a pointer on the respective swing arm points to the scale line corresponding to the current triggering. The present solution can improve the efficiency of unlocking and key making.

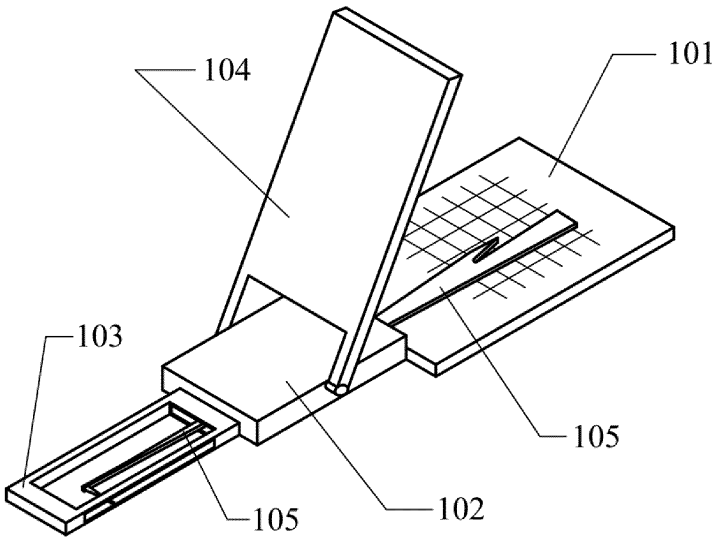

Figure 1

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Description

TECHNICAL FIELD

[0001] The present invention relates to the field of mechanical engineering, and specifically to a tool for unlocking and/or measuring a lock and a use method thereof.

BACKGROUND OF THE INVENTION

[0002] A lock is a common security product in daily life, for closing use. A common lock is generally a mechanical lock, such as a burglar-proof door lock, a car lock, a padlock, a chain lock, etc. The lock is provided with a key corresponding thereto by which the lock can be locked or unlocked. With the development of the science and technology, there present many locks which are unlocked by optical, electric, magnetic, audio, or fingerprint instructions. However, in order that the lock can be unlocked in special situations, these locks are also provided with mechanical lock holes and can be unlocked by corresponding keys.

[0003] Often in daily life, the key may be lost and there is not a backup key. For example, the car key is lost and there is not a backup key. As for this, there are two handling methods. In one of the methods, the car door is opened by a professional unlocking person without the key, and then all the locks of the car are removed and are replaced with new locks. In another method, the car door is opened by a professional unlocking person, and then one of the locks is removed; after the lock is disassembled, a corresponding key is made according to the lock core structure thereof.

[0004] In either of the two methods for solving the problem of a lost key, it is necessary to invite a professional unlocking person to unlock the lock. The professional unlocking person unlocks the lock based on the experiences and may take a long time to unlock the lock. When replacing the locks of the car, due to difference in structure of the locks, it may take a long time to remove old locks and install new locks. If the lock is disassembled and a key is made according to the lock core structure thereof, it may also take a long time to disassembly, measure and reassembly the lock. Therefore, the methods for solving the problem of a lost key in the prior art are low in efficiency of unlocking and key making.

SUMMARY OF THE INVENTION

[0005] According to the present invention, a tool for unlocking and/or measuring a lock and a use method thereof are provided, which can improve the efficiency for unlocking or key making.

[0006] According to an embodiment of the present invention, a tool for unlocking and/or measuring a lock is provided, comprising: a main panel, a support body, a key body, a rotation rod, and at least one swing arm, wherein

the support body is fixed at one end to the main panel and is fixed at the other end to the key body, and the rotation rod and the swing arm are connected with the support body, respectively;

the rotation of the rotation rod can drive the support body to rotate;

the main panel is provided thereon with scale lines;

the key body can be inserted into a lock hole of the lock to be measured, and the key body is provided thereon with a via hole corresponding to a resilient tongue of the lock to be measured;

the swing arm can move on the support body and is provided at its end with a top hook, the top hook can pass through the via hole on the key body and trigger the resilient tongues of the lock to be measured, and every time when one of the resilient tongues is triggered, a pointer on the respective swing arm points to the scale line corresponding to the current triggering.

[0007] Preferably, the scale lines comprise: tooth location lines and tooth depth lines intersecting therewith; the tooth location lines correspond to arrangement numbers of the resilient tongues in the lock to be measured, and the tooth depth lines correspond to positions of the resilient tongues when the lock to be measured is in the unlocked state;

numbers of the tooth location lines and of the tooth depth lines, a spacing between adjacent tooth location lines and a spacing between adjacent tooth depth lines correspond to the type of the lock to be measured.

[0008] Preferably, the swing arm is provided thereon with a rotation shaft which is fixed between the top hook and the pointer; the support body is provided thereon with a sliding groove in which the rotation shaft is positioned; the rotation shaft can move within the sliding groove in a direction towards the key body or the main panel such that the top hook comes into contact with different resilient tongues; the swing arm can rotate around the rotation shaft to trigger the resilient tongue to move.

[0009] Preferably, the rotation rod is connected with the support body via a pin and can rotate around the pin in a direction towards the key body or the main panel to change its angle with respect to the support body; when the rotation rod is perpendicular to the support body and when the rotation rod is rotated under an effect by an external force parallel to the direction of the pin, the support body can be driven to rotate in the same direction, the rotation of the support body drives the key body and the main panel to rotate in the same direction; and when the rotation rod is parallel to the support body, the rotation rod becomes overlapped with the swing arm.

[0010] Preferably, the key body has its size and shape corresponding to the type of the lock to be measured; the key body has one end as a fixing end and the other end as a free end, wherein the fixing end is fixed to the support body and the free end is provided with a chamfer, when the lock to be measured is unlocked or measured, the key body is inserted by the free end into the lock hole

of the lock to be measured.

[0011] Preferably, the swing arm comprises a sheet shape swing arm or a cylinder shape swing arm;

when the swing arm is the sheet shape swing arm, the key body has a sheet shape structure and is provided on its thickness face with a first via hole; the sheet shape swing arm is fixed at its middle portion to the rotation shaft perpendicular to its sheet shape plane; when the sheet shape swing arm rotates around the rotation shaft, the top hook at one end of the sheet shape swing arm can pass through the first via hole and trigger the resilient tongue having its contact point in the same plane of the sheet shape key body;

when the swing arm is the cylinder shape swing arm, the key body has a sheet shape structure and is provided on the middle portion of its sheet shape plane with a second via hole; the cylinder shape swing arm has a ⌟ shape structure wherein the middle portion thereof serves as the rotation shaft of the cylinder shape swing arm; the rotation shaft of the cylinder shape swing arm has one end fixed to the top hook of the cylinder shape swing arm and the other end fixed to a rotation handle of the cylinder shape swing arm; the rotation shaft of the cylinder shape swing arm is parallel to the plane of the sheet shape key body, and by operation of the rotation handle of the cylinder shape swing arm, the top hook of the cylinder shape swing arm can be moved in a direction towards the key body or the main panel, or be rotated around the rotation shaft of the cylinder shape swing arm; the top hook of the cylinder shape swing arm can pass through the second via hole and trigger the resilient tongue having its contact point not in the same plane of the key body.

[0012] Preferably, the tool further comprises a dial, the dial has a structure of a circular cake and is fixed to the support body, the dial is provided on its circular surface with a plurality of tooth depth lines extending through a center of the circular surface, and the circular surface provided with the tooth depth lines is perpendicular to the rotation shaft of the cylinder shape swing arm; as the top hook of the cylinder shape swing arm rotates around the rotation shaft of the cylinder shape swing arm to trigger the resilient tongue having its contact point not in the same plane of the key body, the rotation handle of the cylinder shape swing arm is parallel to different tooth depth lines on the dial;

the support body is provided on its surface with a plurality of tooth location lines which are parallel to one another, as the rotation handle of the cylinder shape swing arm is operated such that the top hook of the cylinder shape swing arm is moved in a direction towards the key body or the main panel to trigger different resilient tongues having their contact points not in the same plane of the key body, the rotation handle of the cylinder shape swing arm is aligned with different tooth location lines on the surface of the support body.

[0013] Preferably, the support body has a hollow-out structure of sheet shape and is provided on its thickness face with a via hole which is provided on its inner wall with a sliding groove; the swing arm passes through the via hole on the thickness face of the support body, and the rotation shaft of the swing arm is positioned within the sliding groove on the inner wall of the support body and can move or rotate within the sliding groove.

[0014] According to an embodiment of the present invention, a use method of the tool for unlocking and/or measuring a lock according to any one of the above embodiments is also provided, comprising:

inserting the key body into the lock hole of the lock to be measured;

rotating the rotation rod in a direction of unlocking the lock to be measured to drive the support body to rotate until further rotation is prevented, keeping applying the force in the direction for unlocking the lock to be measured to the rotation rod such that the support body is in a state where further rotation is prevented;

rotating the swing arm to make the top hook on the swing arm pass through the via hole on the key body and trigger the resilient tongue of the lock to be measured such that the resilient tongue can be moved under the effect of a relatively small triggering force;

moving the swing arm to change its position on the support body to trigger other resilient tongues until all the resilient tongues can be moved simultaneously under the effect of a relatively small triggering force, thus unlocking the lock to be measured;

keeping the unlocked state of the lock to be measured, using the swing arm to successively trigger the resilient tongues to their target positions where further movement is prevented, and accordingly recording the scale lines pointed by the pointer on the swing arm.

[0015] Preferably, the steps of using the swing arm to successively trigger the resilient tongues to their target positions where further movement is prevented and accordingly recording the scale lines pointed by the pointer on the swing arm comprise:

after triggering each of the resilient tongues to its target position where further movement is prevented, keeping the position of the swing arm unchanged, and recording the tooth location line and the tooth depth line pointed by the pointer on the swing arm at this time.

[0016] Preferably, after the step of accordingly recording the scale lines and scales pointed by the pointer on the swing arm, the use method further comprises:

according to the tooth location line and the tooth depth line pointed by the pointer on the swing arm when each of the resilient tongues is in its target position, obtaining the tooth location line and the tooth depth line corresponding to each of the resilient tongues;

according to the tooth location line and the tooth

depth line corresponding to each of the resilient tongues, obtaining the arrangement number of the resilient tongue in the lock to be measured and the position of the resilient tongue when the lock to be measured is unlocked;

according to the arrangement number of each of the resilient tongues in the lock to be measured and the position of the resilient tongue when the lock to be measured is unlocked, obtaining the arrangement order for all the resilient tongues and a tooth code corresponding to each of the resilient tongues;

according to the arrangement order for all the resilient tongues and a tooth code corresponding to each of the resilient tongues, making a key corresponding to the lock to be measured.

[0017] According to the embodiments of the present invention, a tool for unlocking and/or measuring a lock and a use method thereof are provided. The key body can be inserted into the lock hole of the lock to be measured. The rotation rod rotates to drive the support body and the key body to rotate. The top hook at one end of the swing arm can pass through the via hole on the key body and trigger the resilient tongue of the lock to be measured. Accordingly, when each resilient tongue is triggered, the pointer on the swing arm will points to the corresponding scale lines on the main panel. When a lock is to be unlocked or measured, the key body is inserted into the lock hole of the lock to be measured; the rotation rod is used to rotate the lock core of the lock to be measured; the scale lines on the main panel are used to locate the positions of the resilient tongues of the lock to be measured; the top hook on the swing arm is used to trigger the resilient tongues of the lock to be measured, thus unlocking the lock to be measured; the pointer on the swing arm is used to record the scales corresponding to the resilient tongues when the lock to be measured is unlocked; according to the scales corresponding to the resilient tongues, a key corresponding to the lock to be measured is made. By the tool, the positions of the resilient tongues can be rapidly located, the scale values corresponding to the resilient tongues when the lock is unlocked are recorded, and a corresponding key can be made directly according to the scale values, thus improving the efficiency of unlocking and key making.

DESCRIPTION OF THE DRAWINGS

[0018]

Figure 1 is a diagram of a first tool for unlocking and/or measuring a lock according to an embodiment of the present invention.

Figure 2 is a diagram of a second tool for unlocking and/or measuring a lock according to an embodiment of the present invention.

Figure 3 is a diagram of a third tool for unlocking and/or measuring a lock according to an embodiment of the present invention.

Figure 4 is a diagram of a fourth tool for unlocking and/or measuring a lock according to an embodiment of the present invention.

Figure 5 is a diagram of a fifth tool for unlocking and/or measuring a lock according to an embodiment of the present invention.

Figure 6 is a diagram of a sixth tool for unlocking and/or measuring a lock according to an embodiment of the present invention.

Figure 7 is a diagram of a seventh tool for unlocking and/or measuring a lock according to an embodiment of the present invention.

Figure 8 is a diagram of a eighth tool for unlocking and/or measuring a lock according to an embodiment of the present invention.

Figure 9 is a diagram of a ninth tool for unlocking and/or measuring a lock according to an embodiment of the present invention.

Figure 10 is a diagram of a tenth tool for unlocking and/or measuring a lock according to an embodiment of the present invention.

Figure 11 is a diagram of an eleventh tool for unlocking and/or measuring a lock according to an embodiment of the present invention.

Figure 12 is a diagram of a twelfth tool for unlocking and/or measuring a lock according to an embodiment of the present invention.

Figure 13 is a flow diagram of a use method of a tool for unlocking and/or measuring a lock according to an embodiment of the present invention.

Figure 14 is a flow diagram of a use method of a tool for unlocking and/or measuring a lock according to another embodiment of the present invention.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0019] Hereinafter, the technical solutions in the embodiments of the present invention will be described clearly and completely in connection with the accompanying drawings for the embodiments of the present invention. Obviously, the embodiments as described are only some of the embodiments of the present invention, rather than all of the embodiments. Based on the embodiments of the present invention, any other embodiment(s) obtained by those skilled in the art without inventive work will fall into the protection scope of the present invention.

[0020] As shown in figure1, according to an embodiment of the present invention, a tool for unlocking and/or measuring a lock is provided, comprising: a main panel 101, a support body 102, a key body 103 , a rotation rod 104, and at least one swing arm 105, wherein

the support body 102 is fixed at one end to the main panel 101 and is fixed at the other end to the key body 103, and the rotation rod 104 and the swing arm 105 are connected with the support body 102, respectively;

the rotation of the rotation rod 104 can drive the support

body 102 to rotate;
the main panel 101 is provided thereon with scale lines; the key body 103 can be inserted into a lock hole of the lock to be measured, and the key body 103 is provided thereon with a via hole corresponding to a resilient tongue of the lock to be measured;
the swing arm 105 can move on the support body 102 and is provided at its end with a top hook which can pass through the via hole on the key body 103 and trigger the resilient tongues of the lock to be measured, and every time when one of the resilient tongues is triggered, a pointer on the respective swing arm 105 points to the scale line corresponding to the current triggering.

[0021] According to an embodiment of the present invention, a tool for unlocking and/or measuring a lock is provided, wherein the key body can be inserted into a lock hole of the lock to be measured; the rotation of the rotation rod drives the support body as well as the key body to rotate; the swing arm is provided at its end with a top hook which can pass through the via hole on the key body and trigger the resilient tongues of the lock to be measured, and accordingly, when one of the resilient tongues is triggered, a pointer on the swing arm will point to the corresponding scale line on the main panel. When a lock is to be unlocked or measured, the key body is inserted into the lock hole of the lock to be measured; the rotation rod is used to rotate the lock core of the lock to be measured, the scale lines on the main panel are used to locate the positions of the resilient tongues of the lock to be measured, the top hook on the swing arm is used to trigger the resilient tongues of the lock to be measured, thus unlocking the lock to be measured; the pointer on the swing arm is used to record the scales corresponding to the resilient tongues when the lock to be measured is unlocked, and according to the scales corresponding to the resilient tongues, a key corresponding to the lock to be measured can be made. With such tool, the positions of the resilient tongues can be located rapidly, the scale values corresponding to the resilient tongues when the lock to be measured is unlocked can be recorded, and a corresponding key can be directly made according to the scale values, thus improving the efficiency for unlocking or key making.

[0022] According to an embodiment of the present invention, the scale lines on the main panel 101 comprise: tooth location lines and tooth depth lines intersecting therewith; the tooth location lines correspond to arrangement numbers of the resilient tongues in the lock to be measured, and the tooth depth lines correspond to positions of the resilient tongues when the lock to be measured is in its unlocked state; the numbers of the tooth location lines and of the tooth depth lines correspond to the type of the lock to be measured, and a spacing between a tooth location line and the adjacent tooth location line and a spacing between a tooth depth line and the adjacent tooth depth line also correspond to the type of the lock to be measured. With the tooth location line(s), the resilient tongues of the lock to be measured can be located to facilitating rapid unlocking of the resilient tongues. With the tooth depth line, the tooth codes corresponding to the resilient tongues of the lock to be measured can be obtained, and with the tooth codes corresponding to the resilient tongues, a key can be made quickly, thus improving the efficiency of unlocking or key making.

[0023] In an embodiment of the present invention, on the swing arm 105, the rotation shaft is fixed between the top hook and the pointer; the support body 102 is provided thereon with a sliding groove in which the rotation shaft on the swing arm 105 is positioned; the rotation shaft can move within the sliding groove in a direction towards the key body 103 or the main panel 101, also the rotation shaft can rotate within the sliding groove, thus, the swing arm 105 can move in a direction towards the key body 103 or the main panel 101 such that the top hook on the swing arm 105 can trigger different resilient tongues; also, the rotation shaft provides a support point for force application in triggering of the resilient tongues, to facilitate triggering of the resilient tongues, thus improving efficiency of unlocking. When the top hook rotates around the rotation shaft, the pointer rotates accordingly to indicate the position(s) of the corresponding resilient tongue(s), thus accurately obtaining information of the resilient tongue of the lock to be measured.

[0024] In an embodiment of the present invention, the rotation rod 104 is fixed to the support body 102 via a pin and can rotate around the pin to change its angle with respect to the support body 102; when the rotation rod 104 is perpendicular to the support body 120, the rotation rod 104 will rotate under an effect of an external force parallel to the direction of the pin, and the rotation of the rotation rod 104 will drive the support body 102 to rotate, the rotation of the support body 102 further drives the key body 103 and the main panel 101 to rotate. Thus, when the tool is not used, the rotation rod 104 can be rotated to be parallel to the support body 102 to facilitate storage and carrying; and when the tool is to be used, the rotation rod 104 can be rotated to be perpendicular to the support body 102. With a relatively small force, the rotation rod 104 can be rotated to provide a triggering signal necessary for triggering the resilient tongue(s) of the lock to be measured.

[0025] In an embodiment of the present invention, the key body 103 has its size and shape corresponding to the type of the lock to be measured, to ensure that the key body 103 can be inserted into the lock hole of the lock to be measured. The key body 103 is provided at its front end with a chamfer to ensure that the key body 103 can be smoothly inserted into the lock hole of the lock to be measured, and any undesirable occurrence, such as the key body 103 being unable to be fully inserted due to blocking by the resilient tongue of the lock to be measured, or the key body 103 damaging the resilient tongue of the lock to be measured during insertion, should be prevented.

[0026] In an embodiment of the present invention, ac-

cording to the difference in type of the lock to be measured, the swing arm 105 may be a sheet shape swing arm or a cylinder shape swing arm. When the swing arm 105 is the sheet shape swing arm, the sheet shape swing arm is fixed at its middle portion to the rotation shaft perpendicular to its sheet shape plane. Under this condition, the key body 103 is provided with a first via hole in a direction of its thickness. The sheet shape swing arm rotates around the rotation shaft which is perpendicular to its sheet shape plane. The top hook at one end of the sheet shape swing arm can pass through the first via hole on the key body 103 and trigger the resilient tongue having its contact point in the same plane of the key body 103. When the swing arm is the cylinder shape swing arm in "⌟" shape wherein the middle portion thereof serves as the rotation shaft, the rotation shaft has one end fixed to the top hook and the other end fixed to a rotation handle; the rotation shaft of the cylinder shape swing arm is positioned in the sliding groove of the support body and is parallel to the plane of the sheet shape key body, and by operation of the rotation handle of the cylinder shape swing arm, the top hook of the cylinder shape swing arm can be moved in a direction towards the key body or the main panel, or be rotated around the rotation shaft of the cylinder shape swing arm; the top hook of the cylinder shape swing arm, when rotating around the rotation shaft of the cylinder shape swing arm, can pass through the second via hole provided at the middle portion of the sheet shape plane of the sheet shape key body 103 and trigger the resilient tongue having its contact point not in the same plane of the key body. For different types of the locks to be measured, the swing arms in different forms can be made to trigger the resilient tongues in different positions, thus improving adaptability of the tool for unlocking and/or measuring a lock.

[0027] In an embodiment of the present invention, when the cylinder shape swing arm is included, the tool for unlocking and/or measuring a lock further comprises a dial. The dial has a structure of a circular cake and is fixed to the support body, the dial is provided on its circular surface with a plurality of tooth depth lines extending through a center of the circular surface, and the circular surface of the dial is perpendicular to the rotation shaft of the cylinder shape swing arm. The circular surface having the tooth depth lines is close to the side of the main panel. The support body is provided, on its surface in a position close to the outlet of the swing arm, with a plurality of tooth location lines which are parallel to one another, as the rotation handle of the cylinder shape swing arm is operated such that the top hook of the cylinder shape swing arm is moved in a direction towards the key body or the main panel, the operation handle of the cylinder shape swing arm is aligned with different tooth location lines on the support body. Thus, the resilient tongues not in the same plane of the key body can be located rapidly, and the arrangement position(s) of the corresponding resilient tongue(s) in the lock to be measured can be obtained. When the rotation handle of the cylinder shape swing arm is operated to make the top hook of the cylinder shape swing arm rotate around the rotation shaft of the cylinder shape swing arm, the rotation handle of the cylinder shape swing arm is rotated to different angles to be parallel to different tooth depth lines on the dial, then the position(s) of the resilient tongue(s) not in the same plane of the key body when the lock to be measured is unlocked can be obtained, thus determining the tooth code(s) corresponding to the resilient tongue(s). Also, the resilient tongue(s) not in the same plane of the key body can be unlocked quickly, and the arrangement order and the corresponding tooth code(s) of the resilient tongue(s) in the lock to be measured can be obtained, thus enabling fast and effective unlocking or key making for the lock with the resilient tongues having their contact points not in the same plane.

[0028] In an embodiment of the present invention, the support body 102 has a hollow-out structure of sheet shape and is provided on its thickness face with a via hole which is provided on its inner wall with a sliding groove; the swing arm 105 passes through the via hole. The end having the top hook is positioned on the side of the key body 103 and the end having the pointer is positioned on the side of the main panel 101. The rotation shaft of the swing arm 105 is positioned within the sliding groove on the inner wall of the via hole of the support body 102 and can move or rotate within the sliding groove. With such structure, the swing arm 105 is connected with the support body 102 to ensure that the swing arm 105 when triggering the resilient tongue will not shake, thus improving the usability of the tool for unlocking and/or measuring a lock as well as the accuracy of the measurement result for the lock.

[0029] In order to make the purposes, technical solutions and advantages of the present invention clearer, the present invention will be further described in detail hereinafter in combination with the accompanying drawings and the specific embodiments.

[0030] As shown in figure 2, in an embodiment of the present invention, a tool for unlocking and/or measuring a lock is provided, comprising: a main panel 203, a support body 202, a key body 201, a rotation rod 204, and a swing arm 205, wherein

[0031] The key body 201 and the main panel 203 are fixed to the support body 202, respectively; the rotation rod 204 is connected, via two pins 206, with the support body 202; the support body 202 is provided thereon with a sliding groove 2021; the swing arm 205 is provided at its one end with a top hook 2051 and is provided at its other end with an operation handle 2053, and is provided at its middle portion with a pointer 2052; a rotation shaft 2054 is fixed between the pointer 2052 and the top hook 2051; the rotation shaft 2054 on the swing arm 205 is positioned within the sliding groove 2021 on the support body 202; the main panel 203 is provided thereon with a plurality of tooth location lines 207 and tooth depth lines 208 intersecting therewith.

[0032] The rotation rod 204 can rotate around the pin 206 to change its angle with respect to the support body 202; when the rotation rod 204 rotates around the pin 206 to a position perpendicular to the support body 202 and when the rotation rod is rotated under an effect by an external force parallel to the direction of the pin, the support body 202 can be driven to rotate, the rotation of the support body 202 accordingly drives the key body 201, the main panel 203 and the swing arm 205 to rotate; and when the rotation rod 204 is rotated around the pin 206 to a position parallel to the support body 202, the rotation rod 204 becomes overlapped with the swing arm 205.

[0033] By pushing or pulling the operation handle 2053, the rotation shaft 2054 can be moved in a direction towards the key body 201 or the main panel 203 and thus drives the top hook 2051 and the pointer 2052 to move accordingly. The pointer 2052 points to different tooth location lines 207. By rotating the operation handle 2053 around the rotation shaft 2054, the top hook 2051 and the pointer 2052 will accordingly rotate around the rotation shaft 2054, and the pointer 2052 points to different tooth depth lines 208.

[0034] The key body 201 has its size and shape corresponding to the respective lock type for the tool for unlocking and/or measuring a lock. The key body 201 is provided at its front end with a chamfer and is provided at its side face with a via hole. The position of the via hole corresponds to the position of the resilient tongue in the lock to be measured corresponding to the tool, to ensure that the top hook 2051 can pass through the via hole to trigger the resilient tongues.

[0035] The number of the tooth location lines 207 on the main panel 203 is equal to the number of the resilient tongues in the lock to be measured. When the pointer 2052 points to different tooth location lines 207, the top hook 2051 accordingly points to different resilient tongues. The number of the tooth depth lines 208 on the main panel 203 is equal to the number of the position states of all the resilient tongues in the lock to be measured when the lock is in the unlocked state. When the pointer 2052 points to different tooth depth lines 208, the top hook 2051 triggers the resilient tongue(s) to different position states.

[0036] In an embodiment of the present invention, when the contact points of the resilient tongues in the lock to be measured are not in the same plane, the tool for opening and/or measuring corresponding to the lock should comprise the sheet shape swing arm and the cylinder shape swing arm. As shown in figure 3, the tool for unlocking and/or measuring a lock comprises two sheet shape swing arms and two cylinder shape swing arms. The sheet shape swing arms 304 and 305 are used to trigger the resilient tongues having the contact point thereof in the same plane of the key body, and the cylinder shape swing arms 302 and 303 are used to trigger the resilient tongues having the contact points thereof not in the same plane of the key body. On the support body 301, a dial 307 in a shape of a circular cake is fixed. The dial 307 is provided on its circular surface with a plurality of tooth depth lines extending through a center of the circular surface, and the tooth depth lines have different angles with respect to the plane of the support body 301. The dial 307 is provided, at its circular surface in the middle thereof, with a via hole, and the support body 301 passes through this via hole and is fixed to the dial 307. The circular surface on the dial 307 provided with the tooth depth lines is close to the main panel and is perpendicular to the support body 301. The support body 301 is provided on its surface with a plurality of tooth location lines 306 which are parallel to one another, and each tooth location line 306 corresponds to a different resilient tongue. The cylinder shape swing arms 302 and 303 are in a "⌟" shape structure wherein the middle portion thereof serves as the rotation shaft of the cylinder shape swing arm. The cylinder shape swing arm 302 is provided, on the side of the rotation shaft, with the top hook 3021 of the cylinder shape swing arm 302 and cylinder shape swing arm 303 is provided, on the side of the rotation shaft, with the top hook 3031 of the cylinder shape swing arm 303, while the cylinder shape swing arms 302 and 303 are provided on the other side with their respective rotation handles. The rotation shaft of the cylinder shape swing arm is positioned within the sliding groove on the inner wall of the support body and is parallel to the plane of the support body.

[0037] When the cylinder shape swing arm is used to trigger the resilient tongue having its contact point not in the same plane of the key body, the rotation handle of the cylinder shape swing arm is pushed or pulled, to move the rotation shaft of the cylinder shape swing arm in the sliding groove on the support body 301. The rotation handle is aligned with different tooth location lines 306 on the support body 301 to locate the top hook 3021 or 3031 to different resilient tongues. After the top hook is located to the target resilient tongue, the rotation handle of the cylinder shape swing arm is rotated around its rotation shaft, and the top hook on the respective cylinder shape swing arm is rotated, triggering the corresponding target resilient tongue to be able to move by a relatively small triggering force. After the lock to be measured is unlocked, the rotation handle of the cylinder shape swing arm is aligned with different tooth location lines 306 on the support body in sequence. After the resilient tongue is triggered, by rotation of the rotation handle, to the target position where it is prevented from further moving, the rotation handle of the cylinder shape swing arm is parallel to different tooth depth lines 307 on the dial 307. The tooth location line 306 aligned with the rotation handle and the tooth depth line 307 parallel to the rotation handle are recorded at this time. Various groups tooth location lines and tooth depth lines are those corresponding to the resilient tongues having their contact points not in the same plane of the key body. With the tooth location lines and tooth depth lines corresponding to the resilient

tongues having their contact points in the same plane of the key body measured by the sheet shape swing arms 304 and 305, the key for the lock to be measured can be made.

[0038] As shown in figure 4, in an embodiment of the present invention, a tool for unlocking and/or measuring a lock is provided, comprising two sheet shape swing arms, i.e. the swing arms 402 and 403, respectively. The swing arm 402 is fixed at its end with a sheet shape top hook 4021 and is fixed at its middle portion with a pointer 4022. The swing arm 403 is fixed at its end with a sheet shape top hook 4031 and is fixed at its middle portion with a pointer 4032. The sheet shape key body 401 is provided on its thickness face with a via hole. When the swing arm 402 rotates in a clockwise direction, the top hook 4021 can pass through the via hole on the key body 401 and trigger the resilient tongue on the upper side of the lock hole of the lock to be measured. When the swing arm 403 rotates in a counterclockwise direction, the top hook 4031 can pass through the via hole on the key body 401 and trigger the resilient tongue on the lower side of the lock hole of the lock to be measured. The sheet shape top hook can be used to push the resilient tongue towards outside of the lock hold or pull the resilient tongue towards inside of the lock hole.

[0039] As shown in figure 5, in an embodiment of the present invention, a tool for unlocking and/or measuring a lock is provided, comprising one sheet shape swing arm 502. The sheet shape swing arm 502 is fixed at its end with a top hook 5021 and is fixed at its middle portion with a pointer 5022 on either side thereof. The top hook 5021 has a symmetrical structure, and can pass through a via hole in the thickness direction of the key body 501 and trigger the resilient tongues on either side of the key body 201. When the sheet shape swing arm 502 is rotated in a clockwise direction, the upper side of the top hook 5021 triggers the resilient tongue on the upper side of the lock hole of the lock to be measured, and the corresponding pointer 5022 on the lower side and at the middle portion of the sheet shape swing arm 502 points to the corresponding tooth location line and tooth depth line. When the sheet shape key body 502 is rotated in a counterclockwise direction, the lower side of the top hook 5021 triggers the resilient tongue on the lower side of the lock hole of the lock to be measured, and the corresponding pointer 5022 on the upper side and at the middle portion of the sheet shape swing arm 502 points to the corresponding tooth location line and tooth depth line.

[0040] As shown in figure 6, in an embodiment of the present invention, a tool for unlocking and/or measuring a lock is provided, comprising two sheet shape swing arms, i.e. the swing arms 601 and 602, respectively. The swing arm 601 is fixed at its end with a sheet shape top hook 6011 and is fixed at its middle portion with a pointer 6013. A rotation shaft 6012 is fixed between the top hook 6011 and the pointer 6013. The swing arm 602 is fixed at its end with a sheet shape top hook 6021 and is fixed at its middle portion with a pointer 6023. A rotation shaft 6022 is fixed between the top hook 6021 and the pointer 6023. The support body 603 is provided thereon with two sliding grooves parallel to each other, i.e. the sliding grooves 6031 and 6032, respectively, wherein the rotation shaft 6012 is positioned in the sliding groove 6031 and the rotation shaft 6022 is positioned in the sliding groove 6032.

[0041] As shown in figure 7, in an embodiment of the present invention, a tool for unlocking and/or measuring a lock is provided, comprising a key body 701 having a "T" shape structure.

[0042] As shown in figure 8, in an embodiment of the present invention, a tool for unlocking and/or measuring a lock is provided, comprising four sheet shape swing arms, i.e. the swing arms 801, 802, 803, 804, respectively. Each of the swing arms is provided thereon with the corresponding pointer, top hook, rotation shaft and operation handle. Different swing arms are used to push or pull the resilient tongues in different directions.

[0043] As shown in figure 9, in an embodiment of the present invention, a tool for unlocking and/or measuring a lock is provided, comprising two sheet shape swing arms, i.e. the swing arms 902 and 903, respectively. The key body 901 is provided with a plurality of positioning holes in the thickness direction. The top hook on the swing arm 902 can pass through the positioning hole(s) on the lower side of the key body and trigger the resilient tongue(s) on the lower side of the lock hole of the lock to be measured corresponding to the positioning hole(s) on the lower side. The top hook on the swing arm 903 can pass through the positioning hole(s) on the lower side of the key body and trigger the resilient tongue(s) on the upper side of the lock chain of the lock to be measured corresponding to the positioning hole(s) on the upper side.

[0044] As shown in figure 10, in an embodiment of the present invention, a tool for unlocking and/or measuring a lock is provided, comprising one sheet shape swing arm 302. The sheet shape swing arm 302 is fixed at its end with two cylinder shape top hooks 3021 and is fixed at its middle portion with a pointer 3022 on either side thereof. The key body 301 is provided with a via hole in the thickness direction. When the sheet shape swing arm 302 is rotated in a clockwise direction, the top hook 3021 on the upper side of the sheet shape swing arm 302 passes through the upper portion of the via hole to push the resilient tongue on the upper side of the lock hole of the lock to be measured, and the corresponding pointer 3022 on the lower side and at the middle portion of the sheet shape swing arm 302 points to the corresponding tooth location line and tooth depth line. When the sheet shape swing arm 302 is rotated in a counterclockwise direction, the top hook 3021 on the lower side of the sheet shape swing arm 302 passes through the lower portion of the via hole to push the resilient tongue on the lower side of the lock hole of the lock to be measured, and the corresponding pointer 3022 on the upper side and at the middle portion of the sheet shape swing arm 302 points to

the corresponding tooth location line and tooth depth line.

[0045] As shown in figure 11, in an embodiment of the present invention, a tool for unlocking and/or measuring a lock is provided, comprising two sheet shape swing arms, i.e. the swing arms 1105 and 1106, respectively. The support body 1102 is fixed to the key body 1101 and the main panel 1103, respectively. The rotation rod 1104 is connected via a pin to the support body 1102. The key body 1101 is provided on its thickness face with two via holes parallel to each other. The top hook 11051 at one end of the swing arm 1105 can pass through one of the via holes on the key body 1101 and trigger the resilient tongue(s) on one side or both sides of the lock hole of the lock to be measured, and the top hook 11061 at one end of the swing arm 1106 can pass through the other of the via holes on the key body 1101 and trigger the resilient tongue(s) on one side or both sides of the lock hole of the lock to be measured, applied to the lock to be measured which is provided on the side of the lock hole with two rows of resilient tongues.

[0046] As shown in figure 12, in an embodiment of the present invention, a tool for unlocking and/or measuring a lock is provided, comprising four sheet shape swing arms, i.e. the swing arms 1201, 1202, 1203, 1204, respectively. The support body 1205 is provided thereon with a via hole which is provided on its inner wall with two relatively large side faces. Each of the relatively large side faces is provided thereon with two sliding grooves parallel to each other, thus being four sliding grooves totally. The rotation shaft of each swing arm is matched with one of the sliding grooves. The side of the sheet shape plane of the swing arm 1201 without providing the rotation shaft is in contact with the side of the sheet shape plane of the swing arm 1202 without providing the rotation shaft, and the side of the sheet shape plane of the swing arm 1203 without providing the rotation shaft is in contact with the side of the sheet shape plane of the swing arm 1204 without providing the rotation shaft, thus assembling the respective rotation shafts of the swing arms into the respective sliding grooves.

[0047] As shown in figure 13, in an embodiment of the present invention, a use method of the tool for unlocking and/or measuring a lock according to one of the above embodiments is provided, comprising:

Step 1301: inserting the key body into the lock hole of the lock to be measured;

Step 1302: rotating the rotation rod in a direction of unlocking the lock to be measured to drive the support body to rotate until further rotation is prevented, keeping applying the force in the direction for unlocking the lock to be measured to the rotation rod such that the support body is in a state where further rotation is prevented;

Step 1303: rotating the swing arm to make the top hook on the swing arm pass through the via hole on the key body and trigger the resilient tongue of the lock to be measured such that the resilient tongue can be moved under the effect of a relatively small triggering force;

Step 1304: moving the swing arm to change its position on the support body to trigger other resilient tongues until all the resilient tongues can be moved under the effect of a relatively small triggering force, thus unlocking the lock to be measured;

Step 1305: keeping the unlocked state of the lock to be measured, using the swing arm to successively trigger the resilient tongues to their target positions where further movement is prevented, and accordingly recording the scale lines pointed by the pointer on the swing arm.

[0048] In an embodiment of the present invention, a use method of the tool for unlocking and/or measuring a lock is provided, comprising: inserting the key body into the lock hole of the lock to be measured; rotating the rotation rod to rotate the lock core until further rotation is prevented, keeping applying the force such that during unlocking, the lock core is in a state where further rotation is prevented; rotating the swing arm to make the top hook on the swing arm pass through the via hole on the key body and trigger the resilient tongue of the lock to be measured; by moving the swing arm to change its position on the support body, successively triggering the immovable resilient tongues to make them movable; with the lock to be measured being unlocked at this time, using the rotation rod to keep the unlocked state of the lock to be measured, using the swing arm to successively trigger the resilient tongues to their target positions where further movement is prevented, and recording the scale lines pointed by the pointer at this time, thus completing unlocking and/or measuring of the lock to be measured. According to the recorded scale lines, the key corresponding to the lock to be measured can be made. When the lock to be measured is unlocked, the scale lines can be used to locate the resilient tongues, and according to the scale lines corresponding to the resilient tongues when the lock to be measured is unlocked, the corresponding key can be made directly, without disassembling the lock to be measured, thus improving the efficiency of unlocking or key making.

[0049] In an embodiment of the present invention, the tooth location line and the tooth depth line corresponding to each resilient tongue when the lock to be measured is unlocked are recorded wherein the tooth location lines represent the arrangement positions of the resilient tongues in the lock to be measured and the tooth depth lines represent the positions of the resilient tongues when the lock to be measured is unlocked. According to the tooth depth lines, the tooth codes corresponding to the resilient tongues can be obtained; and according to the corresponding tooth codes and arrangement positions, the key corresponding to the lock to be measured can be directly made, thus enabling key making without disassembling the lock. Moreover, when the pointer on the swing arm points to a tooth location line, the top hook on

the swing arm accordingly points to the resilient tongue corresponding to the tooth location line, thus locating the resilient tongue and thereby improving the efficiency of unlocking or key making.

[0050] In an embodiment of the present invention, after the tooth location lines and the tooth depth lines corresponding to the resilient tongues are obtained, first, according to the tooth depth lines corresponding to the resilient tongues, the tooth codes corresponding to the resilient tongues are obtained. According to the tooth codes corresponding to the resilient tongues and according to the tooth location lines corresponding to the resilient tongues, the arrangement order for the resilient tongues in the lock to be measured can be obtained. According to the arrangement order for the resilient tongues in the lock to be measured, the arrangement order for the teeth on the key corresponding to the lock to be measured can be known. According to the tooth codes and arrangement order of the teeth on the key, the key corresponding to the lock to be measured can be directly made.

[0051] In order to make the working principle of the tool for unlocking and/or measuring a lock as provided in the embodiment(s) of the present invention clearer, the use method of the tool will be described in detail hereinafter in combination with the tool for unlocking and/or measuring a lock as shown in figure 2.

[0052] As shown in figure 14, in an embodiment of the present invention, a use method of the tool for unlocking and/or measuring a lock is provided, comprising:

Step 1401: according to the type of the lock to be measured, selecting the corresponding tool for unlocking and/or measuring a lock.

[0053] In an embodiment of the present invention, the locks with different types have different lock core structures and correspond to the keys in different forms; while the locks with the same type have the same lock core structure and the keys in the same form. The lock core structure of the locks with the same type comprises a combined arrangement of a fixed number of resilient tongues wherein the resilient tongues comprise a fixed number of shapes. By disassembling and measuring the lock cores of different types of locks, the tools for unlocking and/or measuring corresponding to various types of locks are obtained. When a lock is to be unlocked and/or measured, according to the type of the lock to be measured, the tool for unlocking and/or measuring a lock corresponding to the type is selected. For example, the lock to be measured is an X type lock wherein the lock core of the X type lock comprises six resilient tongues, i.e. the resilient tongues 1-6, respectively. The X type lock comprises the resilient tongues with totally 5 different types of shapes. The contact points of the resilient tongues are in the same plane and are on the same side of the lock hole. Thus, the X type tool for unlocking and/or measuring a lock, corresponding to the X type lock, should be selected.

[0054] Step 1402: inserting the key body into the lock hole of the lock to be measured.

[0055] In an embodiment of the present invention, when the key body of the tool for unlocking and/or measuring a lock is inserted into the lock hole of the lock to be measured, and it is ensured that the via hole on the key body is close to the side of the resilient tongue in the lock to be measured. For example, the key body is inserted into the lock hole of the lock to be measured, and the side on the key body having the via hole is close to the resilient tongue of the lock to be measured.

[0056] Step 1403: rotating the rotation rod in a direction of unlocking the lock to be measured to drive the lock core of the lock to be measured to rotate until further rotation is prevented, keeping applying the force to the rotation rod to ensure that the lock core is keeping in a state where further rotation is prevented.

[0057] In an embodiment of the present invention, the rotation rod is rotated around the pin to a position perpendicular to the support body, and by a force parallel to the pin applied to the rotation rod, the rotation rod is rotated around the support body in a direction of unlocking the lock to be measured. The rotation of the rotation rod drives the support body to rotate, and accordingly the rotation of the support body drives the key body and the main panel to rotate. The rotation of the key body drives the lock core of the lock to be measured to rotate, and the lock core, after rotating by a certain angle, can not rotate further due to blocking by the resilient tongue(s). The force applied to the rotation rod is kept such that the lock core can be rotated immediately once it is movable. It is ensured that the lock core is in the state where further rotation is prevented. For example, for the X type lock, it can be unlocked by rotation of the key in the counterclockwise direction, then the rotation rod can be turned to make it rotate around the pin until it is perpendicular to the support body, the rotation rod is operated to make it rotate in the counterclockwise direction around the support body, and the respective lock core is rotated in the counterclockwise direction. Due to the difference in shape of the resilient tongues and due to the machining precision, during rotation of the lock core, one of the resilient tongues will first contact the outer sleeve of the lock core and block further rotation of the lock core. The force applied to the rotation rod is retained such that there is always a driving force to rotate the lock core, and it is ensured that the lock core can be rotated immediately once the blocking effect by the resilient tongue is removed.

[0058] Step 1404: moving the swing arm to make the pointer thereon successively point to different tooth location lines; rotating the swing arm to make the top hook thereon trigger the resilient tongue(s) such that the resilient tongue(s) can be moved under the effect of a relatively small triggering force.

[0059] In an embodiment of the present invention, after the lock core comes to the position where further rotation is prevented, the swing arm is moved to make the pointer thereon successively point to the tooth location lines. When the pointer points to a tooth location line, the swing

arm is rotated to use the top hook thereon to trigger, with a relatively small triggering force, the resilient tongue corresponding to this tooth location line. If the resilient tongue can be moved, then the pointer points to the next tooth location line to trigger the resilient tongue corresponding to the next tooth location line; and if the resilient tongue can not be moved, then the triggering force is increased to move the resilient tongue until the resilient tongue can be triggered by a relatively small triggering force. Such process is repeated until all the resilient tongues can be moved under the effect of a relatively small triggering force. For example, the pointer on the swing arm points to the tooth location line 1, and in this case, the top hook on the swing arm is positioned corresponding to the resilient tongue 1 which corresponds to the tooth location line 1. The swing arm is rotated to make the top hook pass through the via hole on the key body and trigger the resilient tongue 1. If the resilient tongue 1 can be moved under the effect of a relatively small triggering force, it means that the resilient tongue 1 is not the one to currently block the lock core from rotation, and accordingly, the pointer on the swing arm points to the tooth location line 2 to test whether the resilient tongue corresponding to the tooth location line 2 can be moved under the effect of a relatively small triggering force. If the resilient tongue 1 cannot be moved under the effect of a relatively small triggering force, the triggering force to the resilient tongue 1 will be increased until the resilient tongue 1 can be triggered under the effect of a relatively small triggering force. Then, the resilient tongue corresponding to the tooth location line 2 is tested as whether it can be moved under the effect of a relatively small triggering force. The above step is repeated until the resilient tongue 6 is triggered to a state such that it can be moved under the effect of a relatively small triggering force.

[0060] Step 1405: repeating Step 1404, until all the resilient tongues can be moved simultaneously under the effect of a relatively small triggering force, thus unlocking the lock to be measured.

[0061] In an embodiment of the present invention, after a resilient tongue, which firstly cannot be moved under the effect of a relatively small triggering force, is triggered with a large triggering force until the resilient tongue can be moved under the effect of a relatively small triggering force, as the rotation rod is under the effect of the rotation force, the lock core immediately rotates by an angle. At this time, another resilient tongue contacts the outer sleeve of the lock core to block the lock core from further movement. Step 1404 is repeated. After Step 1404 is repeated for several times, all the resilient tongues can be moved simultaneously under the effect of a relatively small triggering force. At this time, there is no resilient tongue to block the lock core from rotation, the lock core is rotated to the position where the lock to be measured is unlocked, thus unlocking the lock to be measured. For example, at the first time for circulatively triggering the resilient tongue(s) of the lock to be measured, each of the resilient tongues 1-5 can be moved under the effect of a relatively small triggering force. At this time, it is the resilient tongue 6 that blocks the lock core from further rotation. After the resilient tongue 6 is triggered such that it can be moved under the effect of a relatively small triggering force, the lock core rotates by a certain angle. The second time for circulatively triggering is started. Starting from the resilient tongue 1 again for triggering, each of the resilient tongues 1, 2, 3 can be moved under the effect of a relatively small triggering force. After the resilient tongue 4, which can not be moved under the effect of a relatively small triggering force, is triggered such that it can be moved under the effect of a relatively small triggering force, the lock core rotates by a certain angle. In this case, when the resilient tongue 5 is triggered, it is found that the resilient tongue 5 can not be moved under the effect of a relatively small triggering force. After the resilient tongue 5 is triggered such that it can be moved under the effect of a relatively small triggering force, the lock core rotates further by a certain angle. As the resilient tongue 6 has been unlocked by the previous/last triggering, the resilient tongue 6 can be moved under the effect of a relatively small triggering force. The third time for circulatively triggering is started. Firstly, after the resilient tongue 1, which cannot be moved under the effect of a relatively small triggering force, is triggered such that it can be moved under the effect of a relatively small triggering force, the lock core rotates by a certain angle. It is found that the resilient tongue 2 cannot be moved under the effect of a relatively small triggering force. After the resilient tongue 2 is triggered such that it can be moved under the effect of a relatively small triggering force, the lock core rotates further by a certain angle. It is found that the resilient tongue 3 cannot be moved under the effect of a relatively small triggering force. The resilient tongue 3 is triggered such that it can be moved under the effect of a relatively small triggering force. So far, all the resilient tongues are unlocked by triggering and there is no resilient tongue to block the lock core from rotation. The lock core is rotated, under the effect of the rotation rod, to the position where the lock to be measured is unlocked, thus unlocking the lock to be measured. Thus, by totally three times of circulative triggering, the resilient tongues are unlocked by triggering, and the lock core is rotated to the unlocked position, thus unlocking the lock to be measured.

[0062] Step 1406: keeping the position of the lock core where the lock to be measured is unlocked, using the swing arm to trigger the resilient tongues to their target positions where further movement is prevented, and recording the tooth location lines and the tooth depth lines pointed by the pointer on the swing arm when the resilient tongues are in their target positions.

[0063] In an embodiment of the present invention, after the lock to be measured is unlocked, the rotation force on the rotation rod is retained and the lock core is kept in the position where the lock to be measured is unlocked. The pointer on the swing arm is moved successively to

the tooth location lines. The swing arm is rotated to use the top hook to trigger the resilient tongue corresponding to each tooth location line. The resilient tongue is triggered to the position where further movement is prevented and the tooth depth line pointed by the pointer at this time is recorded, thus obtaining the tooth location line and the tooth depth line corresponding to each resilient tongue. For example, the pointer on the swing arm is made to point to the tooth location line 1, and the swing arm is rotated to use the top hook to trigger the resilient tongue 1 corresponding to each tooth location line 1. The resilient tongue 1 is triggered to the position where further triggering is prevented and at this time, the pointer points to the tooth depth line A. The same operation is performed for the tooth location lines 2-6 and it is found that in the position where further triggering is prevented, the resilient tongue 2 corresponds to the tooth depth line B, the resilient tongue 3 corresponds to the tooth depth line C, each of the resilient tongue 4 and 5 corresponds to the tooth depth line D, and the resilient tongue 6 corresponds to the tooth depth line E, thus obtaining the tooth location line and the tooth depth line corresponding to each resilient tongue, with the specific correspondence relation as: the resilient tongue 1 corresponding to the tooth location line 1 and the tooth depth line A, the resilient tongue 2 corresponding to the tooth location line 2 and the tooth depth line B, the resilient tongue 3 corresponding to the tooth location line 3 and the tooth depth line C, the resilient tongue 4 corresponding to the tooth location line 4 and the tooth depth line D, the resilient tongue 5 corresponding to the tooth location line 5 and the tooth depth line D, the resilient tongue 6 corresponding to the tooth location line 6 and the tooth depth line E.

[0064] Step 1407: according to the tooth location lines and the tooth depth lines corresponding to the resilient tongues, making a key corresponding to the lock to be measured.

[0065] In an embodiment of the present invention, the tooth location lines corresponding to the resilient tongues correspond to the arrangement order for the resilient tongues in the lock to be measured, and the tooth depth lines corresponding to the resilient tongues correspond to the positions of the resilient tongues when the lock to be measured is unlocked. According to the positions of the resilient tongues when the lock to be measured is unlocked, the tooth codes of the teeth on the key corresponding to the resilient tongues can be obtained. According to the tooth codes corresponding to the resilient tongues as well as the arrangement order for the resilient tongues, the key corresponding to the lock to be measured is made. For example, according to the tooth location lines corresponding to the resilient tongues 1-6, it is determined that the order for the resilient tongues 1-6 in the lock to be measured, from inside to outside, is: the resilient tongue 1 - the resilient tongue 2 - the resilient tongue 3 - the resilient tongue 4 - the resilient tongue 5 - the resilient tongue 6. According to the tooth depth lines corresponding to the resilient tongues 1-6, it is determined that the resilient tongue 1 corresponds to the tooth code A, the resilient tongue 2 corresponds to the tooth code B, the resilient tongue 3 corresponds to the tooth code C, the resilient tongue 4 corresponds to the tooth code D, the resilient tongue 5 corresponds to the tooth code D, the resilient tongue 6 corresponds to the tooth code E. The six tooth codes ABCDDE are successively input into the numerically controlled key machine, and the numerically controlled key machine automatically makes a key with its tooth codes being ABCDDE in sequence from the inserting end to the handle end of the key, thus obtaining the key corresponding to the lock to be measured.

[0066] According to the above solutions, the tool for unlocking and/or measuring a lock and the use method thereof as provided in the embodiment(s) of the present invention have at least the following beneficial effects:

1) In the embodiment(s) of the present invention, the key body can be inserted into the lock hole of the lock to be measured; the rotation rod can rotate and drive the support body as well as the key body to rotate; the top hook at one end of the swing arm can pass through the via hole on the key body and trigger the resilient tongue of the lock to be measured; accordingly, when each resilient tongue is triggered, the pointer on the swing arm will point to the corresponding scale lines on the main panel. When a lock is to be unlocked and/or measured, the key body is inserted into the lock hole of the lock to be measured; the rotation rod is used to rotate the lock core of the lock to be measured; the scale lines on the main panel are used to locate the positions of the resilient tongues of the lock to be measured; the top hook on the swing arm is used to trigger the resilient tongue(s) of the lock to be measured, thus unlocking the lock to be measured; the pointer on the swing arm is used to record the scales corresponding to the resilient tongues when the lock to be measured is unlocked; according to the scales corresponding to the resilient tongues, a key corresponding to the lock to be measured is made. By the tool, the positions of the resilient tongues can be located rapidly, the scale values corresponding to the resilient tongues when the lock is unlocked can be recorded, and according to the scale values, a corresponding key can be directly made, thus improving the efficiency of unlocking and/or key making.

2) In the embodiment(s) of the present invention, the rotation rod can rotate around the pin. When the tool for unlocking and/or measuring a lock is used, the rotation rod can be rotated to a position perpendicular to the support body to facilitate rotation of the lock core of the lock to be measured; and when the tool for unlocking and/or measuring a lock is not used, the rotation rod can be rotated to a position parallel to the support body wherein the rotation rod is overlapped with the swing arm at this time, reduc-

ing the space to be occupied by the tool for unlocking and/or measuring a lock and facilitating storage and carrying.

3) In the embodiment(s) of the present invention, according to different types of locks, the swing arm can be in sheet shape or cylinder shape. The sheet shape swing arm can trigger the resilient tongue in the same plane of the sheet shape key body, and the cylinder shape swing arm can trigger the resilient tongue not in the same plane of the sheet shape key body, thus improving the applicable range of the tool for unlocking and/or measuring a lock as provided in the embodiment(s) of the present invention.

4) In the embodiment(s) of the present invention, the key body has its shape and size corresponding to the lock hole of the lock to be measured, thus ensuring that the key body can be inserted into the lock hole of the lock to be measured and can be inserted to the appropriate position. The key body is provided at its front end with a chamfer to facilitate insertion of the key body and to prevent the resilient tongues of the lock to be measured from damaging, thus improving the usability of the tool for unlocking and/or measuring a lock.

5) In the embodiment(s) of the present invention, the swing arm is provided thereon with a rotation shaft. The support body is provided thereon with a sliding groove. The rotation shaft can move or rotate in the sliding groove in only one direction. Thus, on one hand, the rotation shaft provides a support point when the resilient tongue is triggered, to facilitate triggering of the resilient tongue; and on the other hand, the sliding groove restricts the direction of movement of the rotation shaft, to prevent the swing arm from overshooting or shaking during triggering of the resilient tongue(s), thus improving the accuracy of the measurement result of the tool for unlocking and/or measuring a lock.

[0067] It should be noted herein that the relation terms, such as first, second, etc, are used only to distinguish one entity or operation from another entity or operation, not to necessarily require or suggest that there is any actual relation or order between these entities or operations. Moreover, the term "comprise", "include" or any other variations thereof is intended to cover the non-exclusive inclusion such that the process, method, device or apparatus including a series of elements not only includes these elements, but also includes other elements not specifically listed, or also includes the element(s) inherent to the process, method, device or apparatus. In the case that there is no further limitation, the element defined by the clause of "comprising a/an" does not exclude the existence of additional same element(s) in the process, method, device or apparatus including the element.

[0068] Finally, it should be noted that the above description is only for the preferred embodiments of the present invention and is used only to explain the technical solutions of the present invention, rather than limiting the protection scope of the present invention. Any modifications, equivalent substitutions, improvements or the like made within the spirit and principle of the present invention will fall within the protection scope of the present invention.

Claims

1. A tool for unlocking and/or measuring a lock, comprising: a main panel, a support body, a key body, a rotation rod, and at least one swing arm, wherein
the support body is fixed at one end to the main panel and is fixed at the other end to the key body, and the rotation rod and the swing arm are connected with the support body respectively;
the rotation of the rotation rod can drive the support body to rotate;
the main panel is provided thereon with scale lines;
the key body can be inserted into a lock hole of the lock to be measured, and the key body is provided thereon with a via hole corresponding to a resilient tongue of the lock to be measured;
the swing arm can move on the support body and is provided at its end with a top hook, the top hook can pass through the via hole on the key body and trigger the resilient tongues of the lock to be measured, and every time when one of the resilient tongues is triggered, a pointer on the respective swing arm points to the scale line corresponding to the current triggering.

2. The tool according to claim 1, wherein
the scale lines comprise: tooth location lines and tooth depth lines intersecting with the tooth location lines;
the tooth location lines correspond to arrangement numbers of the resilient tongues in the lock to be measured, and the tooth depth lines correspond to positions of the resilient tongues when the lock to be measured is in the unlocked state;
numbers of the tooth location lines and of the tooth depth lines, a spacing between tooth location lines and a spacing between adjacent tooth depth lines correspond to the type of the lock to be measured.

3. The tool according to claim 1, wherein
the swing arm is provided thereon with a rotation shaft which is fixed between the top hook and the pointer;
the support body is provided thereon with a sliding groove in which the rotation shaft is positioned;
the rotation shaft can move within the sliding groove in a direction towards the key body or the main panel such that the top hook comes into contact with different resilient tongues;

the swing arm can rotate around the rotation shaft to trigger the resilient tongue to move.

4. The tool according to claim 1, wherein
the rotation rod is connected with the support body via a pin and can rotate around the pin in a direction towards the key body or the main panel to change its angle with respect to the support body; when the rotation rod is perpendicular to the support body and when the rotation rod is rotated under an effect caused by an external force parallel to the direction of the pin, the support body can be driven to rotate in the same direction, the rotation of the support body drives the key body and the main panel to rotate in the same direction; and when the rotation rod is parallel to the support body, the rotation rod and the swing arm fit closely.

5. The tool according to claim 1, wherein
the key body has a size and a shape corresponding to the type of the lock to be measured;
the key body has one end as a fixing end and the other end as a free end, wherein the fixing end is fixed to the support body and the free end is provided with a chamfer, when the lock to be measured is unlocked or measured, the key body is inserted by the free end into the lock hole of the lock to be measured.

6. The tool according to claim 3, wherein
the swing arm comprises a sheet shape swing arm or a cylinder shape swing arm;
when the swing arm is the sheet shape swing arm, the key body has a sheet shape structure and is provided on its thickness face with a first via hole; the sheet shape swing arm is fixed at its middle portion to the rotation shaft perpendicular to a sheet shape plane of the sheet shape swing arm; when the sheet shape swing arm rotates around the rotation shaft, the top hook at one end of the sheet shape swing arm can pass through the first via hole and trigger the resilient tongue having its contact point in the same plane of the sheet shape key body;
when the swing arm is the cylinder shape swing arm, the key body has a sheet shape structure and is provided on the middle portion of its sheet shape plane with a second via hole; the cylinder shape swing arm has a "⌟" shape structure wherein the middle portion of the "⌟" shape structure serves as the rotation shaft of the cylinder shape swing arm; the rotation shaft of the cylinder shape swing arm has one end fixed to the top hook of the cylinder shape swing arm and the other end fixed to a rotation handle of the cylinder shape swing arm; the rotation shaft of the cylinder shape swing arm is parallel to the plane of the sheet shape key body, and by operation of the rotation handle of the cylinder shape swing arm, the top hook of the cylinder shape swing arm can be moved in a direction towards the key body or the main panel, or be rotated around the rotation shaft of the cylinder shape swing arm; the top hook of the cylinder shape swing arm can pass through the second via hole and trigger the resilient tongue having its contact point not in the same plane of the key body.

7. The tool according to claim 6, further comprises a dial,
the dial has a structure of a circular cake and is fixed to the support body, the dial is provided on its circular surface with a plurality of tooth depth lines extending through a center of the circular surface, and the circular surface provided with the tooth depth lines is perpendicular to the rotation shaft of the cylinder shape swing arm; as the top hook of the cylinder shape swing arm rotates around the rotation shaft of the cylinder shape swing arm to trigger the resilient tongue having its contact point not in the same plane of the key body, the rotation handle of the cylinder shape swing arm is parallel to different tooth depth lines on the dial;
the support body is provided on its surface with a plurality of tooth location lines which are parallel to one another, as the rotation handle of the cylinder shape swing arm is operated such that the top hook of the cylinder shape swing arm is moved in a direction towards the key body or the main panel to trigger different resilient tongues having their contact points not in the same plane of the key body, the rotation handle of the cylinder shape swing arm is aligned with different tooth location lines on the surface of the support body.

8. The tool according to any one of claims 1-7, wherein the support body has a hollow-out structure of sheet shape and is provided on its thickness face with a via hole which is provided on its inner wall with a sliding groove;
the swing arm passes through the via hole on the thickness face of the support body, and the rotation shaft of the swing arm is positioned within the sliding groove on the inner wall of the support body and can move or rotate within the sliding groove.

9. A use method of the tool for unlocking and/or measuring a lock according to any one of claims 1-8, comprising:

inserting the key body into the lock hole of the lock to be measured;
rotating the rotation rod in a direction of unlocking the lock to be measured to drive the support body to rotate until further rotation is prevented, keeping applying the force in the direction for

unlocking the lock to be measured to the rotation rod such that the support body is in a state where further rotation is prevented;

rotating the swing arm to make the top hook on the swing arm pass through the via hole on the key body and trigger the resilient tongue of the lock to be measured such that the resilient tongue can be moved under the effect of a relatively small triggering force;

moving the swing arm to change its position on the support body to trigger other resilient tongues until all the resilient tongues can be moved simultaneously under the effect of a relatively small triggering force, thus unlocking the lock to be measured;

keeping the unlocked state of the lock to be measured, using the swing arm to successively trigger the resilient tongues to their target positions where further movement is prevented, and accordingly recording the scale lines pointed by the pointer on the swing arm.

10. The use method according to claim 9, wherein the steps of using the swing arm to successively trigger the resilient tongues to their target positions where further movement is prevented and accordingly recording the scale lines pointed by the pointer on the swing arm comprise:

after triggering each of the resilient tongues to its target position where further movement is prevented, keeping the position of the swing arm unchanged, and recording the tooth location line and the tooth depth line pointed by the pointer on the swing arm at this time.

11. The use method according to claim 10, wherein after the step of accordingly recording the scale lines and scales pointed by the pointer on the swing arm, the use method further comprises:

according to the tooth location line and the tooth depth line pointed by the pointer on the swing arm when each of the resilient tongues is in its target position, obtaining the tooth location line and the tooth depth line corresponding to each of the resilient tongues;

according to the tooth location line and the tooth depth line corresponding to each of the resilient tongues, obtaining the arrangement number of the resilient tongue in the lock to be measured and the position of the resilient tongue when the lock to be measured is unlocked;

according to the arrangement number of each of the resilient tongues in the lock to be measured and the position of the resilient tongue when the lock to be measured is unlocked, obtaining the arrangement order for all the resilient tongues and a tooth code corresponding to each of the resilient tongues;

according to the arrangement order for all the resilient tongues and the tooth code corresponding to each of the resilient tongues, making a key corresponding to the lock to be measured.

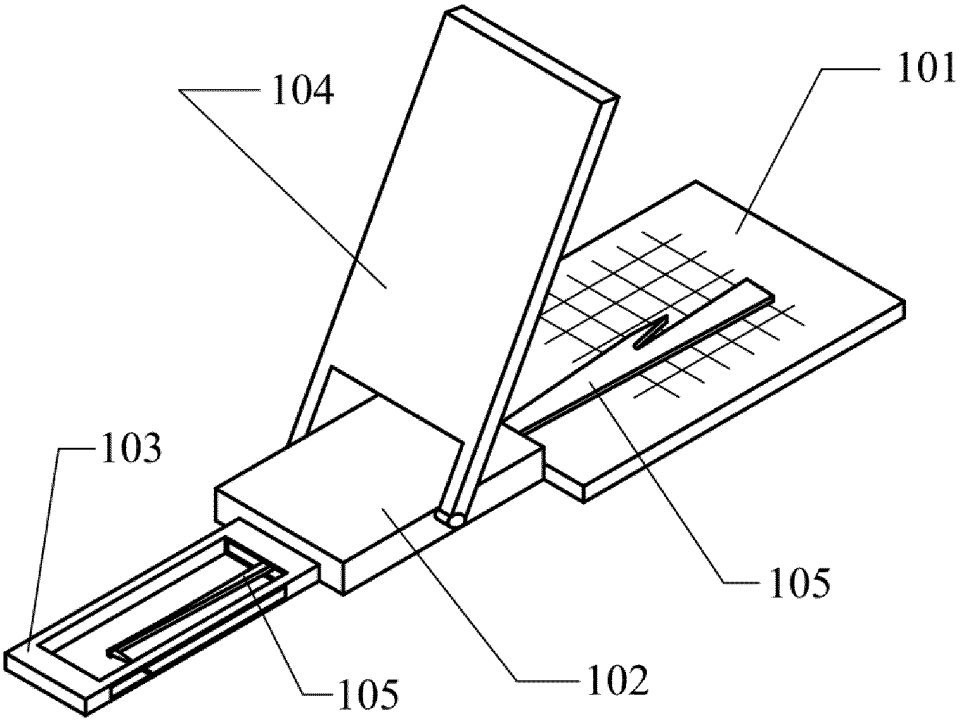

Figure 1

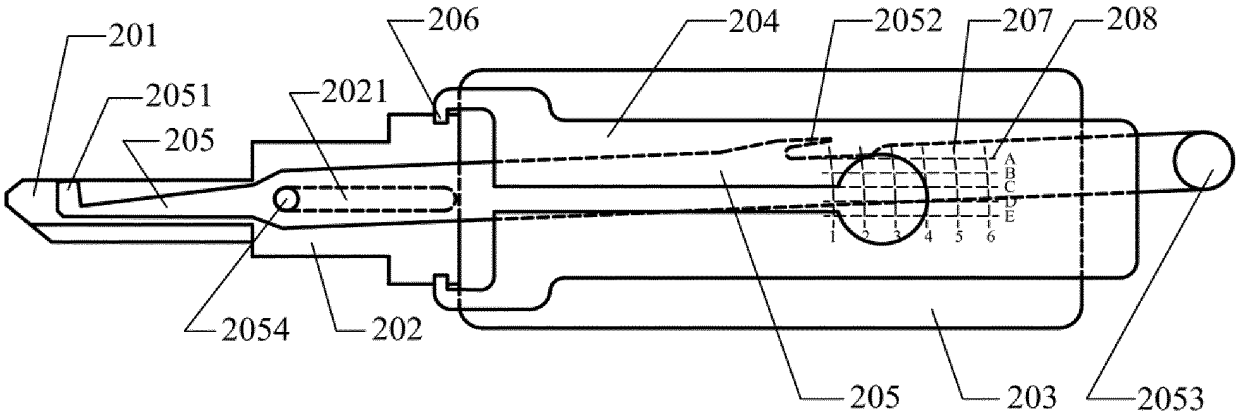

Figure 2

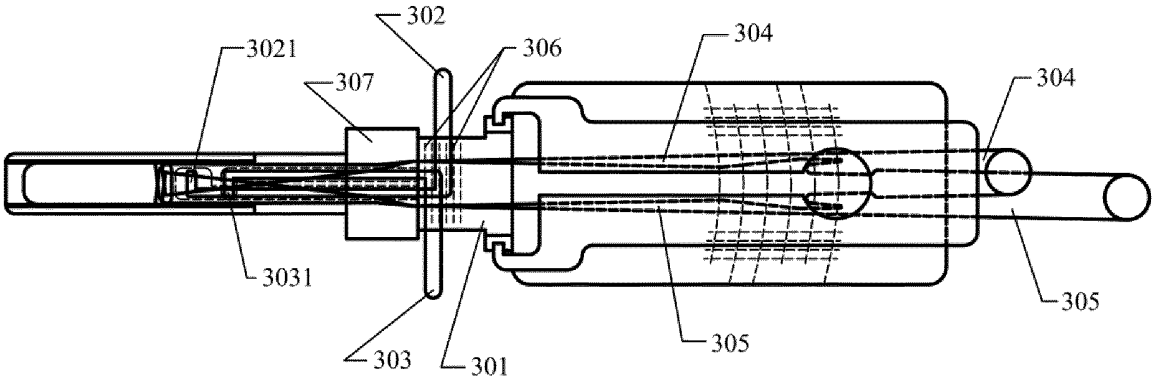

Figure 3

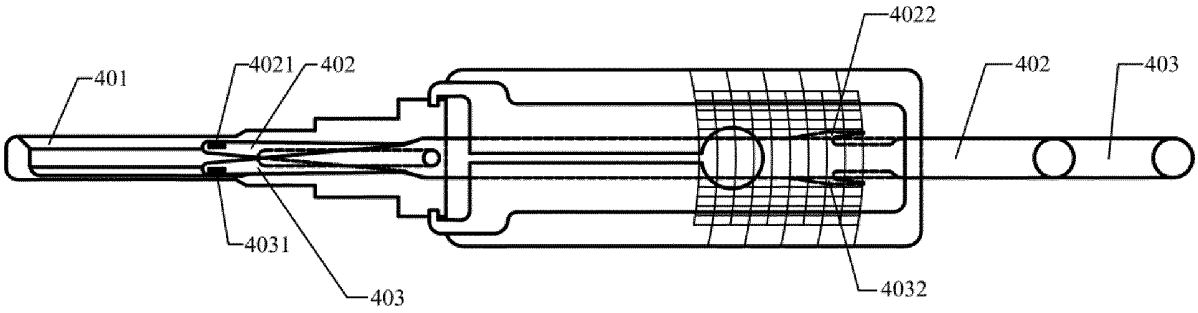

Figure 4

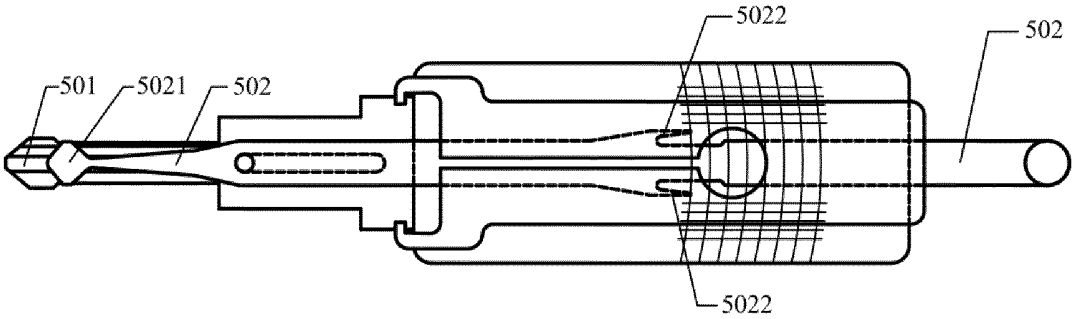

Figure 5

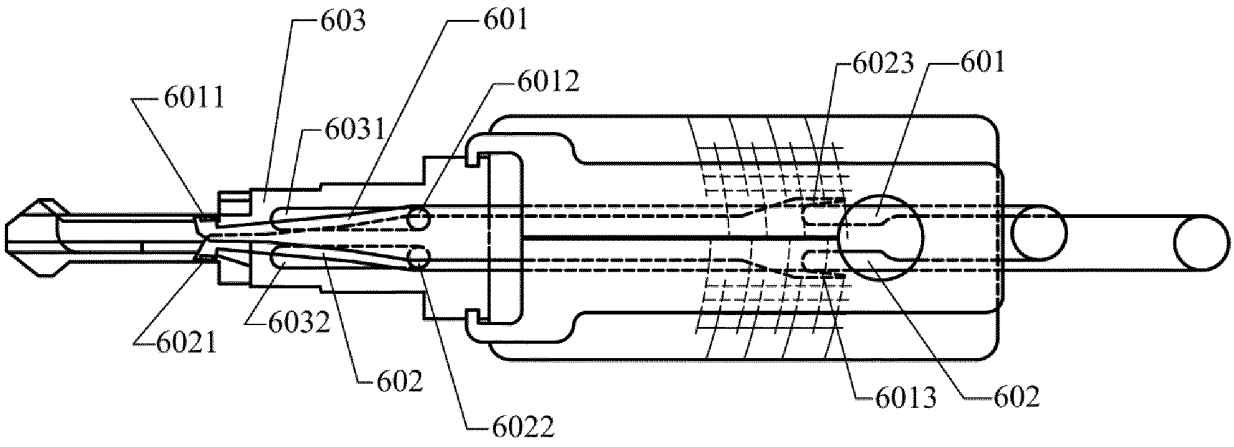

Figure 6

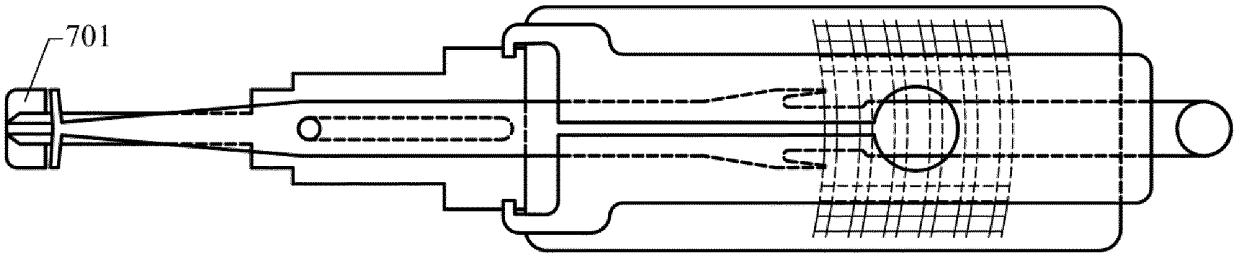

Figure 7

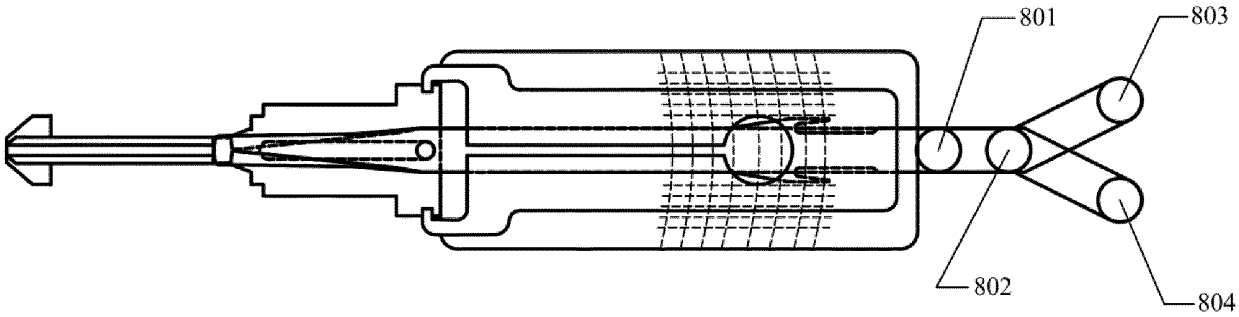

Figure 8

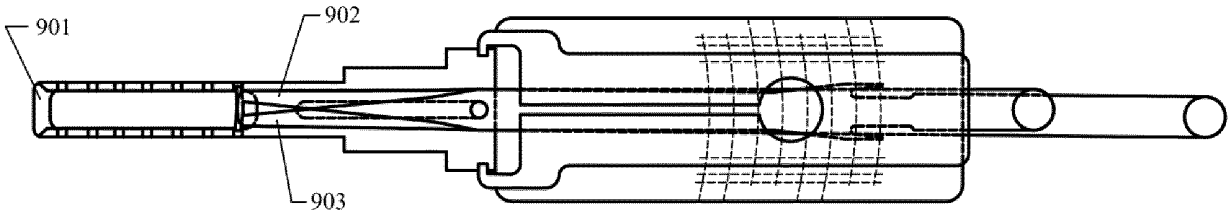

Figure 9

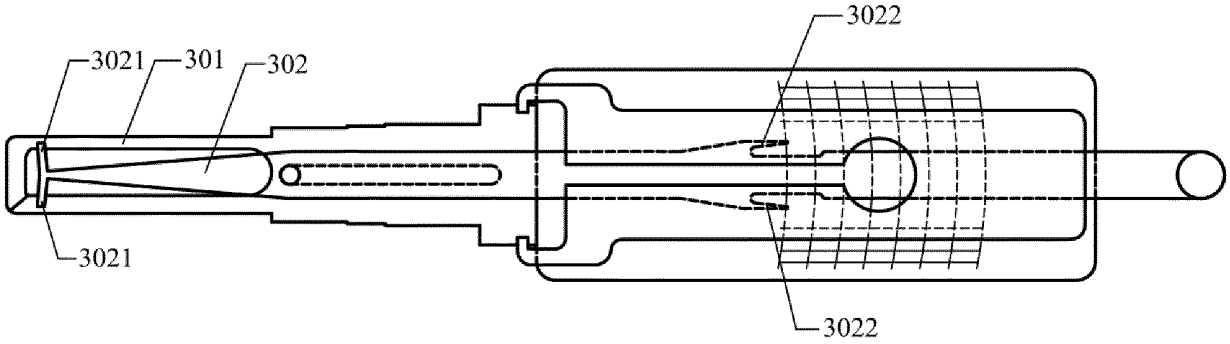

Figure 10

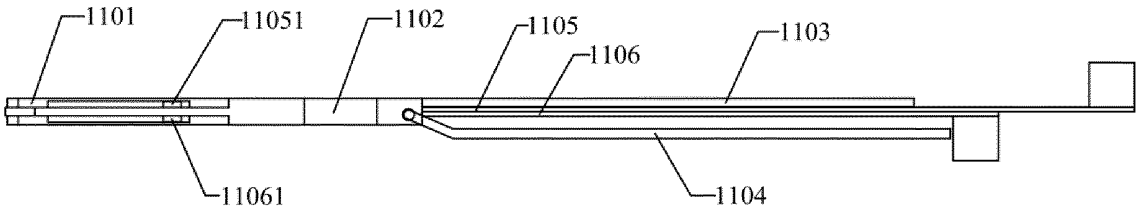

Figure 11

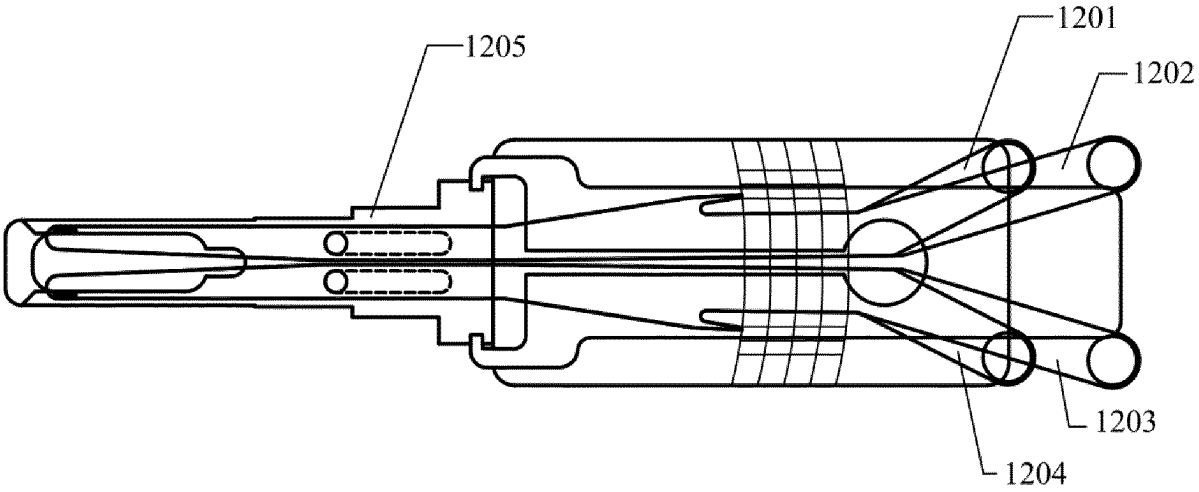

Figure 12

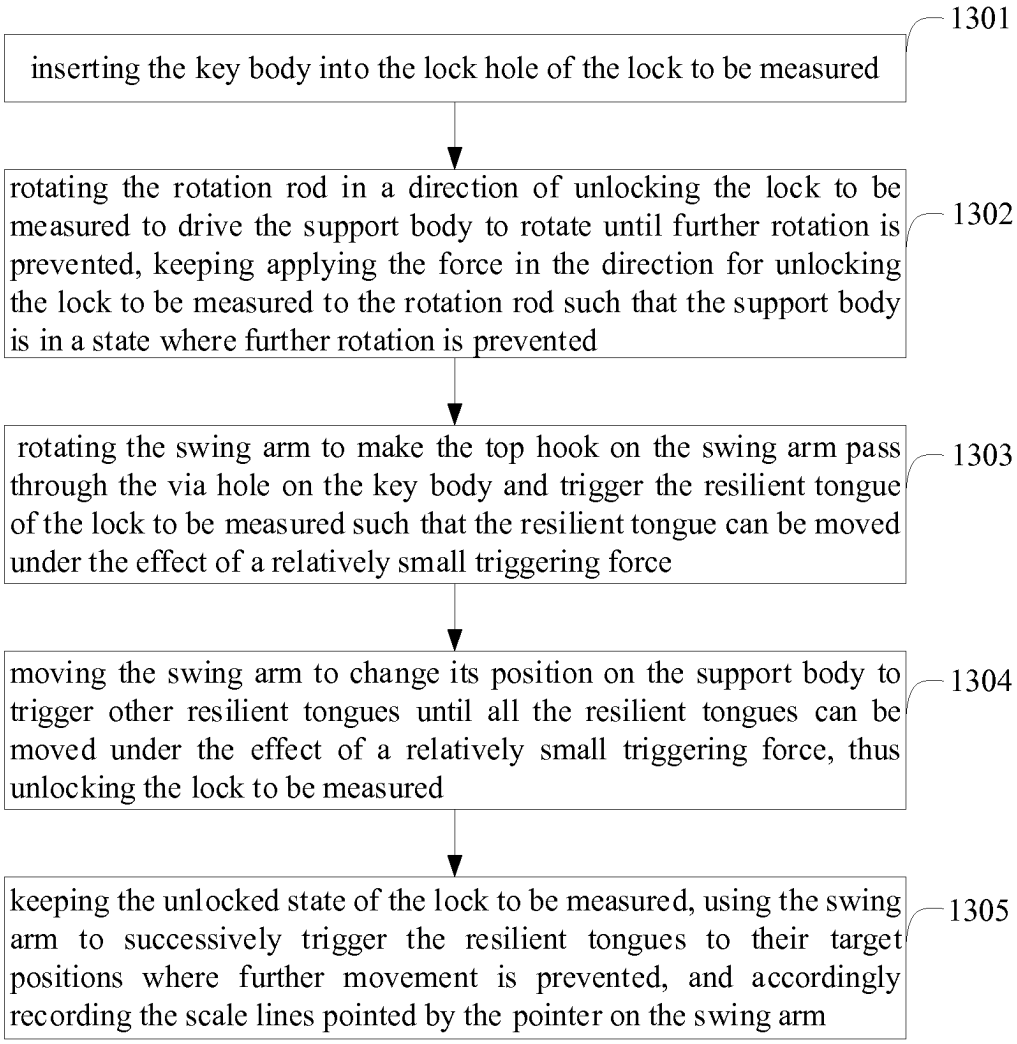

Figure 13

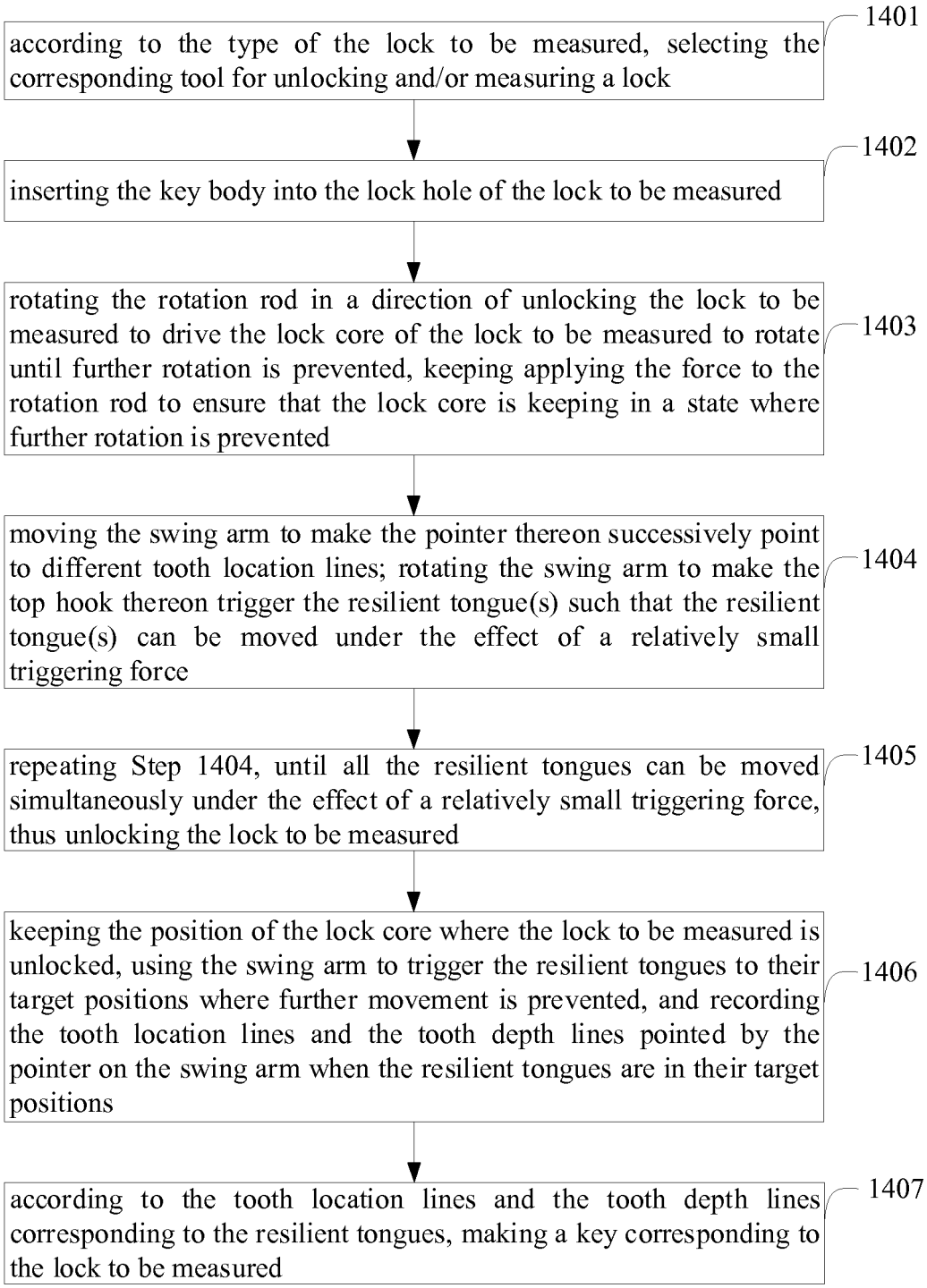
according to the type of the lock to be measured, selecting the corresponding tool for unlocking and/or measuring a lock
1401
inserting the key body into the lock hole of the lock to be measured
1402
rotating the rotation rod in a direction of unlocking the lock to be measured to drive the lock core of the lock to be measured to rotate until further rotation is prevented, keeping applying the force to the rotation rod to ensure that the lock core is keeping in a state where further rotation is prevented
1403
moving the swing arm to make the pointer thereon successively point to different tooth location lines; rotating the swing arm to make the top hook thereon trigger the resilient tongue(s) such that the resilient tongue(s) can be moved under the effect of a relatively small triggering force
1404
repeating Step 1404, until all the resilient tongues can be moved simultaneously under the effect of a relatively small triggering force, thus unlocking the lock to be measured
1405
keeping the position of the lock core where the lock to be measured is unlocked, using the swing arm to trigger the resilient tongues to their target positions where further movement is prevented, and recording the tooth location lines and the tooth depth lines pointed by the pointer on the swing arm when the resilient tongues are in their target positions
1406
according to the tooth location lines and the tooth depth lines corresponding to the resilient tongues, making a key corresponding to the lock to be measured
1407

Figure 14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/091597

A. CLASSIFICATION OF SUBJECT MATTER

E05B 19/20 (2006.01) i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: E05B 19

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT, CNKI, WPI, EPODOC: universal, marble, elastic piece, lock, open, measure, read, master, key, ball, piece, dial, board, pole, swing, sway, graduation

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 204311851 U (SHENZHEN HUA HONG FA LOCKSMITHING CO., LTD.), 06 May 2015 (06.05.2015), description, paragraphs [0017] and [0018], and figure 1	1-11
A	CN 202280296 U (WANG, Dandan), 20 June 2012 (20.06.2012), the whole document	1-11
A	CN 2610023 Y (LI, Zhiqin), 07 April 2004 (07.04.2004), the whole document	1-11
A	US 20150275548 A1 (JENNINGS, D. et al.), 01 October 2015 (01.10.2015), the whole document	1-11
A	US 6134928 A (KANG S), 24 October 2000 (24.10.2000), the whole document	1-11

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 June 2016 (20.06.2016)	**14 July 2016 (14.07.2016)**
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer **CHAI, Guorong** Telephone No.: (86-10) **62084951**

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2015/091597

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 204311851 U	06 May 2015	None	
CN 202280296 U	20 June 2012	None	
CN 2610023 Y	07 April 2004	None	
US 20150275548 A1	01 October 2015	US 9133646 B1	15 September 2015
		GB 2524732 A	07 October 2015
US 6134928 A	24 October 2000	TW 414827 B	11 December 2000

Form PCT/ISA/210 (patent family annex) (July 2009)