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• **LI, Qiping**

Zhuhai, Guangdong 519000 (CN)

• **YANG, Shaohua**

Zhuhai, Guangdong 519000 (CN)

• **ZHANG, Yongcheng**

Zhuhai, Guangdong 519000 (CN)

• **GAO, Jingyuan**

Zhuhai, Guangdong 519000 (CN)

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(74) Representative: **Inchingalo, Simona**

Bugnion S.p.A.

Viale Lancetti, 17

20158 Milano (IT)

(71) Applicant: **Zhuhai Utaiot Technology Co., Ltd.**

Zhuhai, Guangdong 519000 (CN)

(72) Inventors:

• **LI, Baofu**

Zhuhai, Guangdong 519000 (CN)

(54) **LOCKING MECHANISM, LOCK CYLINDER AND LOCK**

(57) The present invention provides a locking mechanism, a lock cylinder and a lock, and relates to the field of locks. The locking mechanism includes a locking member, a driving mechanism and a self-locking member. The locking member is provided with a locked position for locking a lock bolt and an unlocked position for unlocking the lock bolt. The driving mechanism is configured to drive the locking member to move, such that the locking member may be switched between the locked position and the unlocked position. The self-locking member is configured to prevent the locking member from moving from the locked position to the unlocked position. While the locking member is located in the locked position, the self-locking member may prevent the locking member from moving from the locked position to the unlocked position, self-locking of the locking mechanism is achieved, and while the locking mechanism encounters an external impact or a suction force, the self-locking member may prevent the locking member from leaving the locked position, so as to prevent the locking mechanism from being unlocked.

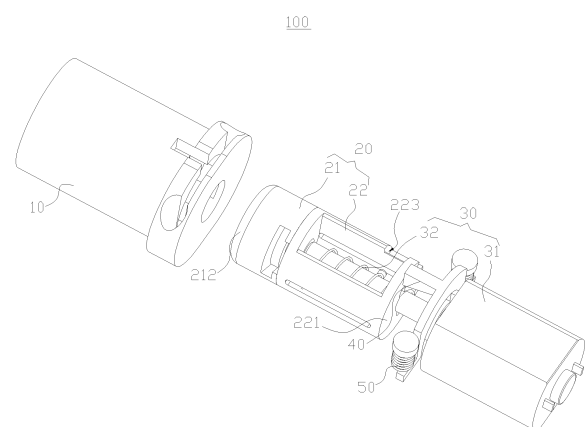


Fig. 1

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Description

Technical Field

[0001] The present invention relates to the field of locks, in particular to a locking mechanism, a lock cylinder and a lock.

Background

[0002] At present, an existing linear locking mechanism may not achieve self-locking in a locked state. While an impact force or a suction force to which a lock is subjected reaches a certain value, a locking member in the locking mechanism has an exit locking position, and the lock has a hidden danger of being unlocked.

Summary

[0003] Some embodiments of the present invention provide a locking mechanism, a lock cylinder, and a lock, as to improve a problem that the lock is easily unlocked while the lock is subjected to an external force.

[0004] In an embodiment of the present invention, a locking mechanism is provided, including a locking member, a driving mechanism and a self-locking member. The locking member is provided with a locked position for locking a lock bolt and an unlocked position for unlocking the lock bolt. The driving mechanism is configured to drive the locking member to move such that the locking member is switched between the locked position and the unlocked position. The self-locking member is configured to prevent the locking member from moving from the locked position to the unlocked position.

[0005] In the above technical scheme, while the locking member is located in the locked position, the self-locking member may prevent the locking member from moving from the locked position to the unlocked position, self-locking of the locking mechanism is achieved, and while the locking mechanism encounters an external impact or a suction force, the self-locking member may prevent the locking member from leaving the locked position, so as to prevent the locking mechanism from being unlocked.

[0006] In addition, the locking mechanism of the embodiment in the first aspect of the present invention also has the following additional technical features.

[0007] In an embodiment of the present invention, the driving mechanism includes a driving unit; while the locking member is axially restricted, the driving unit may drive the locking member to rotate circumferentially; and while the locking member is restricted circumferentially, the driving unit may drive the locking member to move axially.

[0008] In the above technical scheme, the locking member may only perform one of the circumferential rotation and the axial movement at a time, and may not perform the axial movement and the circumferential rotation at the same time, so that two steps of the circumferential rotation and the axial movement must be per-

formed successively in order to achieve locking or unlocking, the complexity of unlocking and locking the locking mechanism is further improved, and the possibility of the locking mechanism being unlocked by an external force is reduced.

[0009] In an embodiment of the present invention, the self-locking member has a first position and a second position; the driving unit is configured to drive the locking member to rotate circumferentially so that the self-locking member is switched between the first position and the second position; while the locking member is located in the first position, the self-locking member may prevent the locking member from moving from the locked position to the unlocked position; and while the locking member is located in the second position, the locking member may be moved from the locked position to the unlocked position.

[0010] In the above technical scheme, the driving unit drives the locking member to operate so as to achieve the switching of the self-locking member between the first position and the second position, thereby the locking member is prevented from moving from the locked position to the unlocked position or the locking member is enabled to move from the locked position to the unlocked position, the self-locking of the locking mechanism is achieved conveniently, and the switching of the position of the self-locking member may be achieved without providing an additional driving structure, an achievement mode is simple, and the structure of the entire locking mechanism is simple and compact.

[0011] In an embodiment of the present invention, the locking member is provided with a locking groove; the driving unit drives the locking member to rotate relative to the self-locking member so that the self-locking member is aligned with the locking groove and located in the second position; while the self-locking member is located in the second position, the driving unit drives the locking member to move axially so that the self-locking member is located in the locking groove, and the locking member is located in the unlocked position.

[0012] In the above technical scheme, the driving unit drives the locking member to rotate so that the self-locking member is located in the second position aligned with the locking groove, and the driving unit drives the locking member to move axially so that the self-locking member is located in the locking groove, namely in order to achieve the unlocking, the driving unit firstly drives the locking member to rotate circumferentially, and then drives the locking member to move axially to achieve the unlocking. The unlocking process thereof is relatively complicated, and it is more difficult to automatically unlock under the impact of an external force.

[0013] In an embodiment of the present invention, the locking mechanism further includes a self-locking resetting member connected with the self-locking member; in a process that the driving unit drives the locking member to rotate so that the self-locking member is separated from the locking groove, the self-locking resetting mem-

ber accumulates an elastic force; and while the locking member is moved axially and located in the locked position, the elastic force may drive the self-locking member to move so that the self-locking member is located in the first position.

[0014] In the above technical scheme, the self-locking resetting member may accumulate the elastic force in the process that the self-locking member is separated from the locking groove, and while the locking member is circumferentially moved to the locked position, the self-locking resetting member may drive the self-locking member to move to the first position under the action of the accumulated elastic force, as to achieve the self-locking of the locking member.

[0015] In an embodiment of the present invention, the locking mechanism further includes a lock body sheathed on an outer side of the locking member; an inner wall of the lock body is provided with an unlocking rail, a locking rail and a communication rail communicating the unlocking rail and the locking rail at intervals; an outer wall of the locking member is provided with a protruding portion; and the driving mechanism drives the locking member to move relative to the lock body, so that the protruding portion cyclically slides along the unlocking rail, the communication rail and the locking rail.

[0016] In the above technical scheme, the driving mechanism drives the locking member to move axially relative to the lock body and rotate circumferentially, so that the protruding portion on the locking member cyclically slides on the unlocking rail, the communication rail, and the locking rail, and the unlocking rail, the communication rail, and the locking rail may guide and limit the axial movement and circumferential rotation of the locking member, it is convenient for the movement of the locking member along a prescribed path, and the unlocking rail and the locking rail may restrict the rotation range of the locking member, and a situation that the locking member may not be moved to the locked position or the unlocked position due to the excessive rotation and insufficient rotation is avoided.

[0017] In an embodiment of the present invention, the driving mechanism further includes an output shaft connected with the driving unit and a spring sheathed on the output shaft; the output shaft is provided with two limiting posts opposite to each other, and the two limiting posts penetrate through the spring; and the driving unit drives the output shaft to rotate and may push the locking member to move axially through two ends of the spring.

[0018] In the above technical scheme, the rotation of the output shaft of the driving unit is converted into the axial movement of the spring, thereby the locking member is driven to move axially, it is achieved conveniently, and the characteristics of the spring itself determine that it has an energy storage function.

[0019] In an embodiment of the present invention, the locking member includes a first locking member and a second locking member, the first locking member and the second locking member are rotatably connected; the

driving mechanism is configured to drive the second locking member to rotate, and the two ends of the spring are respectively limited to the first locking member and the second locking member.

[0020] In the above technical scheme, the locking member includes the first locking member and the second locking member that may be rotated relatively, and the driving mechanism is configured to drive the second locking member to rotate. While the first locking member is locked by the external force, the driving mechanism may still be rotated and drive the second locking member to rotate relative to the first locking member, as to prevent the driving mechanism from blocking and affecting the service life. After the external force acting on the first locking member disappears, the driving mechanism may drive the locking member to move axially or rotate circumferentially.

[0021] The present invention further provides a lock cylinder, including a lock housing, a lock bolt, and the above locking mechanism; and the lock bolt is movably arranged on the lock housing, and the locking mechanism is arranged in the lock housing.

[0022] In the above technical scheme, while the locking member is located in the locked position for locking the lock bolt, the self-locking member may prevent the locking member from moving to the unlocked position, and prevent the lock bolt from being automatically unlocked while the lock bolt is impacted by the external force, and the lock bolt may be locked more firmly and reliably.

[0023] The present invention further provides a lock, including a lock beam and the above lock cylinder. The lock beam is movably arranged on the lock housing; while the lock member is located in the locked position, the locking member locks the lock bolt, as to lock the lock beam; and while the locking member is located in the unlocked position, the locking member may release the lock bolt, so that the lock bolt may be moved relative to the lock housing, as to unlock the lock beam.

[0024] In the above technical scheme, while the locking member is located in the locked position for locking the lock bolt, the lock beam is locked, and the self-locking member may prevent the locking member from moving to the unlocked position, and prevent the lock from being automatically unlocked while impacted by the external force, so that the safety performance of the lock is better.

Brief Description of the Drawings

[0025] In order to describe technical schemes of embodiments of the present invention more clearly, used drawings needed in the embodiments are briefly introduced below. It should be understood that the following drawings only show some embodiments of the present invention, and therefore it should not be regarded as limitation to a scope. For those of ordinary skill in the art, other related drawings may be obtained on the basis of these drawings without creative work.

Fig. 1 is a schematic diagram of a locking mechanism provided by an embodiment of the present invention from a first perspective.

Fig. 2 is a schematic diagram of a locking mechanism provided by an embodiment of the present invention from a second perspective.

Fig. 3 is a schematic diagram of a locking mechanism provided by an embodiment of the present invention from a third perspective.

Fig. 4 is a cross-sectional view of a locking mechanism provided by an embodiment of the present invention.

Fig. 5 is a schematic diagram of a locking mechanism provided by an embodiment of the present invention without a housing.

Fig. 6 is a schematic diagram of an unlocking rail, a locking rail and a communication rail on the housing.

Fig. 7 is a schematic diagram of a locking member located in a locked position and a self-locking member located in a first position.

Fig. 8 is a schematic diagram of the locking member located in the locked position and the self-locking member aligned with a locking groove.

Fig. 9 is a schematic diagram of the locking member located in an unlocked position and the self-locking member locked into the locking groove.

Fig. 10 is a schematic diagram of the locking member located in the unlocked position and the self-locking member exiting from the locking groove.

Fig. 11 is a structure schematic diagram of a lock cylinder with the locking member located in the locked position provided by an embodiment of the present invention.

Fig. 12 is a structure schematic diagram of a lock cylinder with the locking member located in the unlocked position provided by an embodiment of the present invention.

Fig. 13 is a schematic diagram of a locked padlock provided by an embodiment of the present invention.

Fig. 14 is a schematic diagram of an unlocked padlock provided by an embodiment of the present invention.

Fig. 15 is a schematic diagram of a delay-locked padlock provided by an embodiment of the present in-

vention.

[0026] Herein, the above drawings include the following reference signs:

- 5 100. Locking mechanism; 10. Lock body; 11. Unlocking rail; 12. Locking rail; 13. Communication rail; 20. Locking member; 21. First locking member; 212. Locking end; 22. Second locking member; 221. Limiting end; 222. Protruding portion; 223. Locking groove; 30. Driving mechanism; 31. Driving unit; 311. Output shaft; 312. Limiting post; 32. Spring; 40. Self-locking member; 50. Self-locking resetting member; 200. Lock cylinder; 210. Lock housing; 211. First locking hole; 213. Second locking hole; 220. Lock bolt; 224. Inserting groove; 300. Padlock; 310. Lock beam; 313. First locking rod; 314. Locking slot; and 315. Second locking rod.

Detailed Description of the Embodiments

20 **[0027]** In order to make purposes, technical schemes and advantages of embodiments of the present invention clearer, the technical schemes in the embodiments of the present invention are clearly and completely described below with reference to the drawings in the embodiments of the present invention. Apparently, the embodiments described are a part of the embodiments of the present invention, but not all of the embodiments. Assemblies of the embodiments of the present invention generally described and shown in the drawings herein may be arranged and designed in various different configurations.

30 **[0028]** As shown in Figs. 1 to 4, an embodiment of the present invention provides a locking mechanism 100, including a locking member 20, a driving mechanism 30 and a self-locking member 40. The locking member 20 is provided with a locked position for locking a lock bolt and an unlocked position for unlocking the lock bolt. The driving mechanism 30 is configured to drive the locking member 20 to move so that the locking member 20 is switched between the locked position and the unlocked position. The self-locking member 40 is configured to prevent the locking member 20 from moving from the locked position to the unlocked position. While the locking member 20 is located in the locked position, the self-locking member 40 may prevent the locking member 20 from moving from the locked position to the unlocked position, and self-locking of the locking mechanism 100 is achieved. While the locking mechanism 100 is subjected to an external impact or a suction force, the self-locking member 40 may prevent the locking member 20 from leaving the locked position and prevent the locking mechanism 100 from being unlocked.

40 **[0029]** In the embodiment, as shown in Figs. 4 and 5, the driving mechanism 30 includes a driving unit 31; while the locking member 20 is axially limited, the driving unit 31 may drive the locking member 20 to rotate circumferentially; and while the locking member 20 is circumferentially limited, the driving unit 31 may drive the locking

member 20 to move axially. The locking member 20 may only perform one of the circumferential rotation and the axial movement at a time, and may not perform the axial movement and the circumferential rotation at the same time, so that two steps of the circumferential rotation and the axial movement must be performed successively in order to achieve locking or unlocking, the complexity of unlocking and locking the locking mechanism 100 is further improved, and the possibility of the locking mechanism 100 being unlocked by an external force is reduced.

[0030] Herein, the driving mechanism 30 further includes an output shaft 311 connected with the driving unit 31 and a spring 32 sheathed on the output shaft 311; the output shaft 311 is provided with two limiting posts 312 opposite to each other, and the two limiting posts 312 penetrate through the spring 32; and the driving unit 31 drives the output shaft 311 to rotate and may push the locking member 20 to move axially through two ends of the spring 32. The circumferential rotation of the output shaft 311 of the driving unit 31 is converted into the axial movement of the spring 32, thereby the locking member 20 is driven to move axially, it is achieved conveniently, and the characteristics of the spring 32 itself determine that it has an energy storage function.

[0031] In the embodiment, the two limiting posts 312 on the output shaft 311 extend along a radial direction of the output shaft 311, the spring 32 is sheathed on an outer side of the output shaft 311 of the driving unit 31, and the two limiting posts 312 are away from each other and extend from the spring 32 along a radial direction of the spring 32.

[0032] The limiting posts 312 on the output shaft 311 of the driving unit 31 extend radially from a gap between two adjacent coils of the spring 32. After the circumferential direction of the locking member 20 is limited, the rotation of the output shaft 311 of the driving unit 31 enables the limiting posts 312 to be inserted in the gap between any two adjacent coils, so that the spring 32 may be moved axially along the output shaft 311 of the driving unit 31, thereby the locking member 20 is driven to move axially; and after the locking member 20 is axially limited, the spring 32 may not be moved axially along the output shaft 311 of the driving unit 31, and the rotation of the output shaft 311 of the driving unit 31 may give a torsion force to the spring 32, so that the spring 32 may drive the locking member 20 to rotate. In the embodiment, the driving unit 31 includes a motor.

[0033] In other embodiments, the driving mechanism 30 may also be other forms. For example, the driving mechanism 30 is a screw motor, the locking member 20 is screwed on a screw rod of the screw motor, and the screw motor may convert the rotation of the screw rod into the linear movement of the locking member 20. The forward rotation of the screw motor may cause the locking member 20 to move towards a direction close to the locked position, and the reverse rotation of the screw motor may cause the locking member 20 to move towards the unlocked position.

[0034] In other embodiments, the circumferential rotation and axial movement of the locking member 20 driven by the driving unit 31 may also be implemented in other modes. For example, a spiral groove is provided on an inner wall of the locking member 20, and the two limiting posts 312 on the output shaft 311 of the driving unit 31 are inserted into the spiral groove. While the driving unit 31 drives the output shaft 311 to rotate, the limiting posts 312 may slide in the different coils of the spiral groove so that the locking member 20 is moved axially.

[0035] Further, the locking member 20 includes a first locking member 21 and a second locking member 22, the first locking member 21 and the second locking member 22 are rotatably connected; the driving mechanism 30 is configured to drive the second locking member 22 to rotate, and the two ends of the spring 32 are respectively limited to the first locking member 21 and the second locking member 22. The locking member 20 includes the first locking member 21 and the second locking member 22 that may be rotated relatively, and the driving mechanism 30 is configured to drive the second locking member 22 to rotate. While the first locking member 21 is locked by the external force, the driving mechanism 30 may still be rotated and drive the second locking member 22 to rotate relative to the first locking member 21, as to prevent the driving mechanism 30 from blocking and affecting the service life. After the external force acting on the first locking member 21 disappears, the driving mechanism 30 may drive the locking member 20 to move or rotate.

[0036] Certainly, in other embodiments, the locking member 20 may also be an integral structure.

[0037] Herein, the two ends of the spring 32 may be respectively connected to an inner wall of the second locking member 22, and the limiting posts 312 on the output shaft 311 of the driving unit 31 extend radially from the gap between the two adjacent coils of the spring 32. While the circumferential direction of the locking member 20 is limited, the rotation of the output shaft 311 of the driving unit 31 enables the limiting posts 312 to be inserted in the gap between any two adjacent coils, so that the spring 32 may be moved axially along the output shaft 311 of the driving unit 31, thereby the locking member 20 is driven to move axially; while the locking member 20 is axially limited, the spring 32 may not be moved axially along the output shaft 311 of the driving unit 31, the rotation of the output shaft 311 of the driving unit 31 may give a torsion force to the spring 32, so that the spring 32 drives the second locking member 22 to rotate. While the first locking member 21 may not be rotated and moved axially under the action of the external force, because the first locking member 21 and the second locking member 22 may be relatively rotated, so that the driving unit 31 may still drive the second locking member 22 to rotate without blocking the rotation of the driving unit 31, and at the same time, the spring 32 may accumulate an elastic force. After the external force disappears, the locking member 20 may be immediately moved axially or

rotated circumferentially, so that the locking member 20 may be moved to the unlocked position or the locked position.

[0038] In the embodiment, the self-locking member 40 has a first position and a second position; the driving unit 31 is configured to drive the locking member 20 to rotate circumferentially so that the self-locking member 40 is switched between the first position and the second position; while the locking member 20 is located in the first position, the self-locking member 40 may prevent the locking member 20 from moving from the locked position to the unlocked position; while the locking member 20 is located in the second position, the locking member 20 may be moved from the locked position to the unlocked position. The driving unit 31 drives the locking member 20 to operate so as to achieve the switching of the self-locking member 40 between the first position and the second position, thereby the locking member 20 is prevented from moving from the locked position to the unlocked position or the locking member 20 is enabled to move from the locked position to the unlocked position, the self-locking of the locking mechanism 100 is achieved conveniently, and the switching of the position of the self-locking member 40 may be achieved without providing an additional driving structure, an achievement mode is simple, and the structure of the entire locking mechanism 100 is simple and compact.

[0039] Herein, the locking mechanism 100 further includes a lock body 10 sheathed on an outer side of the locking member 20; an inner wall of the lock body 10 is provided with an unlocking rail 11, a locking rail 12 and a communication rail 13 communicating the unlocking rail 11 and the locking rail 12 at intervals; an outer wall of the locking member 20 is provided with a protruding portion 222; and the driving mechanism 31 drives the locking member 20 to move relative to the lock body 10, so that the protruding portion 222 cyclically slides along the unlocking rail 11, the communication rail 13 and the locking rail 12. The unlocking rail 11, the communication rail 13, and the locking rail 12 may guide and limit the axial movement and circumferential rotation of the locking member 20, it is convenient for the movement of the locking member 20 along a prescribed path, and the unlocking rail 11 and the locking rail 12 may restrict the rotation range of the locking member 20, and a situation that the locking member 12 may not be moved to the locked position or the unlocked position due to the excessive rotation and insufficient rotation is avoided.

[0040] As shown in Fig. 3 and Fig. 6, the inner wall of the lock body 10 is provided with the unlocking rail 11 and the locking rail 12, the unlocking rail 11 and the locking rail 12 extend along a rear direction of the lock body 10, and the outer wall of the locking member 20 is provided with a protruding portion 222; while the protruding portion 222 is located on the locking rail 12, the locking rail 12 restricts the locking member 20 from rotating forwards; and while the protruding portion 222 is located on the unlocking rail 11, the unlocking rail 11 restricts the

locking member 20 from rotating reversely. The locking rail 12 and the unlocking rail 11 respectively restrict the forward rotation and the reverse rotation of the locking member 20, thereby the rotation range of the locking member 20 is restricted, and a situation of the excessive rotation or insufficient rotation is avoided.

[0041] The unlocking rail 11 and the locking rail 12 are communicated through the communication rail 13. The locking member 20 may slide along the communication rail 13 so that the self-locking member 40 is switched between the first position and the second position, and it is convenient for the stable rotation of the locking member 20 and the restriction of the axial movement of the locking member 20. Herein, the unlocking rail 11, the locking rail 12 and the communication rail 13 are all arranged on the inner wall of the lock body 10. In the embodiment, there is a plurality of the communication rails 13 arranged at intervals along an axial direction.

[0042] In other embodiments, only one axially extended rectangular rail may be arranged on the inner wall of the lock body 10, and two opposite side walls of the rectangular rail in the circumferential direction of the lock body 10 respectively restrict the forward rotation and reverse rotation of the locking member 20. While the locking member 20 is rotated between the two circumferential side walls of the rectangular rail, the self-locking member 40 may be aligned, separated or staggered with the locking groove 223, and two opposite side walls on the rectangular rail in the axial direction of the locking member 20 respectively limit the locking member 20 axially while the locking member 20 is located in the unlocked position and the locked position; an "L"-shaped rail may also be arranged on the inner wall of the lock body 10, namely the axial movement of the locking member 20 is performed in a same circumferentially extended rail portion, and the forward rotation and reverse rotation of the locking member 20 are both performed in the same circumferentially extended rail portion. Certainly, the form of the rail may also be other forms that may guarantee the axial movement and the circumferential rotation of the locking member.

[0043] The driving unit 31 may drive the locking member 20 to move axially so that the locking member 20 is switched between the unlocked position and the locked position, and the driving unit 31 may drive the locking member 20 to rotate circumferentially so that the self-locking member 40 is switched between the first position and the second position.

[0044] The locking member 20 is provided with the locking groove 223; the driving unit 31 drives the locking member 20 to rotate relative to the self-locking member 40 so that the self-locking member 40 is aligned with the locking groove 223 and located in the second position, namely the second position of the self-locking member 40 is a position in which the self-locking member 40 is aligned with the locking groove 223; while the self-locking member 40 is located in the second position, the driving unit 31 drives the locking member 20 to move axially so

that the self-locking member 40 is located in the locking groove 223, and the locking member 20 is located in the unlocked position. The driving unit 31 drives the locking member 20 to rotate so that the self-locking member 40 is located in the second position aligned with the locking groove 223, and the driving unit 31 drives the locking member 20 to move axially so that the self-locking member 40 is located in the locking groove 223, namely in order to achieve the unlocking, the driving unit 31 firstly drives the locking member 20 to rotate circumferentially, and then drives the locking member 20 to move axially to achieve the unlocking. The unlocking process thereof is more complicated, it is more difficult to automatically unlock under the impact of the external force, a risk that the locking mechanism 100 is unlocked while the locking mechanism 100 is impacted by the external force is further reduced, and the reliability of locking of the locking mechanism 100 is improved.

[0045] It should be noted that in the embodiment, the first position and the second position of the self-locking member 40 are relative to the locking member 20, namely while the locking member 20 is moved, the position of the self-locking member 40 relative to the locking member 20 may be changed, and it does not mean that the self-locking member 40 needs to be moved by itself so that it may be switched between the first position and the second position. For example, while the locking member 20 is located in the locked position, the self-locking member 40 abuts against the locking member 20, the self-locking member 40 is located in the first position at this time, and if the driving unit 31 drives the locking member 20 to rotate reversely so that the locking groove 223 is aligned with the self-locking member 40, the self-locking member 40 is located in the second position at this time, the self-locking member 40 is in a state in which it does not abut against the locking member 20, and the position of the self-locking member 40 relative to the lock body 10 is not changed, but the self-locking member 40 is moved relative to the locking member 20 from the first position to the second position because of the rotation of the locking member 20.

[0046] The locking mechanism 100 further includes a self-locking resetting member 50 connected to the self-locking member 40; in a process that the driving unit 31 drives the locking member 20 to rotate so that the self-locking member 40 is separated from the locking groove 223, the self-locking resetting member 50 accumulates an elastic force; and while the locking member 20 is moved axially and located in the locked position, the elastic force may drive the self-locking member 40 to move so that the self-locking member 40 is located in the first position. The self-locking resetting member 50 may accumulate the elastic force in the process that the self-locking member 40 is separated from the locking groove 223, and while the locking member 20 is moved circumferentially to the locked position, the self-locking resetting member 50 may drive the self-locking member 40 to move to the first position under the action of the elastic

force accumulated, as to achieve self-locking of the locking member 20.

[0047] The self-locking resetting member 50 is connected between the self-locking member 40 and the lock body 10, and the self-locking resetting member 50 may be an elastic structure such as a spring or an elastic sheet. While the locking member 20 is located in the unlocked position, the self-locking member 40 is locked in the locking groove 223, the protruding portion 222 on the locking member 20 is located on the unlocking rail 11, and in a process that the driving unit 31 drives the locking member 20 to rotate forwards along the communication rail 13, the locking member 20 drives the self-locking member 40 to overcome an elastic force of the self-locking resetting member 50 to move, so that the self-locking member 40 exits from the locking groove 223. After the self-locking member 40 exits from the locking groove 223, the driving unit 31 continues to drive the locking member 20 to rotate forwards so that the protruding portion 222 is located in the locking rail 12 and the protruding portion 222 is moved along the locking rail 12 so that the locking member 20 is moved axially to the locked position. While the locking member 20 is located in the locked position, the self-locking resetting member 50 drives the self-locking member 40 to move under the action of the elastic force, so that the self-locking member 40 is staggered with the locking groove 223 and abuts against one end of the locking member 20 in the axial direction. The arrangement of the self-locking resetting member 50 not only enables the self-locking member 40 to exit from the locking groove 223 smoothly, but also enables the self-locking member 40 to automatically stagger with the locking groove 223 and abut against the one end of the locking member 20 in the axial direction while the locking member 20 is moved axially to the locked position, as to achieve axial locking of the locking element 20.

[0048] In order that the self-locking member 40 is conveniently separated from the locking groove 223, at least one of a side surface of the self-locking member 40 that is configured to contact with the locking groove 223 and a side surface of the locking groove 223 that is configured to contact with the self-locking member 40 in a separating process is set as an inclined surface or an arc surface, and a situation that the side surfaces of the self-locking member 40 and the locking groove 223 contacting with each other are completely locked mutually so that the self-locking member 40 may not be separated from the locking groove 223 is avoided in the process that the driving unit 31 drives the locking member 20 to rotate forwards along the communication rail 13.

[0049] It should be noted that, in the embodiment, the locking member 20 has opposite limiting end 221 and locking end 212 in the axial direction. While the self-locking member 40 abuts against the locking member 20, the self-locking member 40 abuts against the limiting end 221 of the locking member 20, namely the first position of the self-locking member 40 is a position abutting against the limiting end 221, and the locking groove 223

is provided with openings on the limiting end 221 of the locking member 20 and an outer peripheral wall of the locking member 20, the self-locking member 40 aligned or staggered with the locking groove 223 means that the self-locking member 40 is aligned or staggered with the opening, located on the limiting end 221, of the locking groove 223, and the self-locking member 40 separated from the locking groove 223 means that the self-locking member 40 exits from the opening, located on the outer peripheral wall of the locking member, of the locking groove 223.

[0050] In other embodiments, the locking groove 223 may also have only one opening, the opening is provided on the outer peripheral wall of the locking member 20, and the self-locking member 40 is connected to the lock body 10 through the self-locking resetting member 50. The self-locking member 40 may be inserted into or exit from the locking groove 223 through the opening on the side wall by moving in the radial direction of the locking member 20, and the locking member 223 has two opposite side walls in the axial direction of the locking member 20. While the self-locking member 40 is inserted into the locking groove 223, the two side walls, located in the axial direction of the locking member 20, of the locking groove 223 interact with the self-locking member 40 to restrict the axial movement of the locking member 20; in the process that the driving unit 31 drives the locking member 20 to rotate circumferentially, the self-locking resetting member 50 may accumulate the elastic force, and the self-locking member 40 may exit from the locking groove 223 along a side wall of the locking groove 223 in the circumferential direction of the locking member 20. The axial limitation of the locking member 20 by the self-locking member 40 is released, so that the driving unit 31 may drive the locking member 20 to move axially so that the locking member 20 may be switched between the locked position and the unlocked position.

[0051] While the locking member 20 is located in the locked position, the self-locking member 40 is inserted into the locking groove 223, and the self-locking member 40 cooperates with the axial side wall of the locking groove 223 to restrict the locking member 20 from moving from the locked position to the unlocked position. In order to unlock, the driving unit 31 drives the locking member 20 to rotate circumferentially, the self-locking resetting member 50 may accumulate the elastic force, and the self-locking member 40 exits from the locking groove 223 along a side wall in the circumferential direction of the locking groove 223. At this time, the self-locking member 40 does not axially limit the locking member 20, the driving unit 31 drives the locking member 20 to move axially, the locking member 20 is moved from the locked position to the unlocked position, and the self-locking member 40 contacts with a portion of the outer peripheral wall, without providing the locking groove 223, of the locking member 20; and while the locking member 20 is located in the unlocked position, the self-locking member 40 does not axially limit the locking member 20, the driving unit 31

drives the locking member 20 to move axially to the locked position, and the driving unit 31 drives the locking member 20 again to rotate circumferentially so that the self-locking member 40 is aligned with the locking groove 223 in the radial direction. After the self-locking member 40 is aligned with the locking groove 223, the self-locking member 40 is moved and inserted into the locking groove 223 under the action of the elastic force of the self-locking resetting member 50, as to prevent the locking member 20 from moving from the locked position to the unlocked position.

[0052] As shown in Figs. 7-9, while the locking member 20 is located in the locked position, at this time, the self-locking member 40 is staggered with the locking groove 223 on the locking member 20 and abuts against the limiting end 221 of the locking member 20, and the protruding portion 222 on the locking member 20 is located at one end, close to the locking end 212, of the locking rail 12 and aligned with the communication rail 13. The locking rail 12 restricts the locking member 20 from rotating forwards, but allows the locking member 20 to rotate reversely. In order to achieve the unlocking, the driving unit 31 is rotated reversely, thereby the locking member 20 is also driven to be reversely rotated in the communication rail 13 to the position in which the self-locking member 40 is aligned with the locking groove 223, even if the self-locking member 40 is located in the first position, and the protruding portion 222 on the locking member 20 is located on the unlocking rail 11. Since the locking groove 223 on the locking member 20 is aligned with the self-locking member 40, the locking member 20 has a space to move to the unlocked position. The unlocking rail 11 restricts the locking member 20 from rotating reversely, but allows the locking member 20 to move axially. At this time, the driving unit 31 continues to rotate reversely so that the locking member 20 may be driven to move along the unlocking rail 11 from the locked position to the unlocked position, and finally the self-locking member 40 is inserted into the locking groove 223, and the locking member 20 is located in the unlocked position. While the locking member 20 is located in the unlocked position, the protruding portion 222 on the locking member 20 is located at one end, close to the limiting end 221, of the unlocking rail 11.

[0053] As shown in Fig. 7 and Figs. 9-10, while the locking member 20 is located in the unlocked position, at this time, the self-locking member 40 is locked into the locking groove 223 on the locking member 20, and the protruding portion 222 on the locking member 20 is located on the unlocking rail 11 and aligned with the communication rail 13. The unlocking rail 11 restricts the locking member 20 from rotating reversely, but allows the locking member 20 to rotate forwards. In order to achieve locking, the driving unit 31 is rotated forwards, thereby the locking member 20 is also driven to rotate forwards in the communication rail 13 and the protruding portion 222 may be rotated into the locking rail 12. In a process that the locking member 20 is rotated along the commu-

nication rail 13, the self-locking member 40 exits from the locking groove 223 on the locking member 20, other outer peripheral walls, except the locking groove 223, on the locking member 20 push the self-locking member 40 in a direction away from the axis of the locking member 20, and the self-locking resetting member 50 is stretched to accumulate the elastic force, and the self-locking member 40 is tightly attached to the outer peripheral wall of the locking member 20 under the action of a pulling force of the self-locking resetting member 50. The locking rail 12 restricts the locking member 20 from rotating forwards, but allows the locking member 20 to move axially, and the driving unit 31 is continuously rotated forwards so that the locking member 20 may be driven to move along the locking rail 12 from the unlocked position to the locked position. After the locking member 20 is moved axially until the outer wall of the locking member 20 is separated from the self-locking member 40, the self-locking resetting member 50 drives the self-locking member 40 to move under the action of the elastic force, so that the self-locking member 40 is staggered with the locking groove 223 and abuts against the limiting end 221, and the locking member 20 is finally locked.

[0054] Certainly, the self-locking resetting member 50 may also be gradually compressed in a process that the self-locking member 40 exits from the locking groove 223, and this is related to an installation mode of the self-locking resetting member 50.

[0055] It should be noted that, in Figs. 7-10, A represents a forward direction, and B represents a reverse direction.

[0056] In an embodiment of the present invention, a lock cylinder 200 is provided, and the lock cylinder 200 includes a lock housing 210, a lock bolt 220 and a locking mechanism 100; the lock bolt 220 is movably arranged on the lock housing 210, and the locking mechanism 100 is arranged in the lock housing 210. While the locking member 20 is located in the locked position for locking the locking tongue 220, the self-locking member 40 may prevent the locking member 20 from moving to the unlocked position, the lock bolt 220 is prevented from being automatically unlocked while impacted by the external force, and the lock bolt 220 may be locked more firmly and reliably.

[0057] As shown in Fig. 11 and Fig. 12, the lock bolt 220 is connected to the lock housing 210 through an elastic member, the driving unit 31 and the lock body 10 are both fixed in position relative to the lock housing 210, and the driving unit 31 and the lock body 10 may be connected in the lock housing 210 through modes such as a bolt, or may be directly limited in the lock housing 210 through a limiting structure such as a limiting groove. The lock bolt 220 is provided with an inserting groove 224 into which the locking member 20 is inserted. While the locking member 20 is inserted into the inserting groove 224, the locking member 20 is located in the locked position for locking the lock bolt 220, the lock bolt 220 is driven, and the lock bolt 220 may not be moved relative to the

lock housing 210; and while the locking member 20 exits from the inserting groove 224, the locking member 20 is located in the unlocked position for unlocking the lock bolt 220, the lock bolt 220 is driven, and the lock bolt 220 may be moved relative to the lock housing 210.

[0058] An embodiment of a third aspect of the present invention provides a lock, including a lock beam 310 and the lock cylinder 200. The lock beam 310 is movably arranged on the lock housing 210; while the locking member 20 is located in the locked position, the locking member 20 locks the lock bolt 220, as to lock the lock beam 310; and while the locking member 20 is located in the unlocked position, the locking member 20 releases the lock bolt 220, so that the lock bolt 220 may be moved relative to the lock housing 210, as to unlock the lock beam 310.

[0059] While the locking mechanism 100 locks the lock beam 310, the self-locking member 40 may automatically abut against the limiting end 221 of the locking member 20, and while the lock is subjected to an external impact or a suction force, the self-locking member 40 may prevent the locking member 20 from leaving the locked position, and prevent the lock from being automatically unlocked, so that the safety performance of the lock is better.

[0060] Exemplarily, as shown in Fig. 13 and Fig. 14, the lock is a padlock 300, and the lock beam 310 is a U-shaped lock beam of the padlock 300. The lock beam 310 includes a first lock rod 313 and a second lock rod 315 that are arranged oppositely. The first lock rod 313 is provided with a locking slot 314, and the lock housing 210 is provided with a first locking hole 211 and a second locking hole 213 corresponding to the first lock rod 313 and the second lock rod 315. The first lock rod 313 is movably inserted in the first locking hole 211. The movement of the first lock rod 313 in the first locking hole 211 enables the lock bolt 220 to enter or leave the locking slot 314. While the lock bolt 220 enters the locking slot 314, the lock bolt 220 is located in the locked position, the locking member 20 is located in the locked position, the locking member 20 locks the lock bolt 220 in the locked position, and the padlock 300 is locked. While the padlock 300 is locked, the second lock rod 315 is inserted into the second locking hole 213. While the locking member 20 is located in the unlocked position, the first lock rod 313 may be moved along the first locking hole 211 so that the lock bolt 220 is moved relative to the lock housing 210 and separated from the locking slot 314, and the padlock 300 is unlocked. While the padlock 300 is unlocked, the second lock rod 315 may be separated from the second locking hole 213.

[0061] As shown in Fig. 15, the lock bolt 220 does not enter the locking slot 314 yet, at this time, the lock bolt 220 restricts the locking member 20 from moving to the locked position. At this time, the driving mechanism 30 may still drive the second locking member 22 to rotate relative to the first locking member 22 and cause the spring 32 to accumulate the elastic force. While the lock

bolt 220 is located in the locking slot 314, the elastic force accumulated by the spring 32 may cause the locking member 20 to move to the locked position.

[0062] It should be noted that the locking mechanism 100 in the present invention is not limited to be just applied to the padlock 300, and other types of locks such as a flat lock are also applicable. While the locking mechanism 100 is applied to different types of the locks, the structure of the lock beam 310 may be different accordingly.

[0063] The above are only preferred embodiments of the present invention, and are not configured to limit the present invention. For those skilled in the art, the present invention may have various modifications and changes. Any modifications, equivalent replacements, improvements and the like made within the spirit and principle of the present invention shall be included in a scope of protection of the present invention.

Claims

1. A locking mechanism, comprising:

a locking member, wherein the locking member is provided with a locked position for locking a lock bolt and an unlocked position for unlocking the lock bolt;

a driving mechanism, wherein the driving mechanism is configured to drive the locking member to move such that the locking member is switched between the locked position and the unlocked position; and

a self-locking member, wherein the self-locking member is configured to prevent the locking member from moving from the locked position to the unlocked position.

2. The locking mechanism as claimed in claim 1, wherein the driving mechanism comprises a driving unit;

while the locking member is axially restricted, the driving unit is able to drive the locking member to rotate circumferentially; and

while the locking member is restricted circumferentially, the driving unit is able to drive the locking member to move axially.

3. The locking mechanism as claimed in claim 2, wherein the self-locking member has a first position and a second position;

the driving unit is configured to drive the locking member to rotate circumferentially so that the self-locking member is switched between the first position and the second position;

while the locking member is located in the first position, the self-locking member is able to pre-

vent the locking member from moving from the locked position to the unlocked position; and while the locking member is located in the second position, the locking member is moved from the locked position to the unlocked position.

4. The locking mechanism as claimed in claim 3, wherein the locking member is provided with a locking groove;

the driving unit drives the locking member to rotate relative to the self-locking member so that the self-locking member is aligned with the locking groove and located in the second position; and

while the self-locking member is located in the second position, the driving unit drives the locking member to move axially so that the self-locking member is located in the locking groove, and the locking member is located in the unlocked position.

5. The locking mechanism as claimed in claim 4, wherein the locking mechanism further comprises a self-locking resetting member connected with the self-locking member; and

in a process that the driving unit drives the locking member to rotate so that the self-locking member is separated from the locking groove, the self-locking resetting member accumulates an elastic force; and while the locking member is moved axially and located in the locked position, the elastic force is able to drive the self-locking member to move so that the self-locking member is located in the first position.

6. The locking mechanism as claimed in any one of claims 1-5, wherein the locking mechanism further comprises a lock body sheathed on an outer side of the locking member;

an inner wall of the lock body is provided with an unlocking rail, a locking rail and a communication rail communicating the unlocking rail and the locking rail at intervals;

an outer wall of the locking member is provided with a protruding portion; and

the driving mechanism drives the locking member to move relative to the lock body, so that the protruding portion cyclically slides along the unlocking rail, the communication rail and the locking rail.

7. The locking mechanism as claimed in any one of claims 2-5, wherein the driving mechanism further comprises an output shaft connected with the driving unit and a spring sheathed on the output shaft;

the output shaft is provided with two limiting

posts opposite to each other, and the two limiting posts penetrate through the spring; and the driving unit drives the output shaft to rotate and is able to push the locking member to move axially through two ends of the spring.

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8. The locking mechanism as claimed in claim 7, wherein the locking member comprises a first locking member and a second locking member, the first locking member and the second locking member are rotatably connected; and the driving mechanism is configured to drive the second locking member to rotate, and the two ends of the spring are respectively limited to the first locking member and the second locking member.

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9. A lock cylinder, comprising a lock housing, a lock bolt, and the locking mechanism as claimed in any one of claims 1-8; and the lock bolt is movably arranged on the lock housing, and the locking mechanism is arranged in the lock housing.

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10. A lock, comprising:

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a lock beam; and

the lock cylinder as claimed in claim 9, wherein the lock beam is movably arranged on the lock housing;

while the lock member is located in the locked position, the locking member locks the lock bolt, as to lock the lock beam; and

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while the locking member is located in the unlocked position, the locking member releases the lock bolt, so that the lock bolt is moved relative to the lock housing, as to unlock the lock beam.

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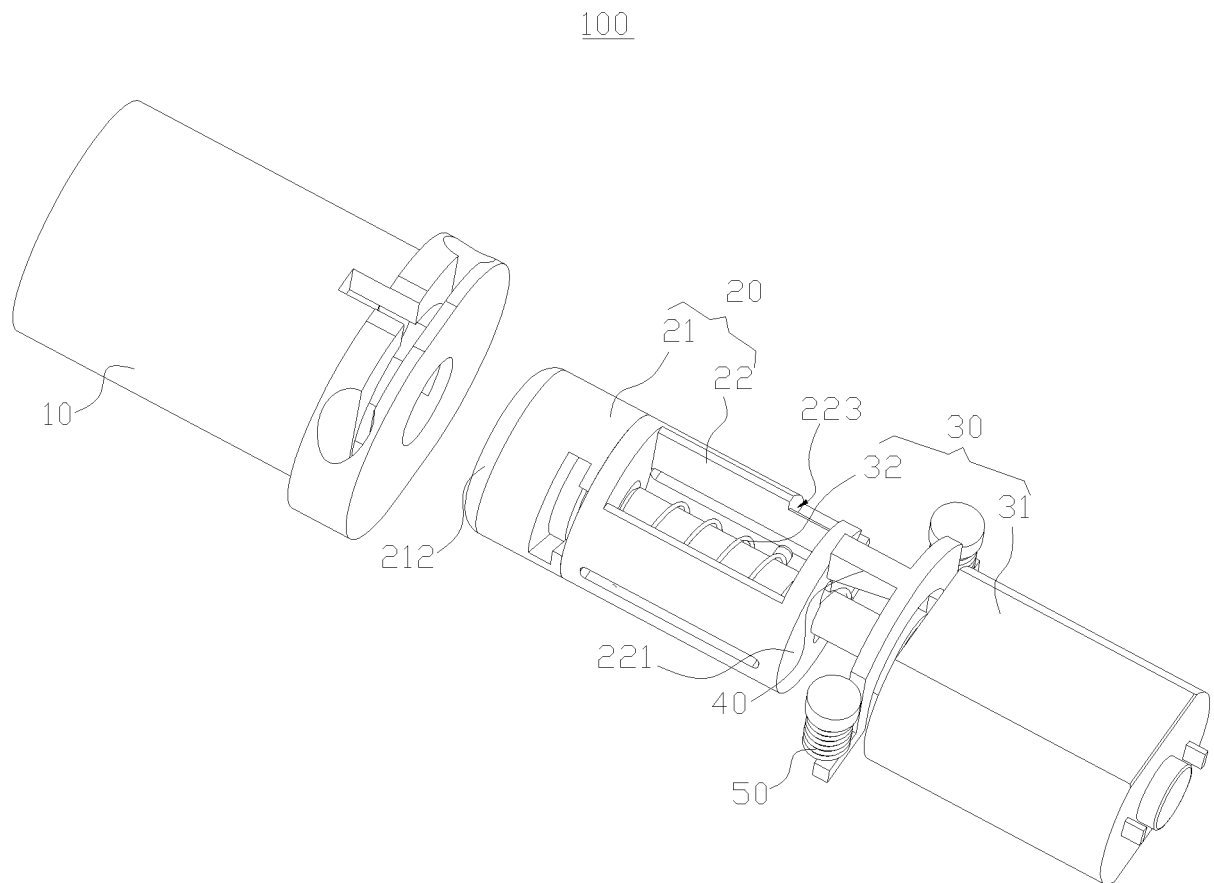


Fig. 1

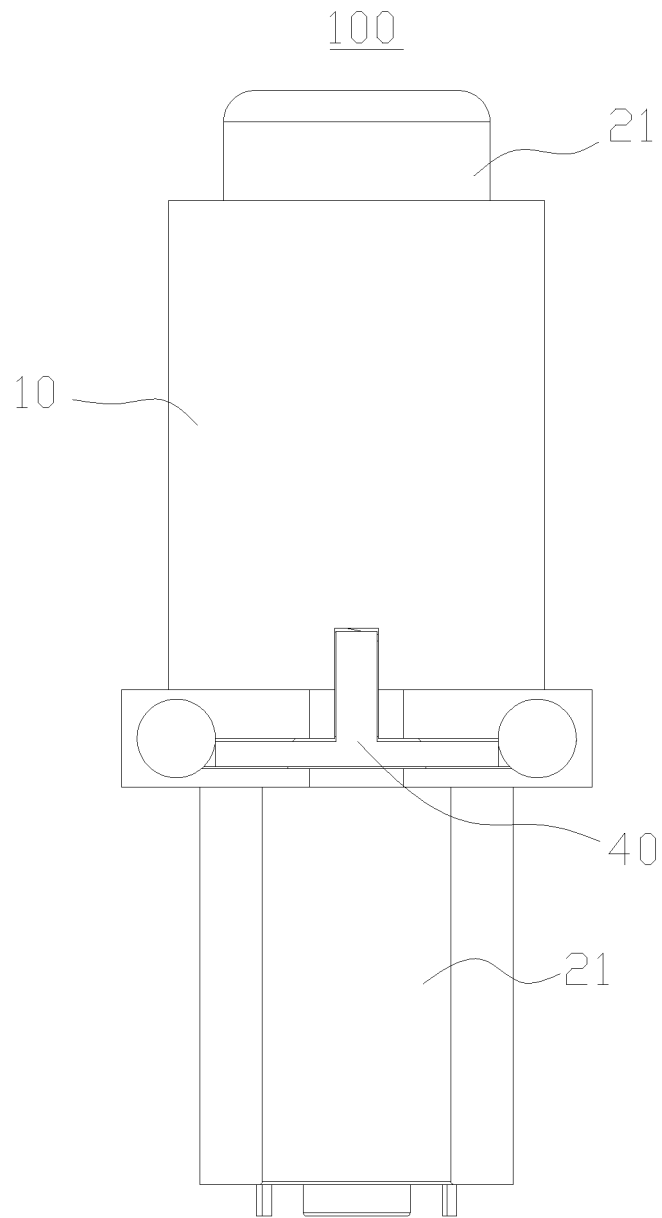


Fig. 2

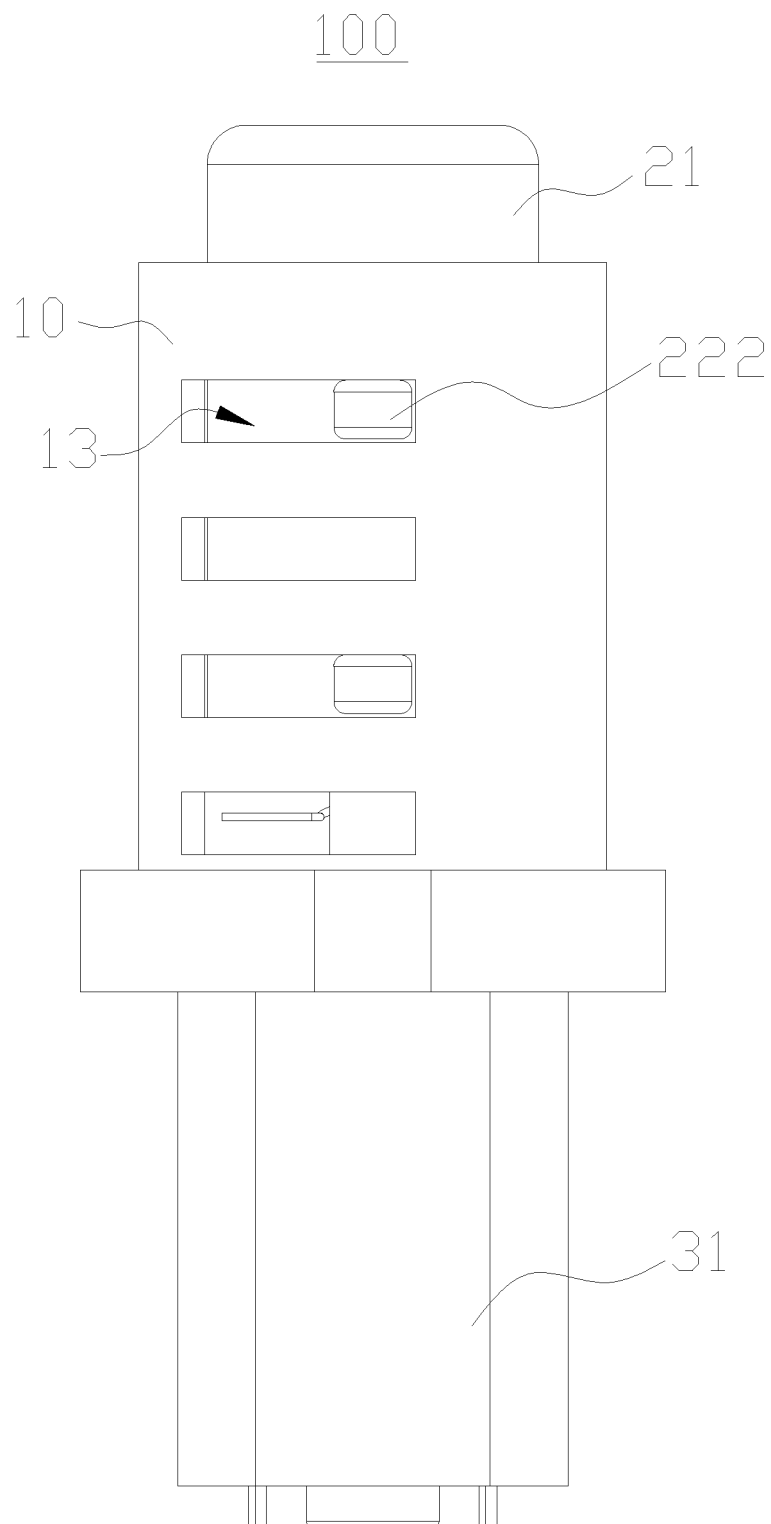


Fig. 3

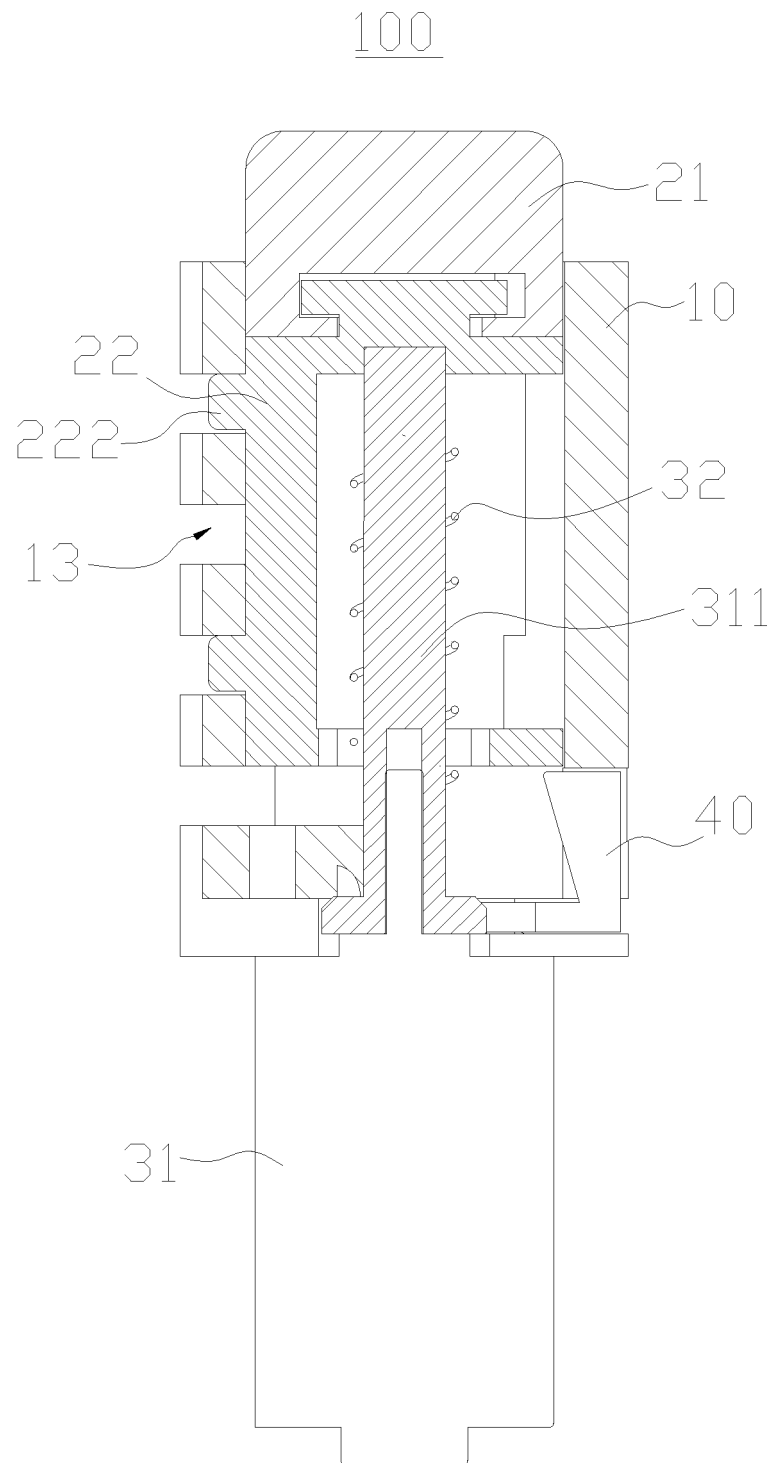


Fig. 4

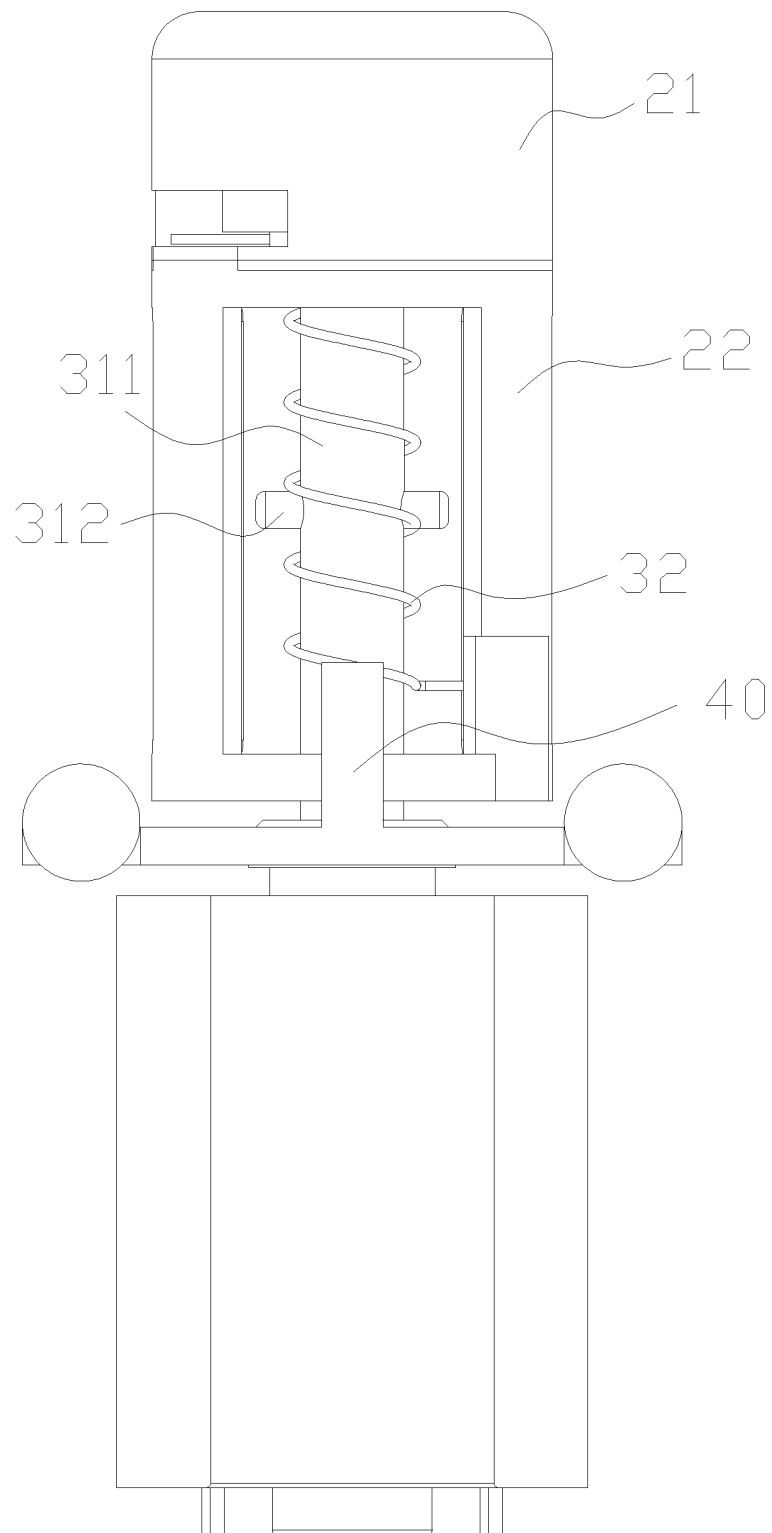


Fig. 5

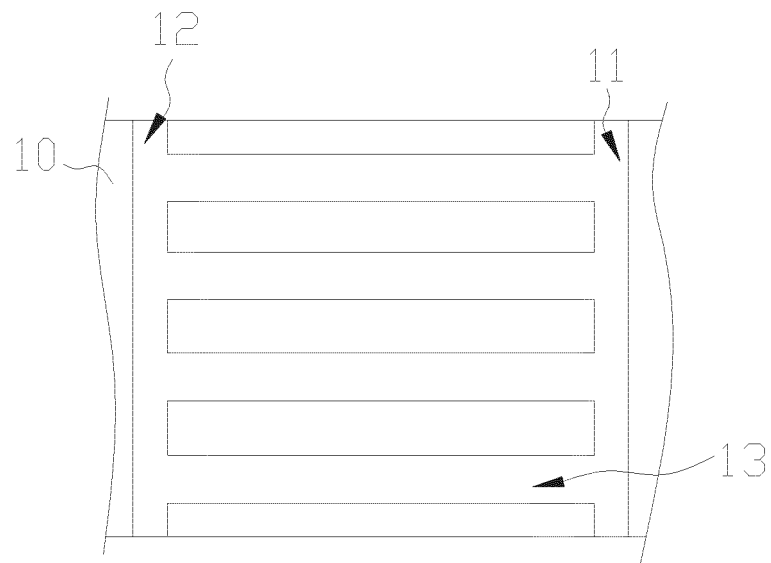


Fig. 6

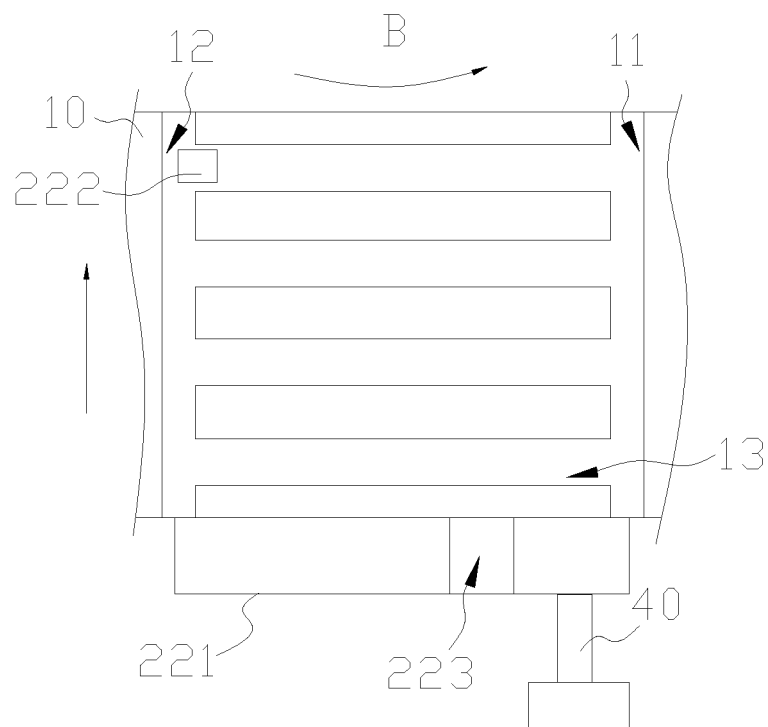


Fig. 7

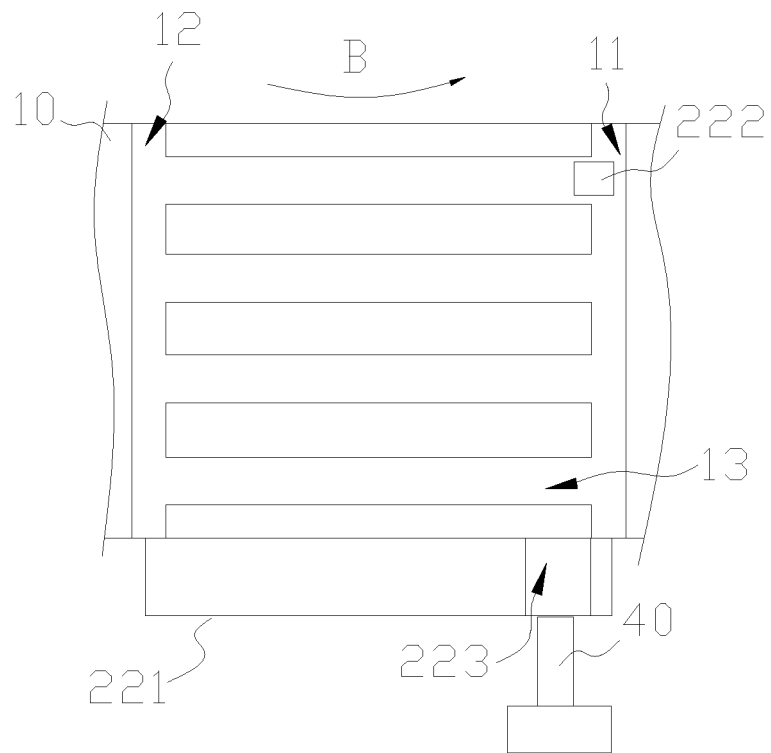


Fig. 8

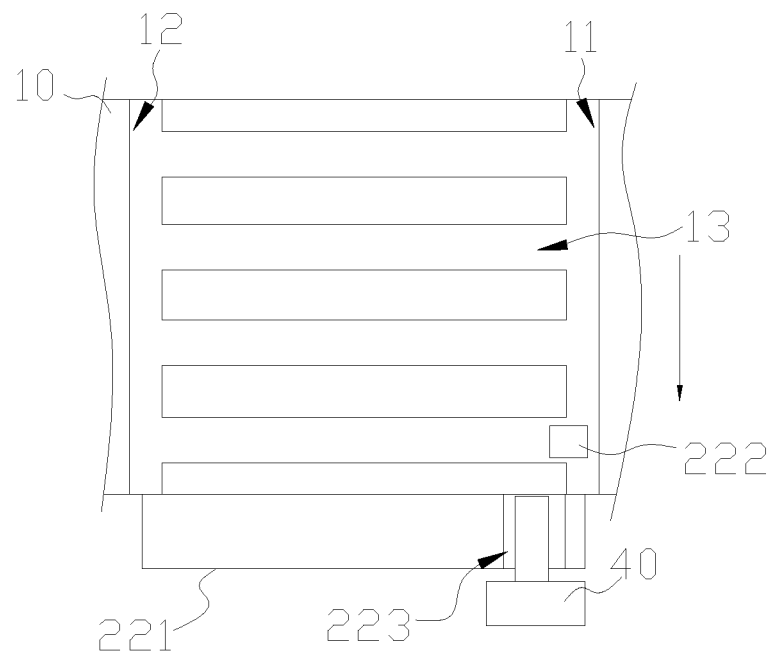


Fig. 9

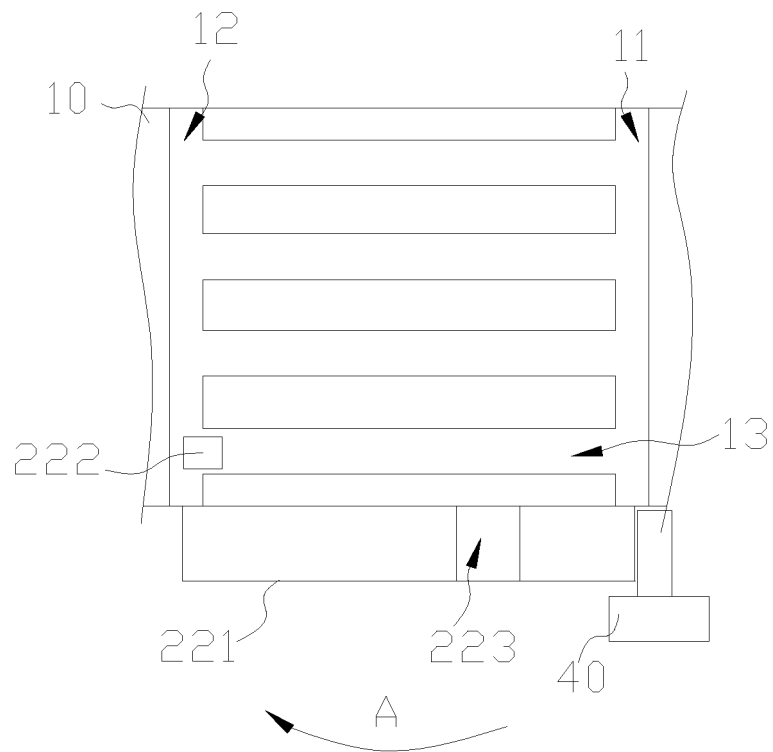


Fig. 10

200

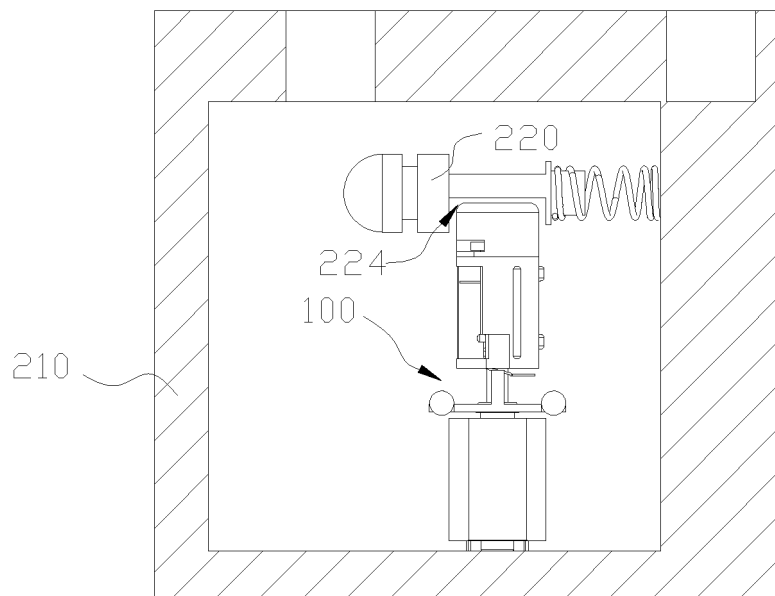


Fig. 11

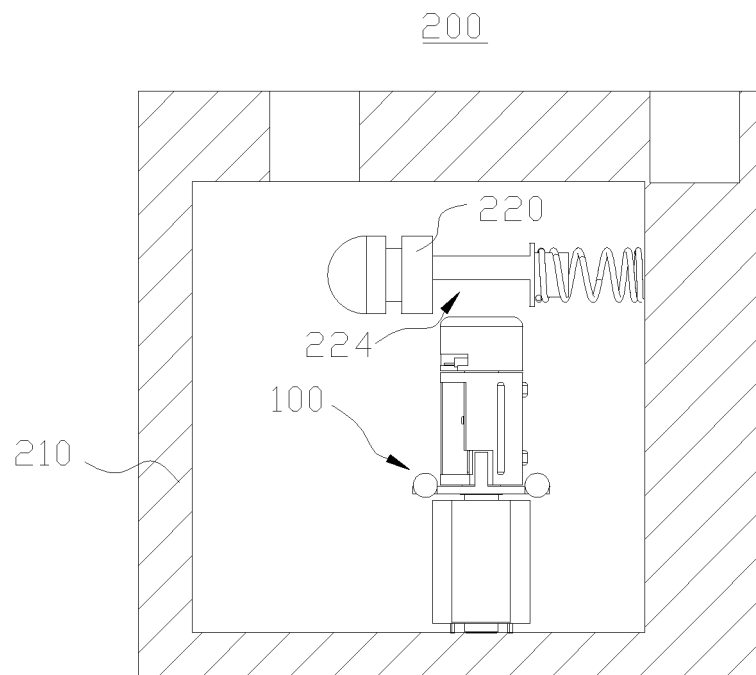


Fig. 12

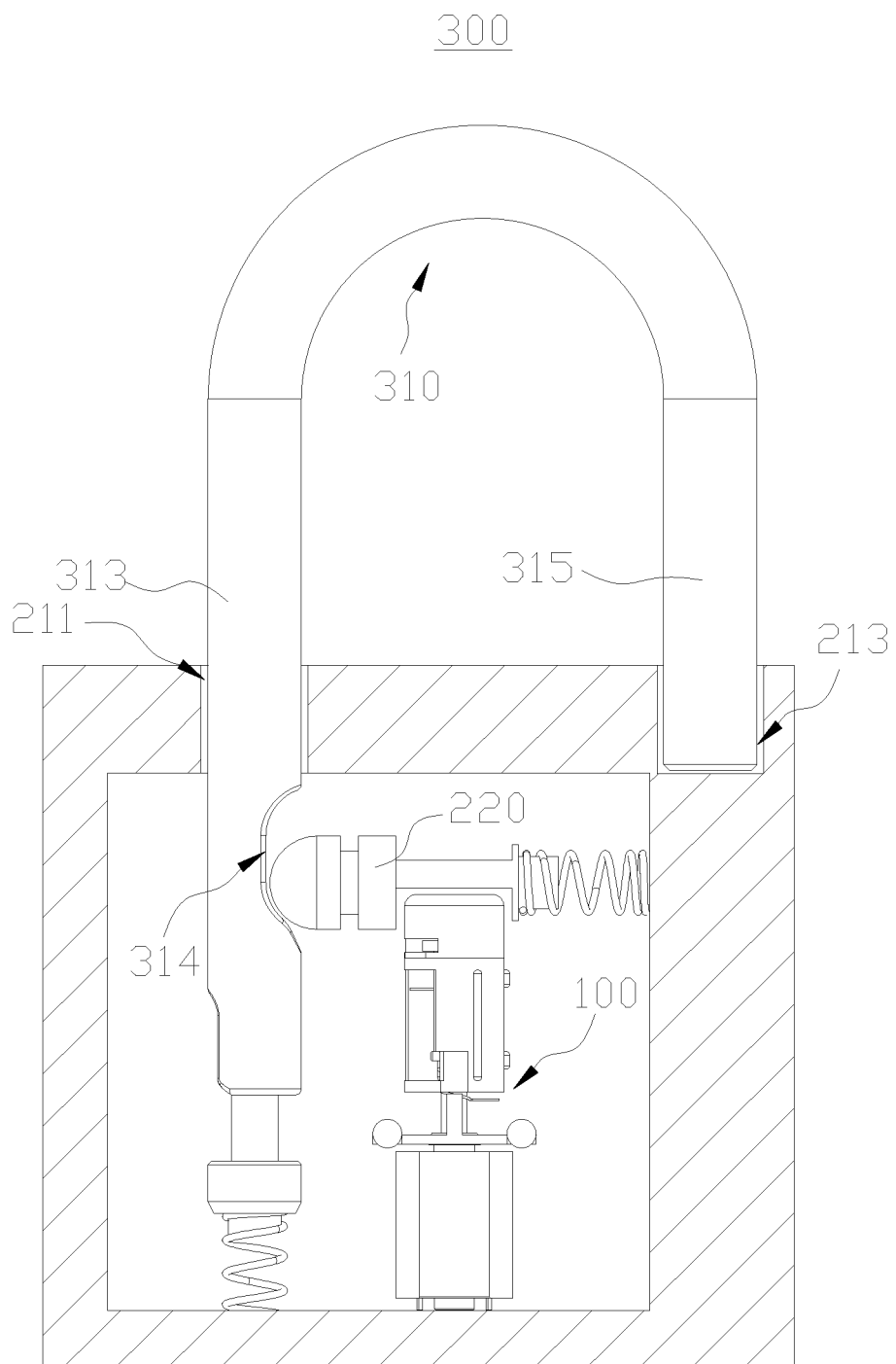


Fig. 13

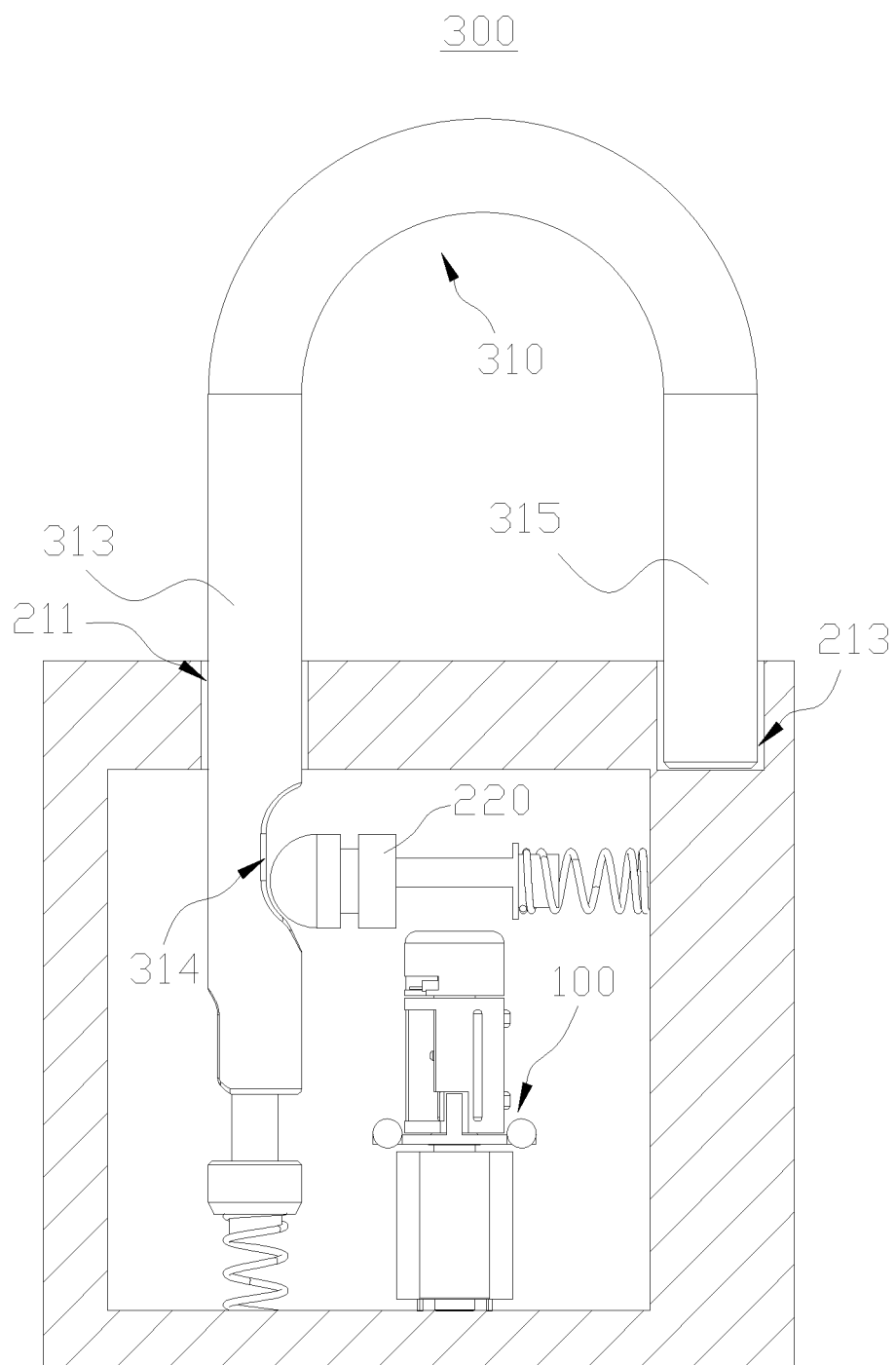


Fig. 14

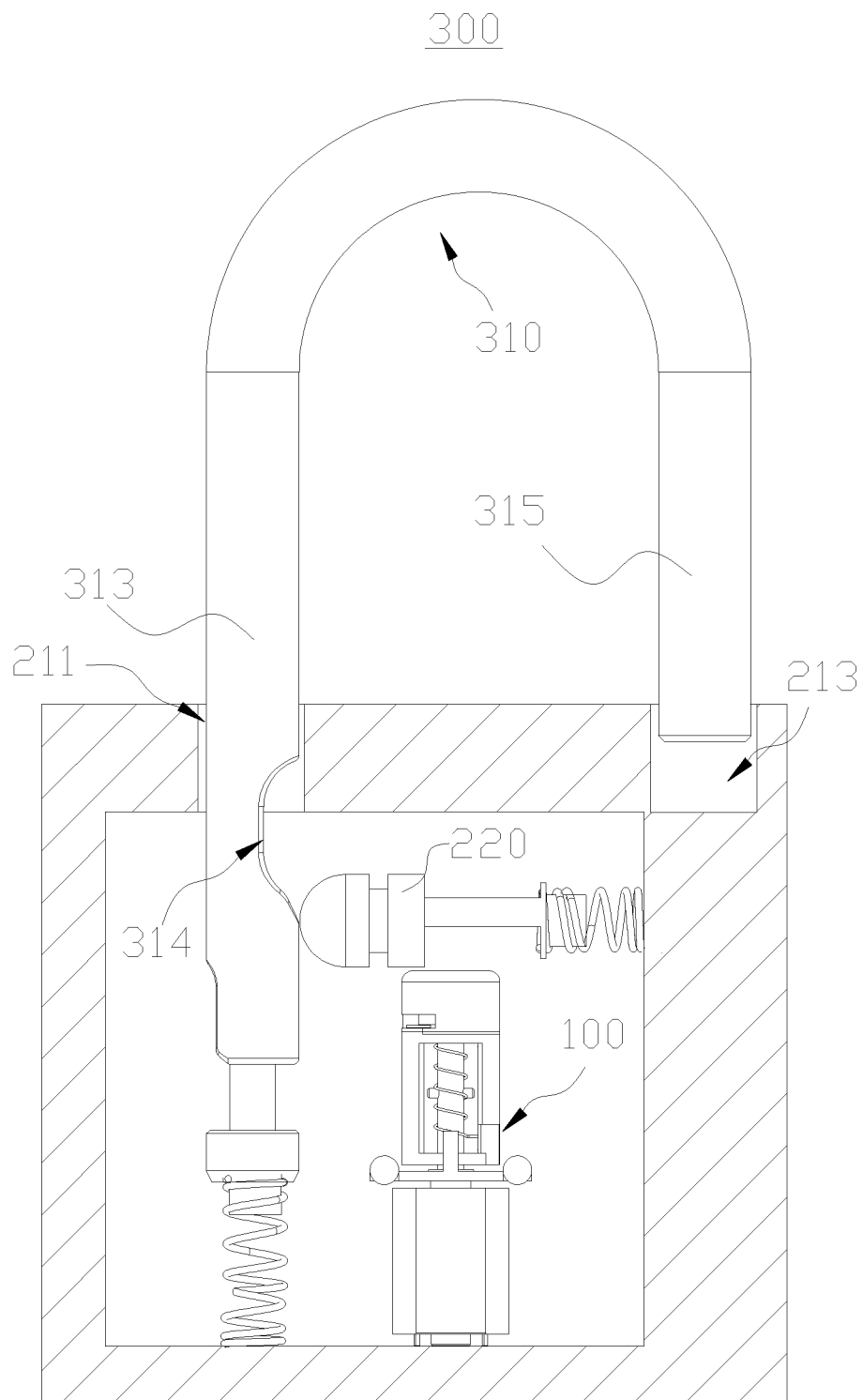


Fig. 15

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/106848

A. CLASSIFICATION OF SUBJECT MATTER

E05B 67/22(2006.01)i; E05B 47/00(2006.01)i; E05B 15/00(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)

E05B

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

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

CNABS, CNTXT, VEN, CNKI: 智能, 电子, 锁, 驱动, 轴向, 周向, 导槽, 滑槽, 轨道, 阻挡, intelligent, electron+, lock, driving, guid+, slid+, groove?, track?, block

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 11140106 A (ZHUHAI UNILINK TECHNOLOGY CO., LTD.) 12 May 2020 (2020-05-12) claims 1-10	1-10
X	CN 207513364 U (CHANGYUAN GONGCHUANG ELECTRIC POWER SECURITY TECHNOLOGY CO., LTD.) 19 June 2018 (2018-06-19) description, paragraphs [0050]-[0074], and figure 2	1, 9, 10
X	CN 110439379 A (ZHUHAI UNITECH POWER TECHNOLOGY CO., LTD.) 12 November 2019 (2019-11-12) description, specific embodiments, and figures 1-18	1, 9, 10
A	CN 207268117 U (ZHUHAI UNITECH POWER TECHNOLOGY CO., LTD.) 24 April 2018 (2018-04-24) entire document	1-10
A	CN 107605252 A (WU, Xue et al.) 19 January 2018 (2018-01-19) entire document	1-10
A	CN 105971407 A (XI'AN JINMAI ELECTRONICS TECHNOLOGY CO., LTD.) 28 September 2016 (2016-09-28) entire document	1-10

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

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

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

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

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

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

“&” document member of the same patent family

Date of the actual completion of the international search

12 November 2020

Date of mailing of the international search report

30 November 2020

Name and mailing address of the ISA/CN

China National Intellectual Property Administration (ISA/
CN)
No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing
100088
China

Authorized officer

Facsimile No. (86-10)62019451

Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/106848

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	WO 1987004213 A1 (BION, Louis) 16 July 1987 (1987-07-16) entire document	1-10

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Information on patent family members

International application No.

PCT/CN2020/106848

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CN 110607948 A	24 December 2019	None	
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		US 2018155961 A1	07 June 2018
		EP 3207197 A1	23 August 2017
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Form PCT/ISA/210 (patent family annex) (January 2015)