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(56) Documents Cited:
CN 205000743 U **CN 203939302 U**

(58) Field of Search:
INT CL **E05B**

(54) Title of the Invention: **Quick freeze breaking-resistant cylinder**
Abstract Title: **Anti-tamper cylinder lock resistant to freeze attacks**

(57) An anti-tamper cylinder lock comprising exterior and interior cylinder housing 1, 2, coupled by bridge portion 3 and exterior and interior rotating barrels 11, 12 with exterior and interior transmission member 12, 22 selectively coupling rotation of barrel to cam 4. An axially sliding pin 41 in cam 4 normally retained in first position with cam free to rotate, and upon snapping/removal of exterior cylinder the sliding pin 41 is no longer retained in first position and moves to second position under bias of sliding driver/blocking pin 23 which couples cam 4 to the interior barrel upon lock snapping. Preferably balance pin 7 in cam maintains position of sliding and blocking pins 41, 23 prior to lock snapping. A sealing gasket 5 is provided between exterior barrel and portion 31 of bridge to seal hole 100 through which transmission member 12 passes. The seal 5 prevents liquid entering and being used to freeze sliding pin 41 which would otherwise circumvent anti-tamper security pin 23. Preferably drainage channel 300 permits expelling of liquid.

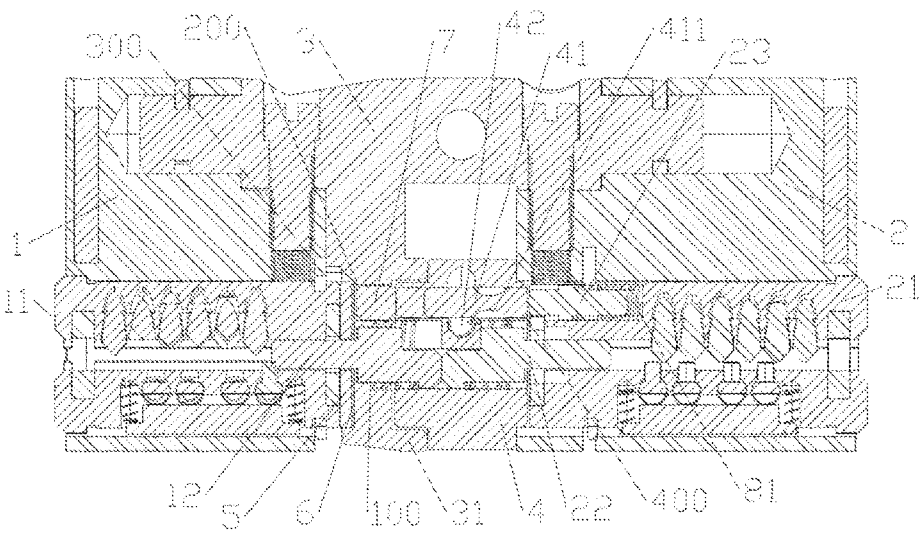

Figure 1

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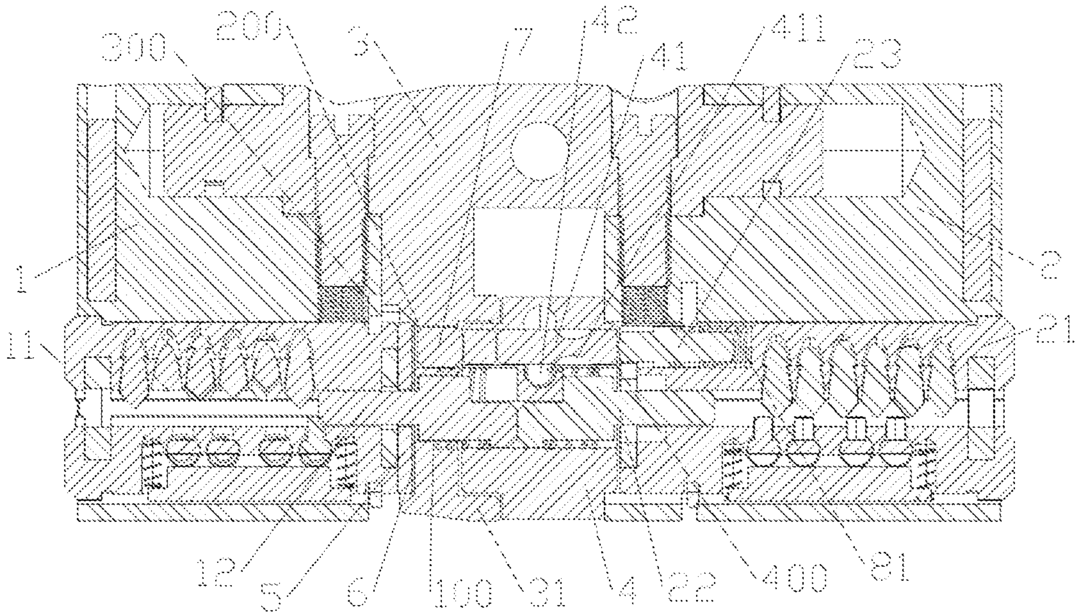

Figure 1

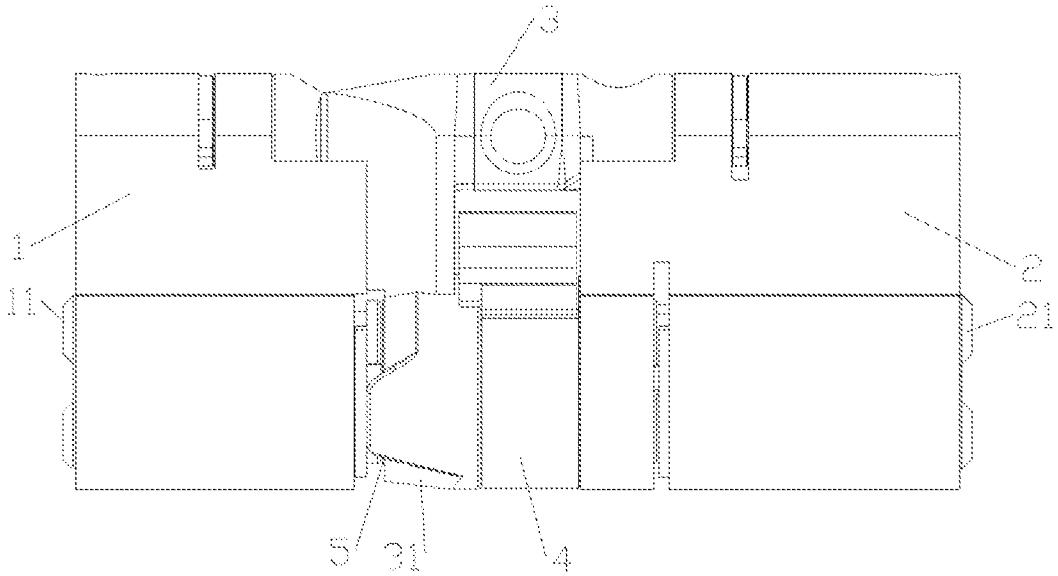

Figure 2

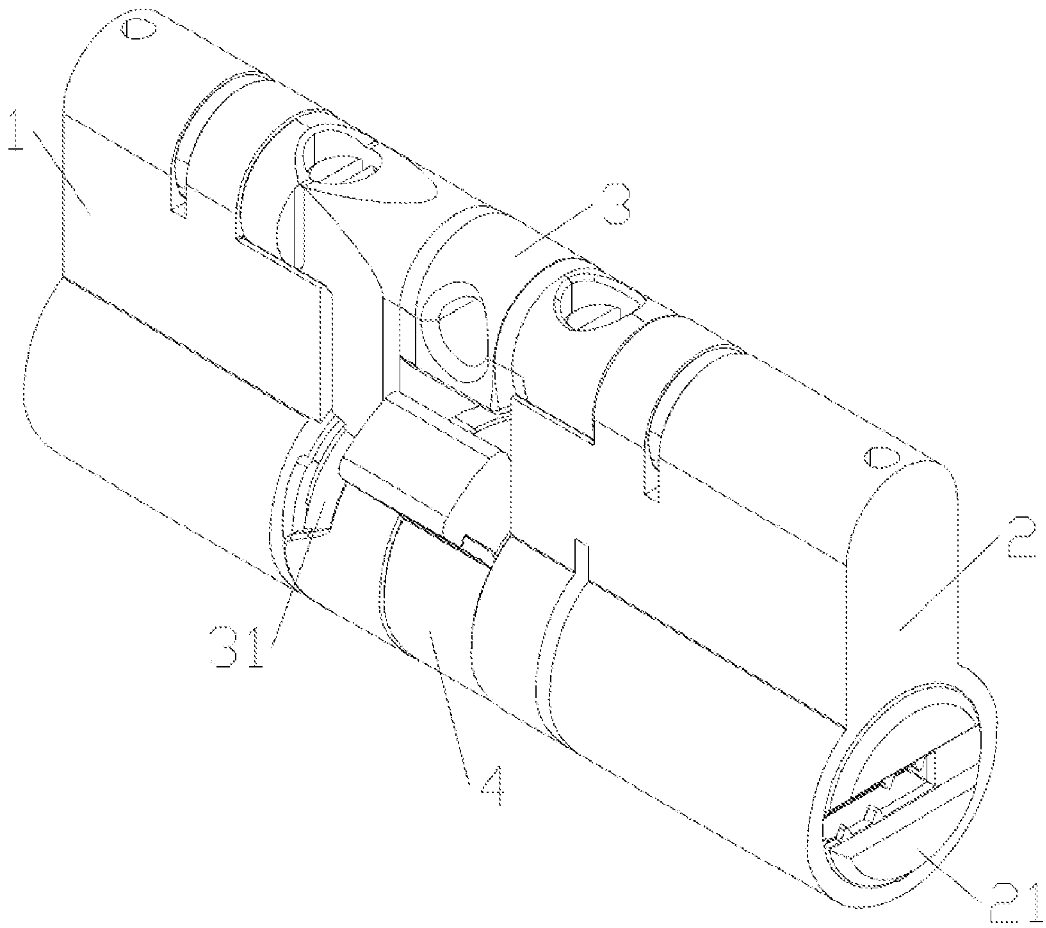

Figure 3

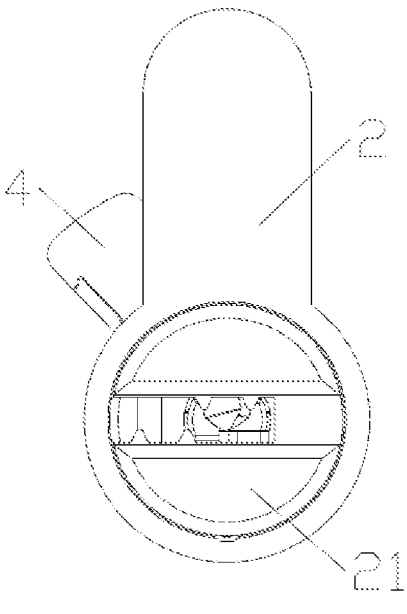

Figure 4

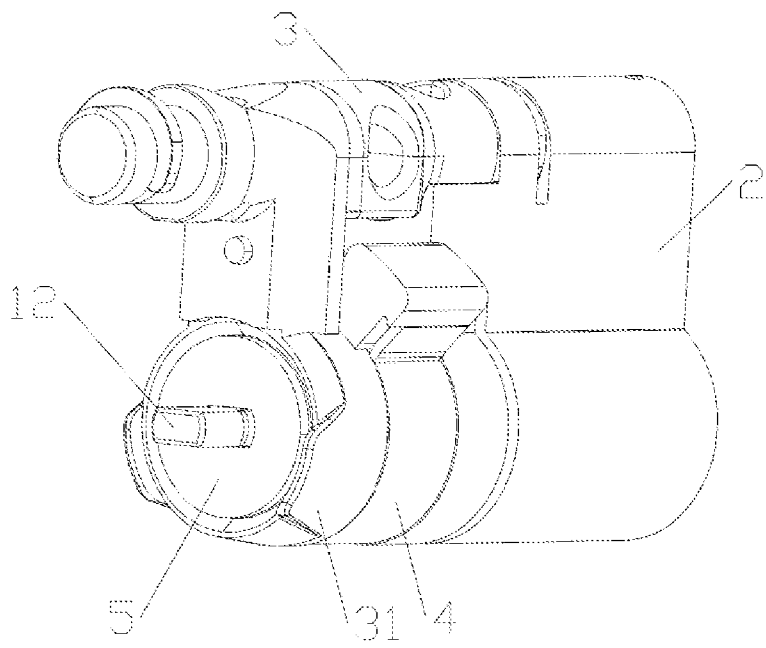

Figure 5

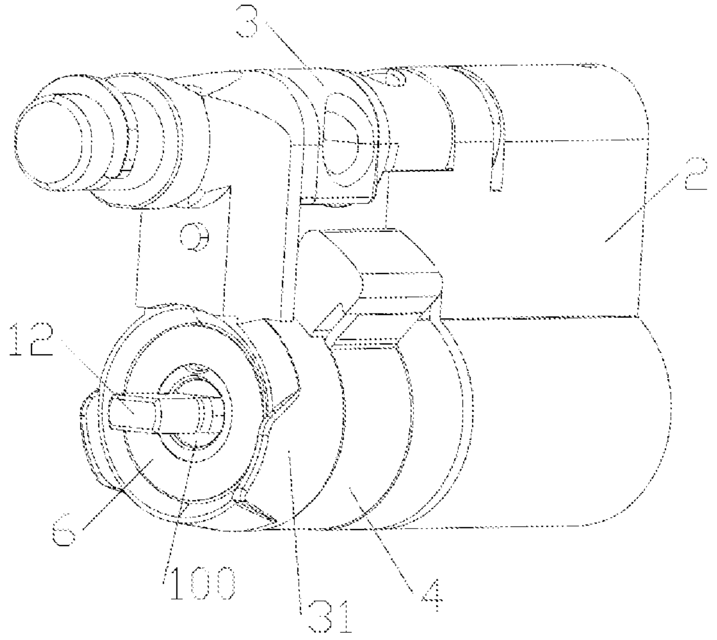

Figure 6

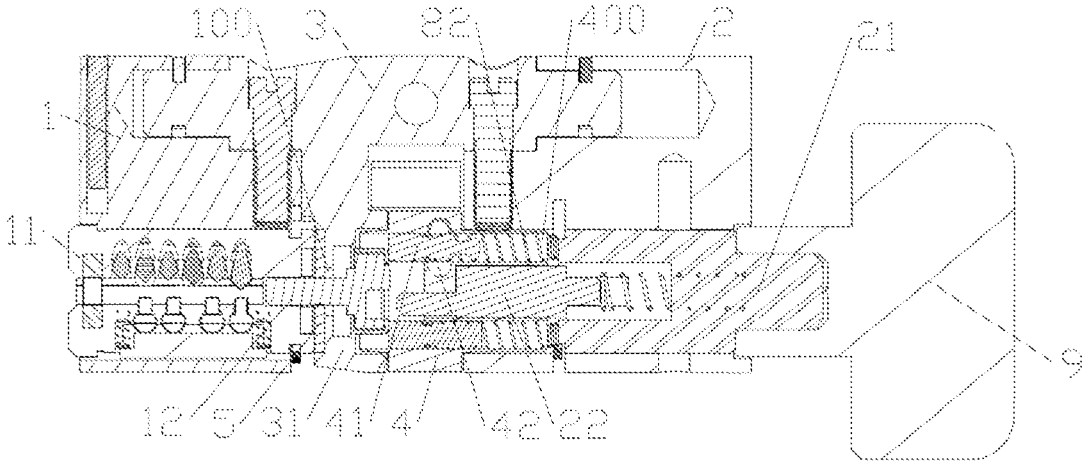

Figure 7

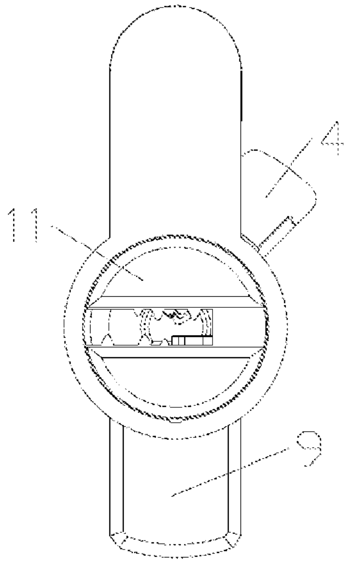

Figure 8

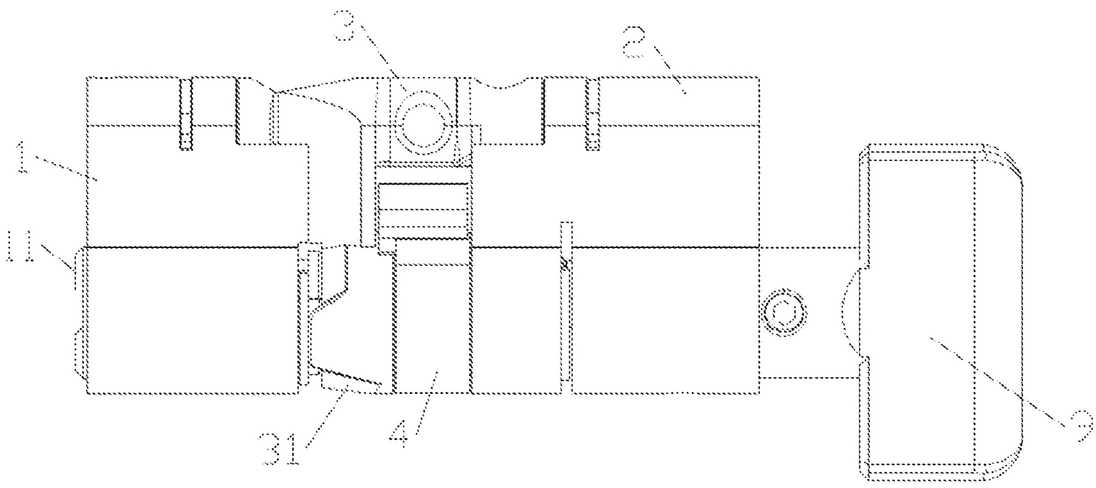

Figure 9

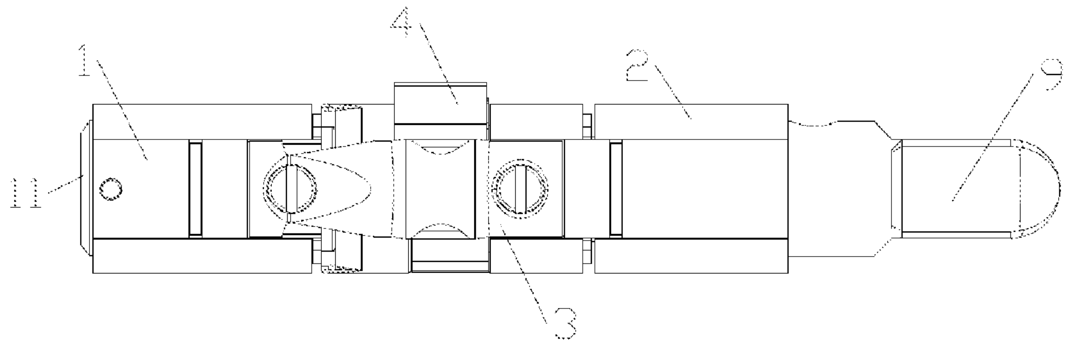

Figure 10

Quick Freeze Breaking-Resistant Cylinder

FIELD

[0001] The subject matter described herein relates to locksets, and more particularly relates to a quick freeze breaking-resistant cylinder.

BACKGROUND

[0002] To prevent protection failure of a door lock after its cylinder body is destructively broken, a blocking element, which can actively block a thumb turn of the destructively broken cylinder body from being turned to open, is generally provided in the cylinder body of the door lock. For example, the patents CN203939302U and CN205000743U disclose a cylinder structure which comprises a left lock core body and a right lock core body connected via a connecting lever; a thumb turn is provided between the left lock core body and the right lock core body, the thumb turn is in transmission connection with a left lever handle via a left transmission block passing through the thumb turn; a linked tab is formed at a front end of the left transmission block; a right lock core shaft is interlinked with a right transmission block; a linked catch groove is formed at the front end of the right transmission block, the linked catch groove being fitted with the linked chuck; a sliding locking pin is radially, vertically arranged in the thumb turn, one end of the sliding locking pin being connected to a pressure spring, the other end thereof being fitted with the right transmission block; an annular groove is arranged on a circumferential surface of the sliding locking pin; two blocking slots are radially, vertically arranged in the thumb turn, in each blocking slot being mounted a blocking spring, and a blocking bolt, the blocking bolt being fitted with the annular groove. This cylinder structure may actively block the thumb turn from being turned to open by virtue of movement of the sliding locking pin when the left lock core body (at the exterior side of the door) is destructively broken and has advantages such as a compact structure, a strong anti-theft property, a wide array of applications, and a high reliability. However, in a case of quick-freeze breaking, water or a quick-freezer would infiltrate into the thumb turn, causing the sliding locking pin to be frozen and unable to move outwardly; as the sliding locking pin is immobilized, the annular groove cannot be fitted with the blocking slot so that the blocking element cannot be inserted into the annular groove to block the thumb turn from being turned, causing self-lock failure of the thumb turn; consequently, the door lock can be opened by turning the thumb turn, resulting in anti-theft failure.

SUMMARY

[0003] An objective of the disclosure is to provide a quick freeze breaking-resistant cylinder to overcome self-lock failure of an existing cylinder structure in case of quick freeze breaking; a sealing gasket as disposed can effectively block a substantial part of liquid from infiltrating into the thumb turn rear to a securing block, so that the thumb turn, when encountering quick freeze breaking, can be promptly self-locked to assure an anti-theft effect.

[0004] To achieve the objective, the disclosure employs a technical solution below: a quick freeze breaking-resistant cylinder, comprising: an exterior cylinder body and an interior cylinder body, the exterior cylinder body and the interior cylinder body being fixed to a connecting lever, the exterior cylinder body being provided with an exterior spindle, the interior cylinder body being provided with an interior spindle, a thumb turn being provided between the exterior cylinder body and the interior cylinder body, the thumb turn being in transmission connection with the exterior spindle via an exterior transmission block and in transmission connection with the interior spindle via an interior transmission block, a securing block being provided on the connecting lever, the securing block being disposed between the exterior cylinder body and the thumb turn, the securing block being provided with a through hole for the exterior transmission block to pass through, a sliding locking pin arranged axially eccentrically being provided in the thumb turn, the sliding locking pin having an initial position where the thumb turn is freely turned and a blocking position where the thumb turn is blocked once the exterior spindle is destructively broken, where a sealing gasket for sealing the through hole is provided between the securing block and the exterior cylinder body, and the exterior transmission block passes through and is in hermetical fit with the sealing gasket, preventing the sliding locking pin from failure due to being frozen to the initial position.

[0005] With the technical solution above, the disclosure offers the following benefits: by disposing the sealing gasket for sealing the through hole between the securing block and the exterior cylinder body, the exterior transmission block passes through and is in hermetical fit with the sealing gasket, and the sealing gasket covers the through hole to seal the through hole; as such, a substantial part of liquid may be effectively blocked from infiltrating into the thumb turn rear to the securing block, which prevents the sliding locking pin from being frozen to the initial position due to freezing of a freezer in the case of quick freeze breaking. This assures that the sliding locking pin can promptly move outward to block the thumb turn after the exterior cylinder body is broken, so that the thumb turn is timely self-locked to ensure the anti-theft effect.

[0006] Furthermore, the cylinder is a double-acting cylinder, a balancing pin and a mounting through hole for mounting the balancing pin are provided in the securing block, a driver pin is provided in the interior cylinder body, the driver pin abuts against the sliding locking pin, the sliding locking pin abuts against the balancing pin, the sealing gasket hermetically covers the mounting through hole, the exterior spindle presses against the sealing gasket causing the sliding locking pin to be held at the initial position and the driver pin to be separated from the thumb turn, and the driver pin pushes the sliding locking pin to the blocking position once the exterior spindle is destructively broken.

[0007] With the technical solution above, in the double-acting cylinder, the driver pin, the sliding locking pin, and the balancing pin cooperate with each other to assure that the driver pin can promptly push the sliding locking pin to the blocking position once the exterior spindle is destructively broken, thereby enabling normal operation of the self-lock function of the thumb turn. The sealing gasket hermetically covers the through hole, which assures sealing reliability. The exterior spindle presses against the sealing gasket to separate the driver pin from the thumb turn, which assures that in a normal operating process, the sliding locking pin does not lock the thumb turn unintentionally, so that the user may unlock normally using a key.

[0008] Furthermore, the sealing gasket is a flexible gasket, a rigid backing plate is provided between the sealing gasket and the securing block, the rigid backing plate has an inner hole for the exterior transmission block to pass through and being clearance-fitted with the exterior transmission block, and the rigid backing plate at least covers part of the mounting through hole.

[0009] With the technical solution above, the flexible gasket can be better adapted to the profile of the exterior transmission block to form tighter sealing and achieve a better liquid infiltration-resistant effect; as such, even if one side of the exterior cylinder body is quickly frozen, the hermetic performance is not affected. Provision of the rigid backing plate may enhance structural stability of the sealing gasket and improve liquid infiltration-resistant property of the thumb turn. The inner hole on the rigid backing plate is configured for the exterior transmission block to pass through; the clearance-fit disables the rigid backing plate from turning with the exterior transmission block in normal manipulation of the user, thereby ensuring positional stability. The rigid backing plate at least covers part of the mounting through hole, so that the acting force applied by the exterior spindle pressing against the sealing gasket is transmitted to the sliding locking pin to separate the driver pin from the thumb turn, assuring that the user may manipulate the cylinder normally.

[0010] Furthermore, an outer diameter of the rigid backing plate is smaller than an outer diameter of the sealing gasket, the sealing gasket covering an edge of the rigid backing plate.

[0011] With the technical solution above, since the outer diameter of the rigid backing plate is smaller than that of the sealing gasket and the sealing gasket covers an edge of the rigid backing plate, it can be assured that the rigid backing plate is completely covered by the sealing gasket, whereby the sealing gasket, the rigid backing plate, and the securing block are well sealed to block liquid infiltration via the edge of the rigid backing plate.

[0012] Furthermore, a first elastic member for pushing the driver pin is provided in the interior cylinder body, so that the driver pin maintains, via an elastic force of the first elastic member, a tendency of pushing the sliding locking pin.

[0013] With the technical solution above, the first elastic member acts on the driver pin, so that once the exterior spindle is destructively broken, the first elastic member may promptly apply an action force to push the driver pin to move forward; as the driver pin pushes the sliding locking pin forward to move towards the blocking position, the self-lock function operates normally. Provision of the first elastic member enables the driver pin to maintain contact with the sliding locking pin via the elastic force, so that the thumb turn is promptly self-locked once the exterior cylinder is destructively broken.

[0014] Furthermore, an eccentric shaft bore, a blocking bolt, and a blocking slot are provided inside the thumb turn, the sliding locking pin being disposed in the eccentric shaft bore, the blocking bolt being disposed in the blocking slot, the blocking slot being intersecting and in communication with the eccentric shaft bore; a catch groove is provided on an outer peripheral surface of the sliding locking pin, when the sliding locking pin is at the initial position, the catch groove is staggered with the blocking slot; the blocking bolt is limited by the sliding locking pin from accessing the eccentric shaft bore; the driver pin pushes the sliding locking pin to the blocking position once the exterior spindle is destructively broken, causing the catch groove to be aligned with the blocking groove; the blocking bolt projects into the eccentric shaft bore to fit with the catch groove to lock the sliding locking pin, further causing an outer end of the driver pin to be caught in the eccentric shaft bore to thereby block the thumb turn.

[0015] With the technical solution above, the complex interlocking structure and multi-step operation enhances self-lock reliability of the thumb turn, further improving security of the cylinder and reducing possibility of forcible intrusion.

[0016] Furthermore, the cylinder is a single-acting cylinder; the exterior transmission block pushes against the sliding locking pin to hold the sliding locking pin to the initial position; a second elastic member is provided at an inner end of the sliding locking pin, so that the sliding locking pin maintains, via an elastic force of the second elastic member, a tendency of moving towards the blocking position.

[0017] With the technical solution above, in the single-acting cylinder, the exterior transmission block, the sliding locking pin, and the second elastic member cooperate to assure that the sliding locking pin is in the initial state and maintains a tendency of moving towards the blocking state, so that once the exterior cylinder body is destructively broken, the sliding locking pin can quickly move, enabling the thumb turn to be self-locked promptly.

[0018] Furthermore, a positioning slot for accommodating the sealing gasket is provided at an end surface of the securing block facing the exterior cylinder body.

[0019] With the technical solution above, the positioning slot may provide a precise position for accommodating the sealing gasket, assuring that the sealing gasket is securely positioned on the securing block, uneasy to get offset or displaced, and more convenient to mount.

[0020] Furthermore, a skeleton is embedded in the sealing gasket.

[0021] With the technical solution above, the skeleton may provide an extra support to the sealing gasket so that the sealing gasket maintains a stable profile, thereby assuring that the sealing gasket does not deform or collapse during service, with its sealing performance effectively maintained; in addition, the skeleton may transmit the acting force of the exterior spindle pressing against the sealing gasket to the sliding locking pin to separate the driver pin from the thumb turn, thereby assuring that the user may manipulate the spindle normally.

[0022] Furthermore, a clearance for liquid drainage out of the cylinder is provided between the exterior cylinder body and the sealing gasket.

[0023] With the technical solution, upon quick freeze breaking, the liquid sprayed to the inside of the cylinder via the exterior cylinder body 1 may be timely drained out via the clearance, which avoids accumulation of frozen liquid on the sealing gasket and enhances the difficulty of quick freeze breaking.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] Hereinafter, the disclosure will be further illustrated with reference to the accompanying drawings below:

[0025] Fig. 1 is a sectional view of a first example embodiment of the disclosure;

[0026] Fig. 2 is a first structural schematic view of a first example embodiment of the disclosure;

[0027] Fig. 3 is a second structural schematic diagram of the first example embodiment of the disclosure;

[0028] Fig. 4 is a side view (inner end) of the first example embodiment of the disclosure;

[0029] Fig. 5 is a first partial structural schematic diagram of the first example embodiment of the disclosure;

[0030] Fig. 6 is a second partial structural schematic diagram of the first example embodiment of the disclosure;

[0031] Fig. 7 is a sectional view of a second example embodiment of the disclosure;

[0032] Fig. 8 is a side view (outer end) of the second example embodiment of the disclosure;

[0033] Fig. 9 is a structural schematic diagram of a second example embodiment of the disclosure; and

[0034] Fig. 10 is a top view of the second example embodiment of the disclosure;

[0035] Reference Numerals:

exterior cylinder body 1; exterior spindle 11; exterior transmission block 12; interior cylinder body 2; interior spindle 21; interior transmission block 22; driver pin 23; connecting lever 3; securing block 31; thumb turn 4; sliding locking pin 41; catch groove 411; blocking slot 42; sealing gasket 5; rigid backing plate 6; balancing pin 7; first elastic member 81; second elastic member 82; handle lever 9; through hole 100; mounting through hole 200; clearance 300; eccentric shaft bore 400.

DETAILED DESCRIPTION OF EMBODIMENTS

[0036] To make the objectives, technical solutions, and advantages of the embodiments of the disclosure more apparent, the technical solutions in the embodiments of the disclosure will be described in a clear and comprehensive manner; it is apparent that the example embodiments described herein are only part of the embodiments of the disclosure, not all of them.

[0037] The terms like “first” and “second” (if existent) in the specification and claim of the disclosure are used for distinguishing like objects, not necessarily used for describing a specific sequence or priority. Even if a technical feature is referred to with “second,” it does not necessary indicate that there surely exists a “first” such feature. It will be understood that the terms “comprise” and “have,” as well as any of their variants, intend for a non-exclusive inclusion. It will be understood that in the disclosure, the term “plurality” refers to two or more. The term “and/or” only describes an association relationship of associated objects, which indicates that there may exist three relationships, e.g., X and/or Y may indicate three circumstances: X individually, or both X and Y together, or Y individually. The character “/” generally indicates a relationship of “or” between the former and latter associated objects. The term “comprising X, Y, and Z” or “comprising X, Y, Z” refers to comprising all of X, Y, and Z; the term “comprising X, Y, or Z” refers to comprising one of X, Y, and Z; the term “comprising X, Y and/or Z” refers to comply any one, or any two, or three of X, Y, and Z.

[0038] The disclosure adopts a technical solution below: a quick freeze breaking-resistant cylinder, comprising: an exterior cylinder body 1 and an interior cylinder body 2, the exterior cylinder body 1 and the interior cylinder body 2 being fixed to a connecting lever 3, the exterior cylinder body 1 being provided with an exterior spindle 11, the interior cylinder body 2 being provided with an interior spindle 21, a thumb turn 4 being provided between the exterior cylinder body 1 and the interior cylinder body 2, the thumb turn 4 being in transmission connection with the exterior spindle 11 via an exterior transmission block 12 and in transmission connection with the interior spindle 21 via an interior transmission block 22, a securing block 31 being provided on the connecting lever 3, the securing block 31 being disposed between the exterior cylinder body 1 and the thumb turn 4, the securing block 31 being provided with a through hole 100 for the exterior transmission block 12 to pass through, a sliding locking pin 41 arranged axially eccentrically being provided in the thumb turn 4. The term “axially” refers to an axial direction in which the thumb turn 4 is turned, i.e., the transverse direction in Fig. 1. The sliding locking pin 41 has an initial position where the thumb turn 4 is freely turned and a blocking position where the thumb turn 4 is blocked after the exterior spindle 11 is destructively broken. A sealing gasket 5 for sealing the through hole 100 is provided between the securing block 31 and the exterior cylinder body 1. The exterior transmission block 12 passes through and is in hermetical fit with the sealing gasket 5, preventing the sliding locking pin 41 from failure due to being frozen at the initial position. By disposing the sealing gasket 5 for sealing the through hole 100 between the securing block 31 and the exterior cylinder body 1, the exterior transmission block 12 passes through and is in hermetical fit with the sealing gasket 5, and the sealing gasket 5 covers the through hole 100 to seal the through hole 100, so that a substantial part of liquid may be effectively blocked from infiltrating into the thumb turn rear to the securing block 31, preventing the sliding locking pin 41 from being frozen to the initial position by freezing of the freezer in the case of quick freeze breaking; this assures that the sliding locking pin 41 can promptly move outward to block the thumb turn 4 after the exterior cylinder body 1 is broken, so that the thumb turn 4 is timely self-locked to ensure the anti-theft effect.

[0039] An end portion of the exterior transmission block 12 inserted into the exterior spindle 11 generally employs a flat shaft structure to facilitate transmitting the torque when the lock is opened using a key. To assure sealing performance at the through hole 100, the hole of the sealing gasket 5 is adapted to the flat shaft structure, so that when the exterior transmission block 12 rotates, the sealing gasket 5 may rotate along with the exterior transmission block. Of course, if the sealing gasket 5 has a good flexibility, the sealing gasket may adapt to the rotation of the exterior transmission block 12 via resettable deformation, so long as it is sufficient to block a substantial part of the liquid in the case of quick freeze breaking. Even if a small amount of liquid would infiltrate through a clearance between the sealing gasket 5 and the exterior transmission block 12, it does not suffice to freeze the sliding locking pin 41; in addition, once the clearance between the sealing gasket 5 and the exterior transmission block 12 is frozen, the subsequently sprayed liquid can hardly further pass through the clearance between the sealing gasket 5 and the exterior transmission block 12, which in turn may block the liquid from accessing the thumb turn 4 to freeze the sliding locking pin 41. Therefore, the disclosure does not require the sealing gasket 5 to be completely sealed or have a high water-proof rating, which is only required to block a substantial part of the fluid from accessing the through hole 100.

[0040] Different locks may have different fit structures. Hereinafter, the technical solution of the disclosure will be illustrated in detail through example embodiments below. The example embodiments described *infra* may be combined or replaced with each other dependent on actual conditions, and same or similar concepts or processes may be omitted in some example embodiments.

[0041] First Example Embodiment

[0042] As illustrated in Figs. 1 to 6, embodiments of the disclosure provide a quick freeze breaking-resistant cylinder. In this example embodiment, the cylinder is a double-acting cylinder; the exterior spindle 11 and the interior spindle 21 of the double-acting cylinder are both pin tumbler spindles; a balancing pin 7 and a mounting through hole 200 for mounting the balancing pin 7 are provided in the securing block 31; a driver pin 23 and an interior transmission block 22 are provided in the interior cylinder body 2; the driver pin 23 abuts against the sliding locking pin 41; the sliding locking pin 41 abuts against the balancing pin 7; the sealing gasket 5 hermetically covers the through hole 100; the exterior spindle 11 presses against the sealing gasket 5 so that the sliding locking pin 41 is held at the initial position and the driver pin 23 is separated from the thumb turn 4; the driver pin 23, after the exterior spindle 11 is destructively broken, pushes the sliding locking pin 41 to the blocking position. In the double-acting cylinder, the driver pin 23, the sliding locking pin 41, and the balancing pin 7 cooperate with each other to assure that the driver pin 23 can promptly push the sliding locking pin 41 to the blocking position once the exterior spindle 11 is destructively broken, thereby enabling normal operation of the self-lock function of the thumb turn 4. Once the exterior spindle 11 is destructively broken, the driver pin 23 pushes the sliding locking pin 41 to the blocking position; and the sealing gasket 5 hermetically covers the through hole 100, thereby assuring sealing reliability. The exterior spindle 11 presses against the sealing gasket 5 to separate the driver pin 23 from the thumb turn 4, which assures that the sliding locking pin 41 does not lock the thumb turn 4 unintentionally in a normal operating process, while the user may open the lock normally using a key.

[0043] To ensure the sealing effect of the sealing gasket 5, the sealing gasket 5 is a flexible gasket in this example embodiment; a rigid backing plate 6 is provided between the sealing gasket 5 and the securing block 31; the rigid backing plate 6 has an inner hole for the exterior transmission block 12 to pass through, the inner hole being clearance-fitted with the exterior transmission block 12. The rigid backing plate 6 is sandwiched between the sealing gasket 5 and the securing block 31 and at least covers part of the mounting through hole 200; the flexible gasket can be better adapted to the profile of the exterior transmission block 12, thereby forming tighter sealing to the through hole 100 and achieving a better liquid infiltration-resistant effect; as such, even if one side of the exterior cylinder body 1 is quickly frozen, its hermetic performance would not be deteriorated. Provision of the rigid backing plate 6 may enhance structural stability of the sealing gasket 5 and improve liquid infiltration-resistant property of the thumb turn 4. The inner hole on the rigid backing plate 6 is configured for the exterior transmission block 12 to pass through; in addition, due to the clearance-fit, the rigid backing plate 6 does not turn with the exterior transmission block 12 in the normal operating process of the user, thereby ensuring positional stability. The rigid backing plate 6 at least covers part of the mounting through hole 200, so that the acting force applied by the exterior spindle 11 pressing against the sealing gasket 5 is transmitted to the sliding locking pin 41 to separate the driver pin 23 from the thumb turn 4, assuring that the user may use the cylinder normally.

[0044] In an example implementation, an outer diameter of the rigid backing plate 6 is smaller than that of the sealing gasket 5, so that the sealing gasket 5 covers an edge of the rigid backing plate 6. Since the outer diameter of the rigid backing plate 6 is smaller than that of the sealing gasket 5, it can be assured that the rigid backing plate 6 is completely covered by the sealing gasket 5, whereby the sealing gasket 5, the rigid backing plate 6, and the securing block 31 are well sealed, which blocks liquid infiltration via the edge of the rigid backing plate. In this example embodiment, the rigid backing plate 6 employs a stainless-steel plate; as stainless steel has a strong corrosion-resistant property and a good high-temperature and low-temperature resistant property, it will not be affected by corrosion even over long-term use in a damp or harsh environment, assuring long-term stability and reliability of the cylinder.

[0045] To facilitate fixation of the sealing gasket 5, a positioning slot for accommodating the sealing gasket 5 is provided on an end surface of the securing block 31 facing the exterior cylinder body 1; the positioning slot may provide a precise position for accommodating the sealing gasket 5, assuring that the sealing gasket 5 is securely positioned on the securing block 31, uneasy to get offset or displaced, and more convenient to mount and replace. In a natural state, the sealing gasket 5 is higher than the positioning slot, which can effectively block liquid from accessing the positioning slot, thereby extending service life of the sealing gasket 5 and enhancing durability of the cylinder.

[0046] In another example embodiment, to secure that the sealing gasket 5 is at an effective sealed position, a skeleton is embedded in the sealing gasket 5. The skeleton may provide an extra support to the sealing gasket 5 so that the sealing gasket 5 maintains a stable profile, assuring that the sealing gasket 5 does not deform or collapse during service, with its sealing performance effectively maintained; in addition, the acting force of the exterior spindle 11 pressing against the sealing gasket 5 is transmitted to the sliding locking pin 41 to separate the driver pin 23 from the thumb turn 4, assuring that the user may use the spindle normally, which may also eliminate the rigid backing plate.

[0047] In this example embodiment, a clearance 300 for liquid drainage out of the cylinder is provided between the exterior cylinder body 1 and the sealing gasket 5; in a case of quick freeze breaking, the liquid sprayed to the inside of the cylinder through the exterior cylinder body 1 may be timely drained out via the clearance 300, which avoids accumulation of frozen liquid on the sealing gasket 5 and enhances the difficulty of quick freeze breaking.

[0048] In this example embodiment, to assure that the sliding locking pin 41 can reach the blocking position after the balancing pin 7 falls off, a first elastic member 81 for pushing against the driver pin 23 is provided in the interior cylinder body 2; the elastic force of the first elastic member 81 enables the driver pin 23 to maintain a tendency of pushing against the sliding locking pin 41; since the first elastic member 81 acts on the driver pin 23, the first elastic member 81 may promptly apply an action force to push the driver pin 23 to move forward once the exterior spindle 11 is destructively broken; as the driver pin 23 pushes the sliding locking pin 41 forward to move towards the blocking position, the self-lock function operates normally. Provision of the first elastic member 81 enables the driver pin 23 to maintain contact with the sliding locking pin 41 via the elastic force, so that the thumb turn 4 is promptly self-locked once the exterior cylinder 1 is destructively broken.

[0049] It may be understood that the first elastic member 81 may be a spring, a spring washer, or a metallic spring plate, etc.

[0050] In addition, in the double-acting cylinder, an eccentric shaft bore 400, a blocking bolt, and a blocking slot 42 are provided in the thumb turn 4, which may refer to the Patent No. CN203939302U, the blocking bolt disclosed therein corresponding to the blocking bolt in this example embodiment, the blocking slot disclosed therein corresponding to the blocking slot 42 in this example embodiment. The sliding locking pin 41 is disposed in the eccentric shaft bore 400, the blocking bolt is disposed in the blocking slot 42, the blocking slot 42 is intersecting and in communication with the eccentric shaft bore 400, and a catch groove 411 is provided at an outer peripheral side of the sliding locking pin 41. The catch groove 411 refers to the annular groove in the Patent No. CN203939302U. When the sliding locking pin 41 is at the initial position, the catch groove 411 is staggered with the blocking slot 42. The blocking bolt is limited by the sliding locking pin 41 and cannot access the eccentric shaft bore 400. Once the exterior spindle 11 is broken, the driver pin 23 pushes the sliding locking pin 41 to the blocking position, causing the catch groove 411 to be aligned with the blocking slot 42. The blocking bolt projects into the eccentric shaft bore 400 to be fitted with the catch groove 411 to lock the sliding locking pin 41, further causing the outer end of the driver pin 23 to be caught in the eccentric shaft bore 400 to thereby lock the thumb turn 4. This complex interlocking structure and multi-step operation enhances security of the cylinder and reduces the possibility of illegal intrusion.

[0051] Second Example Embodiment

[0052] As illustrated in Figs. 7 to 10, this example embodiment provides a quick freeze breaking-resistant cylinder. In this example, the cylinder is a single-acting cylinder. The exterior spindle 11 of the single-acting cylinder is a pin tumbler spindle, while the interior spindle 21 is a non-pin-tumbler spindle connected to the handle lever 9. The single-acting cylinder mainly relies on the transmission connection maintained between the interior transmission block 22 and the thumb turn to ensure that the user can open the lock from the interior side of the door without using the key; to open the lock at the exterior side of the door, the exterior transmission block 12 is in transmission connection with and moves towards the interior transmission block 22 to drive the thumb turn to turn; the exterior transmission block 12 presses against the sliding locking pin 41 to maintain the sliding locking pin 41 at the initial position. A second elastic member 82 is provided at the inner end of the sliding locking pin 41; the elastic force of the second elastic member 82 enables the sliding locking pin 41 to maintain a tendency of moving towards the blocking position, so that once the exterior cylinder body 1 is destructively broken, the sliding locking pin 41 can quickly move outward, enabling the thumb turn 4 to be promptly self-locked.

[0053] In the single-acting cylinder, the exterior transmission block 12, the sliding locking pin 41, and the second elastic member 82 cooperate to assure that the sliding locking pin 41 is in the initial state and maintains a tendency of moving towards the blocking state. With the orientations illustrated in Fig. 7 as an example, once the exterior spindle 11 is destructively broken, the exterior transmission block 12 cannot continue pressing rightward against the sliding locking pin 41; subjected to the elastic force of the second elastic member 82, the sliding locking pin 41 moves outward and meanwhile pushes the exterior transmission block 12 to move outward till the blocking slot 42 is aligned with the catch groove 411; then, the blocking bolt projects in the eccentric shaft bore 400 to fit with the catch groove 411 to thereby block the sliding locking pin 41; as such, the exterior transmission block 12 cannot move rightward further, i.e., its transmission connection with the interior transmission block 22 is disconnected, so that turning of the interior transmission block 22 cannot drive the thumb turn 4, thereby enabling the thumb turn 4 to be self-locked.

[0054] In this example embodiment, the second elastic member 82 may also be a spring, a spring washer, or a metallic spring plate, etc.

[0055] In addition, it is an alternative that the single-acting cylinder does not employ a rigid backing plate, and it is only required that the sealing gasket 5 is in hermetical fit with the exterior transmission block 12 to cover the through hole 100.

[0056] In this disclosure, the interior and exterior orientations or the front and rear orientations may refer to the left-right orientations in Fig. 1 and Fig. 7. Specifically, in Figs. 1 and 7, the left side refers to exterior/front, and the right side refers to interior/rear.

[0057] Besides the example embodiments described *supra*, the disclosure further has other implementations. All other example embodiments derived by a person of normal skill in the art based on the example embodiments described herein fall within the scope of protection as sought in the disclosure.

I/We Claim:

1. A quick freeze breaking-resistant cylinder, comprising: an exterior cylinder body and an interior cylinder body, the exterior cylinder body and the interior cylinder body being fixed to a connecting lever, the exterior cylinder body being provided with an exterior spindle, the interior cylinder body being provided with an interior spindle, a thumb turn being provided between the exterior cylinder body and the interior cylinder body, the thumb turn being in transmission connection with the exterior spindle via an exterior transmission block and in transmission connection with the interior spindle via an interior transmission block, a securing block being provided on the connecting lever, the securing block being disposed between the exterior cylinder body and the thumb turn, the securing block being provided with a through hole for the exterior transmission block to pass through, a sliding locking pin arranged axially eccentrically being provided in the thumb turn, the sliding locking pin having an initial position where the thumb turn is freely turned and a blocking position where the thumb turn is blocked once the exterior spindle is destructively broken, wherein a sealing gasket for sealing the through hole is provided between the securing block and the exterior cylinder body, and the exterior transmission block passes through and is in hermetical fit with the sealing gasket, preventing the sliding locking pin from failure due to being frozen to the initial position.

2. The quick freeze breaking-resistant cylinder according to claim 1, wherein the cylinder is a double-acting cylinder, a balancing pin and a mounting through hole for mounting the balancing pin are provided in the securing block, a driver pin is provided in the interior cylinder body, the driver pin abuts against the sliding locking pin, the sliding locking pin abuts against the balancing pin, the sealing gasket hermetically covers the mounting through hole, the exterior spindle presses against the sealing gasket causing the sliding locking pin to be held at the initial position and the driver pin to be separated from the thumb turn, and the driver pin pushes the sliding locking pin to the blocking position once the exterior spindle is destructively broken.

3. The quick freeze breaking-resistant cylinder according to claim 2, wherein the sealing gasket is a flexible gasket, a rigid backing plate is provided between the sealing gasket and the securing block, the rigid backing plate has an inner hole for the exterior transmission block to pass through and being clearance-fitted with the exterior transmission block, and the rigid

backing plate at least covers part of the mounting through hole.

4. The quick freeze breaking-resistant cylinder according to claim 3, wherein an outer diameter of the rigid backing plate is smaller than an outer diameter of the sealing gasket, the sealing gasket covering an edge of the rigid backing plate.

5. The quick freeze breaking-resistant cylinder according to claim 2, wherein a first elastic member for pushing the driver pin is provided in the interior cylinder body, so that the driver pin maintains, via an elastic force of the first elastic member, a tendency of pushing the sliding locking pin.

6. The quick freeze breaking-resistant cylinder according to claim 5, wherein an eccentric shaft bore, a blocking bolt, and a blocking slot are provided in the thumb turn, the sliding locking pin being disposed in the eccentric shaft bore, the blocking bolt being disposed in the blocking slot, the blocking slot being intersecting and in communication with the eccentric shaft bore; a catch groove is provided on an outer peripheral surface of the sliding locking pin, wherein when the sliding locking pin is at the initial position, the catch groove is staggered with the blocking slot; the blocking bolt is limited by the sliding locking pin from accessing the eccentric shaft bore; the driver pin pushes the sliding locking pin to the blocking position once the exterior spindle is destructively broken, causing the catch groove to be aligned with the blocking groove; the blocking bolt projects into the eccentric shaft bore to fit with the catch groove to lock the sliding locking pin, further causing an outer end of the driver pin to be caught in the eccentric shaft bore to thereby block the thumb turn.

7. The quick freeze breaking-resistant cylinder according to claim 1, wherein the cylinder is a single-acting cylinder; the exterior transmission block pushes against the sliding locking pin to hold the sliding locking pin to the initial position; a second elastic member is provided at an inner end of the sliding locking pin, so that the sliding locking pin maintains, via an elastic force of the second elastic member, a tendency of moving towards the blocking position.

8. The quick freeze breaking-resistant cylinder according to claim 1, wherein a positioning slot for accommodating the sealing gasket is provided at an end surface of the

securing block facing the exterior cylinder body.

9. The quick freeze breaking-resistant cylinder according to claim 1, wherein a skeleton is embedded in the sealing gasket.

10. The quick freeze breaking-resistant cylinder according to claim 1, wherein a clearance for liquid drainage out of the cylinder is provided between the exterior cylinder body and the sealing gasket.

Intellectual Property Office

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Claims searched:	1-10	**Date of search:**	13 November 2024

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A	-	CN203939302 U (XU JUXIANG) the whole document
A	-	CN205000743 U (XU JUXIANG) the whole document

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E05B

The following online and other databases have been used in the preparation of this search report

International Classification:

Subclass	Subgroup	Valid From
E05B	0017/20	01/01/2006
E05B	0009/04	01/01/2006
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