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(54) **NEW DAMPER FOR SLIDING DOOR AND WINDOW**

(57) Disclosed in the present disclosure is a new damper for sliding doors or windows, there is no need to provide a guiding slot on the housing of the damper. Besides sheet metal parts, other high-strength, high-performance materials may also be adopted as housing materials to achieve the upgrading of the structure and materials of the housing. The overall structural strength of the housing is high and the stability is good, avoiding structural deformation of the housing in case of long-term use. There is no need to separate the housing into two halves, which may be formed integrally during the manufacturing process. It is easier to manage the accuracy of the overall structure, which also greatly simplifies the assembly process of the damper and makes it less likely to be scrapped in the assembly process. The toggle block is prevented from moving back under the force of the tension spring by providing a first restricting member and a second restricting member in the interior of the housing, without providing a vertical corner section of the guiding slot, avoiding the technical problem that it is difficult to re-toggle the toggle block to the interior due to the corner section being too close to vertical.

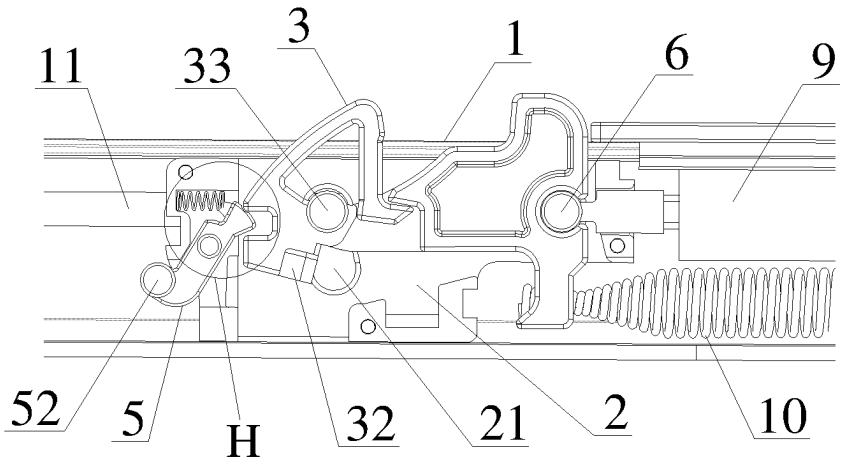


Fig. 1

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## Description

### Technical Field

**[0001]** The present disclosure relates to the technical field of hardware accessories and, particularly, to a new damper for sliding doors or windows.

### Background of the Invention

**[0002]** In the current market, dampers are usually provided on some sliding doors or windows (e.g., closet doors or windows) to play a cushioning role. When the door leaf or window leaf opens or closes, the opening or closing is assisted by the damper to mitigate the collision and reduce the noise.

**[0003]** Disclosed in the prior art is a damper used for a bi-directional damping system (Patent No. 201721125021.1), in which a guiding slot is provided on a lateral surface of a housing, and two sides of a toggle block are provided with outwardly protruding guiding blocks, and a guiding structure of the toggle block is formed by the cooperation of the guiding slot and the guiding blocks. After a long period of practical implementation, it is found that the above structure suffers from the following serious defects and deficiencies:

(1) The damper structure requires a guiding slot to be provided in a middle part of the housing, which results in the housing usually being formed only by processing sheet metal parts, which have low structural strength compared to other materials and are difficult to avoid deformation after a long period of use. If other materials are adopted for processing, the machining process is too complicated, the cost is extremely high, the production efficiency is extremely low, and it is impossible to use as a regular material for practical use.

(2) The damper structure requires the housing to be formed by machining two separate halves in the production process due to the necessity of placing a guiding block into the guiding slot. After placing the toggle block into the two halves of the housing, the two halves of the housing are assembled and combined. The requirement of the assembly process for aligning the two halves of the housing is extremely high, and the scrap rate during assembly is extremely high. Additionally, in conjunction with item (1) mentioned above, a housing formed by assembling two halves of sheet metal is also prone to structural deformation.

(3) In order to enable the toggle block to sink quickly when it reaches an end position of the guiding slot to realize a quick decoupling action, as well as to maintain the stretching state of the tension spring when the toggle block is decoupled, the damper structure is provided with a substantially vertical corner at the end of the guiding slot, so as to enable the toggle block to sink when it reaches the end position of the guiding slot, and to avoid the tension spring from driving the toggle block to move back. However, as the corner is too close to vertical, it leads to difficulties in re-toggling the toggle block to an inner side. If the corner is not provided or if the corner is not vertical enough, it fails to play a role in the rapid sinking of the toggle block as well as in avoiding backward movement of the toggle block.

**[0004]** Therefore, there is an urgent need in the prior art to apply for a damper for sliding doors or windows that overcomes the above defects.

### Summary of the Invention

**[0005]** In order to overcome the technical problems that the sliding door damper mentioned above in the prior art is prone to deformation in the case of long-term use and the assembly process is complicated, provided in the present disclosure is a new damper for sliding doors or windows. The new damper for sliding doors or windows provides a simple and reasonable structural design, high structural strength, and is unlikely to be structurally deformed, easy operation of production and assembly as well as unnecessary to provide a vertical corner section of guiding slot.

**[0006]** The technical solutions adopted in the present disclosure to solve the problems are as follows:

A new damper for sliding doors or windows includes:

a housing and a box, the box being movable provided within the housing, an interior of the housing being provided with a first restricting member; and

a toggle block and a second restricting member, the toggle block being rotatably provided within the box by a first rotating shaft, the second restricting member being configured to be movable between a supporting position and a releasing position,

in which the second restricting member restricts a rotation of the toggle block so that the toggle block is kept at an upper position when the second restricting member is positioned at the supporting position, and

the second restricting member releases a rotation restriction of the toggle block when the second restricting member is positioned at the releasing position, an end of the toggle block distal to the first rotating shaft being rotated down and sunk by gravity so that the toggle block is rotated to a sinking position, the first restricting member being configured to keep the toggle block at the sinking position.

**[0007]** By providing the structure mentioned above, there is no need to provide a guiding slot on the housing. High-strength, high-performance materials other than sheet metal parts may be adopted as materials for the housing. The overall structural strength of the housing is

high and the structural stability is good, avoiding structural deformation of the housing in case of long-term use. There is no need to separate the housing into two halves, which may be formed integrally during the manufacturing process. It is easier to manage the accuracy of the overall structure, which also greatly simplifies the assembly process of the damper and makes it less likely to be scrapped in the assembly process.

**[0008]** Further, the second restricting member comprises a restricting end and a controlling end provided on two ends thereof; when the controlling end is not in contact with objects, the restricting end is close to the toggle block and is abutted against the toggle block so that the second restricting member is positioned at the supporting position; when the controlling end is compressed, the restricting end is away from the toggle block and is not in contact with the toggle block so that the second restricting member is positioned at the releasing position, and an end of the toggle block distal to the first rotating shaft is abutted against the first restricting member.

**[0009]** Further, an interior of the box is also provided with a first elastic member, and the first elastic member is used for providing an elastic force for the restricting end towards the toggle block.

**[0010]** Further, the second restricting member is rotatably provided within the box by a second rotating shaft, the restricting end and the controlling end being positioned on two sides of the second rotating shaft respectively,

in which the first elastic member is a compression spring, an end of the first elastic member abutting against the box, an opposite end of the first elastic member being connected to the restricting end,
or in which the first elastic member is a torsion spring, the first elastic member being sleeved on the second rotating shaft and acting on the second restricting member.

**[0011]** Further, the first elastic member is a compression spring, an end that the restricting end connected to the first elastic member being provided with a protruding structure, the protruding structure being inserted into the first elastic member.

**[0012]** By providing the first elastic member disclosed in the new damper for sliding doors or windows, the restricting end of the second restricting member is rotated in a direction of the toggle block by an elastic force of the first elastic member when the controlling end of the second restricting member is not in contact with the end of the housing, and the restricting end of the second restricting member finally is abutted against the toggle block rotating upward so that the toggle block is kept at the upper position of the box under the force of the restricting end.

**[0013]** Further, the toggle block is provided with a first restricting slot; and when the restricting end is abutted against the toggle block, the restricting end is snap-fitted in the first restricting slot to restrict a rotation of the toggle block.

**[0014]** Further, the toggle block is provided with a second restricting slot; and when the first restricting member is abutted against the toggle block, the first restricting member is snap-fitted in the second restricting slot to restrict the box to move within the housing.

**[0015]** By providing two restricting slot structures disclosed in the new damper for sliding doors or windows, better structural matching effects between the toggle block and the first restricting member, and between the toggle block and the second restricting member, may be achieved respectively.

**[0016]** Further, the second restricting member is fixedly provided on an end of the toggle block distal to the first rotating shaft, the first restricting member being a restricting hole provided on a bottom of the housing; the second restricting member is abutted against a bottom of the housing so that the toggle block is kept at the upper position when the second restricting member is positioned at the supporting position, the second restricting member and the toggle block may slide relative to the housing synchronously; and the second restricting member is opposite to the restricting hole when the second restricting member is positioned at the releasing position, the second restricting member is inserted into the restricting hole so that the toggle block is rotated to be kept at the sinking position.

**[0017]** Further, the second restricting member and the toggle block are integrally molded.

**[0018]** Further, the restricting hole is an oblong hole.

**[0019]** Further, the toggle block is provided with a restricting shaft, and the box is provided with a second track, the restricting shaft being slidably provided in the second track, wherein the second track is used for providing a guiding function for a rotation movement of the toggle block centered on the first rotating shaft.

**[0020]** Further, an interior of the housing is provided with a first track extending in a length direction of the housing, and the box is slidably provided on the first track, wherein the first track is used for providing a guiding function for the box to move within the housing.

**[0021]** By providing two track structures disclosed in the new damper for sliding doors or windows, it may be used to provide a guiding and restricting role for the movement path of the toggle block and the second restricting member respectively.

**[0022]** Further, the housing is formed of an integral stretch-molded aluminum profile.

**[0023]** Further, the new damper for sliding doors or windows also includes a damping tube provided in an interior of the housing, and two ends of the damping tube are directly or indirectly connected to the two toggle blocks respectively.

**[0024]** Further, the new damper for sliding doors or windows also includes a second elastic member provided in the housing, and two ends of the second elastic member are directly or indirectly connected to two toggle

blocks respectively, wherein the second elastic member and the damping tube are provided in parallel.

**[0025]** Further, the second elastic member is a tension spring, and the tension spring is used for providing the two toggle blocks with elastic forces in opposite directions.

**[0026]** The new damper for sliding doors or windows is provided with two sets of box, toggle block, first restricting member, and second restricting member, which may achieve the bidirectional cushioning and shock absorption function of sliding doors or windows on both sides of the frames. When the new damper moves to a certain position with the door body towards the left or the right, the toggle block on the damper encounters the obstruction of the damping toggle block a, so that the toggle block may not continue to move relative to the damping toggle block a. However, the housing is followed by the door body under inertia to move in the direction of the left door frame, which may be damped by the damping tube to be cushioned and shock-absorbed, so that the door body is not moving too fast, and slowly close to the left door frame.

**[0027]** In summary, the new damper for sliding doors or windows provided in the present disclosure provides at least the following technical effects compared to the prior art:

The new damper for sliding doors or windows provided in the present disclosure is provided with a box, a toggle block, and other structures slidably provided within a housing so that there is no need to provide a guiding slot on the housing. High-strength, high-performance materials other than sheet metal parts may be adopted as materials of the housing, which achieves upgrading of the structure and materials used in the housing. The overall structural strength of the housing is high and the structural stability is good, avoiding structural deformation of the housing in case of long-term use.

**[0028]** In the new damper for sliding doors or windows provided in the present disclosure, further, since there is no need to provide structures such as guiding blocks and guiding slots, there is no need to process the housing in two separate halves, which may be directly formed integrally in the production process. It is easier to control the accuracy of the overall structure, while greatly simplifying the assembly process of the damper, which is not easy to be scrapped in the assembly process, and the structure of the housing formed by integrated machining is of higher strength, which further avoids structural deformation in the case of long-term use.

**[0029]** The new damper for sliding doors or windows provided in the present disclosure is provided with a first restricting member and a second restricting member provided within the housing, so that the toggle block is rotated downward centered on the first rotating shaft and sunk by gravity (i.e., sinks), when the second restricting member releases the restriction on the rotation of the toggle block. A first restricting member provided within the housing so that the toggle block is kept at the sinking position, and the toggle block does not move back under the force of the tension spring. The structure is designed without providing a vertical corner section of the guiding slot, avoiding the technical problem that it is difficult to re-toggle the toggle block to the interior due to the corner section being too close to vertical.

**[0030]** The new damper for sliding doors or windows provided in the present disclosure is provided with a first restricting member and a second restricting member provided within the housing, when the toggle block is rotated upwardly centered on the first rotating shaft under the force of the damping toggle block a, the first restricting member releases the movement restriction on the toggle block, and the second restricting member may follow the movement to the supporting position, and the toggle block may be kept at the upper position and unable to be rotated downwardly under the supporting effect of the second restricting member.

## Brief Description of the Drawings

**[0031]**

Fig. 1 is a partially structural diagram of the new damper for sliding doors or windows of embodiment 1, embodiment 2, embodiment 3, and embodiment 4 in the present disclosure;

Fig. 2 is a partially enlarged diagram H as shown in Fig. 1;

Fig. 3 is an exploded diagram of the new damper for sliding doors or windows of embodiment 1, embodiment 2, embodiment 3, and embodiment 4 in the present disclosure;

Fig. 4 is a partially enlarged diagram K as shown in Fig. 3;

Fig. 5 is an interior structural diagram of the new damper for sliding doors or windows of embodiment 1, embodiment 2, embodiment 3, and embodiment 4 in the present disclosure;

Fig. 6 is a diagram of the new damper for sliding doors or windows during the closing process of embodiment 1, embodiment 2, embodiment 3, and embodiment 4 in the present disclosure;

Fig. 7 is a diagram of the new damper for sliding doors or windows during the opening process of embodiment 1, embodiment 2, embodiment 3, and embodiment 4 in the present disclosure;

Fig. 8 is an exploded diagram of the new damper for sliding doors or windows of embodiment 5 in the present disclosure;

Fig. 9 is a partially enlarged diagram N as shown in Fig. 8;

Fig. 10 is a structural diagram of a bottom view of the housing of the new damper for sliding doors or windows of embodiment 5 in the present disclosure;

Fig. 11 is a diagram of the new damper for sliding doors or windows during the closing process of embodiment 5 in the present disclosure;

Fig. 12 is a diagram of the new damper for sliding doors or windows during the opening process of embodiment 5 in the present disclosure.

**[0032]** The meanings of the attached markings are as follows:
1 housing; 11 first track; 2 box; 21 second track; 3 toggle block; 31 first restricting slot; 32 second restricting slot; 33 restricting shaft; 4 first restricting member; 41 restricting hole; 5 second restricting member; 51 restricting end; 52 controlling end; 53 protruding structure; 6 first rotating shaft; 7 second rotating shaft; 8 first elastic member; 9 damping tube; 10 second elastic member.

## Detailed Description of Embodiments

**[0033]** For a better understanding and implementation, the technical solutions in the embodiments of the present disclosure are clearly and completely described below in conjunction with the attached drawings of the present disclosure.

**[0034]** In the description of the present disclosure, it is to be noted that the terms "up", "down", "front", "back", "left", "right", "vertical", "horizontal", "top", "bottom", "inside", "outside" and other orientation or position relationships are based on the orientation or position relationships shown in the attached drawings. It is only intended to facilitate description and simplify operation, but not to indicate or imply that the referred device or element has a specific orientation, or is constructed and operated in a specific orientation. Therefore, they should not be construed as a limitation of the present disclosure.

Embodiment 1

**[0035]** Referring to Fig. 1 to Fig. 5, in the first embodiment of the present disclosure, the new damper for sliding doors or windows includes a housing 1, a box 2, a toggle block 3, and a second restricting member 5; the box 2 is movably provided within the housing 1; and an interior of the housing 1 is also provided with a first restricting member 4. The housing 1 is used for fixedly being mounted on the door body of the sliding door, which reduces impact and noise when the door is opened or closed. The box 2 may move in a length direction of the housing 1 within thereof, and the interior of the box 2 is used for providing the toggle block 3, the second restricting member 5 and so on. That is, the box 2 is used as a load-bearing member for the above structures, so as to achieve the movement of the toggle block 3, the second restricting member 5, and other structures in the length direction of the housing 1.

**[0036]** Further, in the present embodiment, the toggle block 3 is rotatably provided within the box 2 by a first rotating shaft 6, and the second restricting member 5 is configured to be movable between a supporting position and a releasing position, in which the second restricting member 5 restricts a rotation of the toggle block 3 so that the toggle block 3 is kept at an upper position when the second restricting member 5 is positioned at the supporting position, and the second restricting member 5 releases a rotation restriction of the toggle block 3 when the second restricting member 5 is positioned at the releasing position, an end of the toggle block 3 distal to the first rotating shaft 6 being rotated down and sunk by gravity so that the toggle block 3 is rotated to a sinking position, the first restricting member 4 being configured to keep the toggle block 3 at the sinking position.

**[0037]** Preferably, in the present embodiment, the interior of the box is also provided with a second rotating shaft 7, and the second restricting member 5 is rotatably provided in the interior of the box 2 by the second rotating shaft 7. Specifically, the first rotating shaft 6 and the second rotating shaft 7 are all provided in a width direction of the housing 1, which are used to achieve a rotational movement of the toggle block 3 and the second restricting member 5 within the box 2 respectively. To be more specifically, the second restricting member 5 includes a restricting end 51 and a controlling end 52 provided on two sides of the second rotating shaft 7. When the box 2 moves towards an end of the housing 1 and the controlling end 52 is in contact with the end of the housing 1, the controlling end 52 is rotated in a direction proximal to the toggle block 3, so that the restricting member 51 is rotated in a direction distal to the toggle block 3, i.e., the restricting member 51 is away from the toggle block 3, so that the second restricting member 5 is at the releasing position. On the contrary, when the controlling end 52 is not in contact with the end of the housing 1, the controlling end 52 is rotated in a direction distal to the toggle block 3, so that the restricting end 51 is rotated in a direction proximal to the toggle block 3, i.e., the restricting end 51 is close to the toggle block 3 so that the second restricting member 5 is at the supporting position.

**[0038]** In the technical solutions of the present embodiment, by providing a first restricting member 4 and a second restricting member 5 in the interior of the housing 1, switching between two states of the toggle block 3 may be achieved as follows:

(1) When the box 2 is positioned on the end of the housing 1 and the controlling end 52 of the second restricting member 5 is in contact with objects at the end of the housing 1, the restricting end 51 is away from the toggle block 3. The toggle block 3 is rotated downward centered on the first rotating shaft 6 and sunk by gravity (i.e., sinks), which is also rotated to be abutted against the first restricting member 4, so that the toggle block 3 is unable to move under obstruction of the first restricting member 4, and the box 2 is unable to move in the interior of the housing 1, avoiding backward movement of the toggle block 3.

(2) When the box 2 is not positioned on the end of the housing 1 and the controlling end 52 of the second restricting member 5 is not in contact with the

end of the housing 1, the restricting end 51 is close to the toggle block 3, and the toggle block 3 is rotated upward centered on the first rotating shaft 6 under the force of the damping toggle a and is abutted against the restricting end 51. The toggle block 3 is kept at the upper position under the force of the restricting end 51 and is unable to be rotated downward so that the box 2 is restored to a movable state inside the housing 1.

**[0039]** Therefore, the first restricting member 4 is provided in the present embodiment to achieve the avoidance of backward movement of the toggle block 3, without providing the guiding block, guiding slot and vertical corner section thereof, so as to avoid technical problems such as a corner of the guiding slot being too close to the vertical leading to difficulties in re-toggling the toggle block to the interior, which provides a simple and reasonable structural design.

**[0040]** More specifically, in the present disclosure, a box 2, a toggle block 3, and other structures are slidably provided within a housing 1 to achieve the cushioning and shock absorption function of the new damper for sliding doors or windows, so that there is no need to provide a guiding slot on the housing 1. Besides sheet metal parts, other high-strength and high-performance materials may be adopted as materials of the housing 1, which achieves upgrading of the structure and materials used in the housing 1. The overall structural strength of the housing 1 is high, and the structural stability is good, avoiding structural deformation of the housing 1 in case of long-term use. Further, since there is no need to provide structures such as guiding blocks and guiding slots mentioned in the background, there is no need to process the housing 1 in two separate halves, which may be directly formed integrally in the production process. It is easier to control the accuracy of the overall structure of the housing 1, while greatly simplifying the assembly process of the new damper, which is not easy to be scrapped in the assembly process, and the structure of the housing 1 formed by integrated machining is of higher strength, which further avoids structural deformation in the case of long-term use.

**[0041]** The housing 1 of the present disclosure is preferably formed by adopting integral stretch-molded aluminum profiles that offer a variety of advantages, such as light weight, excellent molding, high strength, corrosion resistance, long service life, renewability, less pollution, and low maintenance costs. It is to be noted that in some other embodiments, the housing 1 of the present disclosure may also, but is not limited to, be formed by adopting integral molded steel alloy profiles or steel profiles, which is not solely limited hereby.

**[0042]** In the present embodiment, the working process and the working principle of the new damper for sliding doors or windows are as follows:

a. Before performing the closing operation, referring to the first drawing of Fig. 6, the initial state of the new damper for sliding doors or windows is as follows: The box 2 is provided close to the end of the housing 1, and the controlling end 52 of the second restricting member 5 is in contact with the end of the housing 1; the restricting end 52 is away from the toggle 3; the toggle 3 is abutted against the first restricting member 4 within the housing 1; and the toggle 3 is unable to move back under the force of a tension spring.

b. When performing the closing operation, referring to the second and third drawings of Fig. 6, the new damper for sliding doors or windows moves with the door body towards a side of the door frame, i.e., it moves to the left in the figure. The toggle block 3 is in contact with the damping toggle block a (the damping toggle block a is positioned on the guiding track and the position thereof is fixed.) and moves towards a direction distal to the left end of the housing 1 under the force of the damping toggle block a. Then the damping tube 9 connected with the toggle block 3 plays a role of cushioning and shock-absorption. The toggle block 3 is rotated upward centered on the first rotating shaft 6. The second restricting member 5 on the box moves towards a direction distal to the left end of the housing 1. The controlling end 52 of the second restricting member 5 is no longer in contact with the objects at the end of the housing 1. The restricting end 52 is rotated towards a direction proximal to the toggle block 3 so that the toggle block 3 is abutted against the restricting end 51 and is unable to be rotated downward under the force of the restricting end 51 and the toggle block 3 is kept at the upper position of the box 2.

c. When the door body is fully closed, referring to the fourth drawing of Fig. 6, the box 2 slides to the middle part area of the housing 1; the damping toggle block a is snap-fitted to the top of the toggle block 3; the box 2 is fixed on the position of the housing 1; and the toggle block 3 is kept at the upper position of the box 2.

d. When performing the opening operation, referring to four drawings of Fig. 7, the new damper for sliding doors or windows moves with the door body towards a direction distal to a side of the door frame, i.e., it moves to the right in the figure. The toggle block 3 moves towards the left end of the housing 1 under the force of the damping toggle block a. When the box 2 moves to the end of the housing 1, the controlling end 52 of the second restricting member 5 is in contact with the objects at the end of the housing 1 so that the restricting end 52 on the opposite end of the second restricting member 5 is away from the toggle block 3. After the toggle block 3 loses the force of the restricting end 52, the toggle block 3 is rotated downward and sunk by gravity to be abutted against the first restricting member 4 within the housing 1. Then the toggle block 3 may be prevented from mov-

ing back under the force of the tension spring by the blocking and restricting action of the first restricting member 4 to return to its initial state.

**[0043]** To be more specifically, objects at the end of the housing 1 in the present embodiment may be a sliding wheel structure of the new damper for sliding doors or windows, or may be a rigid structure of the end of the housing 1, which is not specifically limited in the embodiment of the present disclosure.

**[0044]** Referring to Fig. 2, in another preferable solution in the present embodiment, an interior of the box 2 is also provided with a first elastic member 8, and the first elastic member 8 is used for providing an elastic force for the restricting end 51 towards the toggle block 3. In the present preferable technical solution, the restricting end 51 of the second restricting member 5 is rotated in a direction of the toggle block 3 by an elastic force of the first elastic member 8 when the controlling end 52 of the second restricting member 5 is not in contact with the objects at the end of the housing 1, and the restricting end 51 of the second restricting member 5 finally is abutted against the toggle block 3 rotating upward so that the toggle block 3 is kept at the upper position of the box 2 by the force of the restricting end 51.

**[0045]** Referring to Fig. 2 and Fig. 4, in another preferable solution in the present embodiment, the first elastic member 8 is a compression spring. An end of the restricting end 51 towards the spring is provided with a protruding structure 53, and the protruding structure 53 is inserted into the spring so that the restricting end 51 is connected to the spring. Specifically, the first elastic member 8 in the present embodiment adopts a spring structure. In order to be adapted to the spring structure, a protruding structure 53 is provided at the end of the restricting end 51 towards the spring. The protruding structure 53 is inserted into the spring to connect them with each other. When the controlling end 52 is not in contact with the objects at the end of the housing 1, the restricting end 51 is rotated towards the toggle block 3 under the force of the spring.

**[0046]** Additionally, in another preferable solution in the present embodiment, the first elastic member 8 is a torsion spring. The first elastic member 8 is sleeved on the second rotating shaft 7 and acts on the second restricting member 5. By the action of the torsion spring, the second restricting member 5 is enabled to act in the same way as in the previous preferred solution. When the controlling end 52 is not in contact with the objects at the end of the housing 1, the restricting end 51 is rotated towards the toggle block 3 under the force of the torsion spring.

Embodiment 2

**[0047]** The main difference between the second embodiment of the present disclosure and embodiment 1 is that: Two restricting slot structures disclosed in the new damper for sliding doors or windows are used for achieving better structural matching effects between the toggle block 3 and the first restricting member 4, and between the toggle block 3 and the second restricting member 5 respectively.

**[0048]** Referring to Fig. 2 and Fig. 4, in an optional solution of the present embodiment, an end of the toggle block 3 towards the second restricting member 5 is provided with a first restricting slot 31; and when the restricting end 51 is abutted against the toggle block 3, the restricting end 51 is snap-fitted in the first restricting slot 31 to restrict the toggle block 3 to rotate downward centered on the first rotating shaft 6. In the technical solution of the present embodiment, the first restricting slot 31 is specifically a slot structure provided on the end of the toggle block 3 towards the restricting end 51 and formed by recessing towards the inner side of the toggle block 3. The restricting end 51 is a relatively small protruding structure 53 formed by the second restricting member 5 protruding in the direction of the toggle block 3. When the toggle block 3 is rotated upward centered on the first rotating shaft 6 under the force of the damping toggle block a, the restricting end 51 is snap-fitted in the first restricting slot 31 so that the toggle block 3 and the second restricting member 5 are mated to block the toggle block 3 from rotating downward and the toggle block 3 is kept at the upper position of the box 2.

**[0049]** Referring to Fig. 1 and Fig. 4, in another optional solution of the present embodiment, the toggle block 3 is provided with a second restricting slot 32; and when the first restricting member 4 is abutted against the toggle block 3, the first restricting member 4 is snap-fitted in the second restricting slot 32 to restrict the toggle block 3 to move within the housing 1. In the optional technical solution, the second restricting slot 32 is specifically a slot structure provided on a bottom of the toggle block 3 and formed by recessing towards the inner side of the toggle block 3. When the toggle block 3 is rotated downward centered on the first rotating shaft 6, the first restricting member 4 is snap-fitted in the second restricting slot 32 so that the toggle block 3 and the first restricting member 4 are mated to block the toggle block 3 to move back under the force of the tension spring.

**[0050]** More specifically, an opening of the second restricting slot 32 is greater than or equal to the first restricting member 4 so that the first restricting member 4 may be accommodated therein.

Embodiment 3

**[0051]** The main difference among the third embodiment of the present disclosure and embodiment 1 and embodiment 2 is that: Two tracks structure disclosed in the new damper for sliding doors or windows are used to provide a guiding and restricting role for the movement path of the toggle block 3 within the box 2 and the box 2 within the housing 1 respectively.

**[0052]** Referring to Fig. 1 and Fig. 4, in an optional

solution of the present embodiment, the toggle block 3 is provided with a restricting shaft 33, and the box 2 is provided with a second track 21, the restricting shaft 33 being slidably provided in the second track 21, in which the second track 21 is used for providing guiding function for a rotation movement of the toggle block 3 centered on the first rotating shaft 6. In the technical solution of the present embodiment, the second track 21 is specifically mutually symmetrical arc-shaped holes provided on both sides of the box 2 in a width direction thereof. Two ends of the restricting shaft 33 on the toggle block 3 are inserted into two arc-shaped holes and are slidably provided in the two arc-shaped holes so that the movement path of the rotation movement of the toggle block 3 centered on the first rotating shaft 6 is not shifted, i.e., to play a guiding and restricting role.

**[0053]** Referring to Fig.1 and Fig. 5, in another optional solution of the present embodiment, an interior of the housing 1 is provided with a first track 11 extending in a length direction of the housing 1, and the box 2 is slidably provided on the first track 11, wherein the first track 11 is used for providing guiding function for the box 2 to move within the housing 1. In the optional technical solution, the first track 11 is specifically mutually symmetrical track structures provided on two side walls inside the box 1 so that the movement path of the linear movement of the box 2 along the length direction of the housing 1 is not shifted, i.e., to play a guiding and restricting role.

Embodiment 4

**[0054]** Referring to Fig. 3 and Fig. 5, the main difference among the fourth embodiment of the present disclosure and embodiment 1, embodiment 2, and embodiment 3 is that: The new damper for sliding doors or windows also includes a damping tube 9. The damping tube 9 is provided in the housing 1. A number of the box 3, toggle block 3, first restricting member 4 and second restricting member 5 is all two. Two ends of the damping tube 9 are directly connected to the two toggle blocks 3, or indirectly connected to the two toggle blocks 3 through two boxes 2.

**[0055]** In the technical solution of the present embodiment, the new damper for sliding doors or windows is provided with two sets of box 2, toggle block 3, first restricting member 4 and second restricting member 5, which may achieve the bidirectional cushioning and shock absorption function of sliding doors or windows on both sides of the frames. The specific principles are as follows:

As shown in Fig. 5, when closing the door towards the left door frame and the new damper for sliding doors or windows moves to a certain position with the door body towards the left, the toggle block 3 on the damper encounters the obstruction of the damping toggle block *a,* so that the toggle block 3 may not continue to move relative to the damping toggle block *a.* However, the housing 1 is followed by the door body under inertia to move in the direction of the left door frame, which may be damped by the damping tube 9 to be cushioned and shock-absorbed, so that the door body is not moving too fast, and slowly close to the left door frame.

**[0056]** Similarly, when closing the door towards the right door frame and the new damper for sliding doors or windows moves to a certain position with the door body towards the right, the toggle block 3 on the damper encounters the obstruction of the damping toggle block *a,* so that the toggle block 3 may not continue to move relative to the damping toggle block *a.* However, the housing 1 is followed by the door body under inertia to move in the direction of the right door frame, which may be damped by the damping tube 9 to be cushioned and shock-absorbed, so that the door body is not moving too fast, and slowly close to the right door frame.

**[0057]** Therefore, the present disclosure may achieve the function of a bidirectional damping system by providing only two sets of box 2, toggle block 3, first restricting member 4 and second restricting member 5, which is simple and reasonable in structural design, and also cheaper in cost. More specifically, a distance between two sets of box 2 may be adjusted, or a distance between a top of the door frame and the damping toggle block a may be adjusted according to actual demands, so as to be adapted to a corresponding width of the door body or window, thereby improving the adaptability of the production.

**[0058]** In the case of sliding doors, when the door is closed and the damper moves to a certain position with the door body towards the door frame, the toggle block 3 in the damper encounters the blocking of the damping toggle block a, which may be damped by the damping tube 9 in the damper to be cushioned, so that the door body is not moving too fast, and slowly close to the door frame. However, the following technical problems inevitably arise from such a structural design approach:

In the closing process, due to the cushioning role of the damping tube 9, the moving speed of the door will be gradually weakened. However, as the weight of different models of the door body varies, when the door body is heavier or the moving speed of the door body is originally relatively slow when closing the door, it may lead to a situation that the speed of the door body has been weakened to zero (i.e., to stop moving), but the door body still does not reach the door frame, which may lead to the door is not closed tightly, thereby seriously affecting the user's experience.

**[0059]** Therefore, in order to solve the technical problem, disclosed in the present embodiment is the following preferable solution:

Referring to Fig. 3 and Fig. 5, the new damper for sliding doors or windows also includes a second elastic member 10 provided in the housing 1, and two ends of the second elastic member 10 are connected to two toggle blocks 3 respectively, in which the second elastic member 10 and the damping tube 9 are provided in parallel. In the present preferable technical solution, when the toggle block 3 is

blocked by the damping toggle block a and is damped by the damping tube 9 to be cushioned and shock-absorbed, the second elastic member 10 may pull the door body to continue to move towards the door frame under the force of itself, avoiding the possibility of the door not closing properly.

**[0060]** More specifically, the second elastic member 10 mentioned in the above embodiment may adopt a detachable structure, or the tension of the second elastic member 10 may be adjusted, so that the second elastic member 10 after disassembly and replacement or after adjusting the tension is adapted to the weight of the door body, thereby further improving the adaptability of the new damper.

**[0061]** In another preferable solution in the present embodiment, the second elastic member 10 is a tension spring, and the tension spring is used for providing the two toggle blocks 3 with elastic forces in opposite directions. Specifically, since two ends of the tension spring are connected to two toggle blocks 3 of the new damper, when the door body is closed towards the left, the tension spring provides elastic pulling for the left toggle block 3. When the door body is closed towards the right, the tension spring provides elastic pulling for the right toggle block 3, which finally achieves the effect of pulling the door body to continue to move.

**[0062]** More specifically, since the new damper is provided with two toggle blocks 3 on the left and the right, the tension spring is not required to be connected to the housing 1 directly or indirectly through other auxiliary connecting mechanisms, and the tension spring may play a role in continuing to pull the door or window to move when the sliding door or window is moved to the left or to the right, so as to avoid the door or window from not being closed tightly.

Embodiment 5

**[0063]** Referring to Fig. 8 to Fig. 12, the second restricting member 5 and the first restricting member 4 in the fifth embodiment of the present disclosure are different in specific structure and setting from those in embodiment 1, embodiment 2, embodiment 3, and embodiment 4. Preferably, as shown in Fig. 9 and Fig. 10, in the present embodiment, the second restricting member 5 is fixedly provided on the end of the toggle block 3 distal to the first rotating shaft 6, and the first restricting member 4 is a restricting hole 41 provided on a bottom of the housing 1.

**[0064]** In the technical solution of the present embodiment, the switching of the two states of the toggle block 3 may be achieved by providing the first restricting member 4 and the restricting hole 41 in the interior of the housing 1, which is as follows:

(1) When the second restricting member 5 is at the releasing position, the second restricting member 5 is opposite to the restricting hole 41. The second restricting member 5 may be inserted into the restricting hole 41 so that the toggle block 3 is rotated and kept at the sinking position. Then, the toggle block 3 is unable to move under the blocking action of the restricting hole 41, and the box 2 is unable to move in the interior of the housing 1, thereby avoiding the toggle block 3 from moving back.

(2) When the second restricting member 5 is at the supporting position, the second restricting member 5 is abutted against the bottom of the housing 1. The toggle block 3 is kept at the upper position under the force of the second restricting member 5 and is unable to be rotated downward. The second restricting member 5 and the toggle block 3 may slide synchronously relative to the housing 1 so that the box 2 is restored to a movable state inside the housing 1.

**[0065]** In the present embodiment, the working process and the working principle of the new damper for sliding doors or windows are as follows:

a. Before performing the closing operation, referring to the first drawing of Fig. 11, the initial state of the new damper for sliding doors or windows is as follows: The box 2 is provided close to the end of the housing 1; the second restricting member 5 is inserted into the restricting hole 41 so that the toggle block 3 is kept at the sinking position; and the toggle 3 is unable to move back under the force of the tension spring.

b. When performing the closing operation, referring to the second drawing of Fig. 11, the new damper for sliding doors or windows moves with the door body towards a side of the door frame, i.e., it moves to the left in the figure. The toggle block 3 is in contact with the damping toggle block *a* (the damping toggle block *a* is positioned on the guiding track and the position thereof is fixed.) and moves towards a direction distal to the left end of the housing 1 under the force of the damping toggle block *a.* Then the damping tube 9 connected with the toggle block 3 plays a role of cushioning and shock-absorption. The toggle block 3 is rotated upward centered on the first rotating shaft 6 to the upper position. The second restricting member 5 fixedly provided on the toggle block 3 is also rotated upward centered on the first rotating shaft 6. The second restricting member 5 may be abutted against the bottom of the housing 1 after being removed from the restricting hole 41. The toggle block 3 is unable to be rotated downward under the force of the second restricting member 5 so that the toggle block 3 is kept at the upper position of the box 2. The second restricting member 5 and the toggle block 3 may synchronously slide relative to the housing 1.

c. When the door body is fully closed, the box 2 slides to the middle part area of the housing 1; the damping toggle block *a* is snap-fitted to the top of the toggle

block 3; the box 2 is fixed on the position of the housing 1; and the toggle block 3 is kept at the upper position of the box 2.

d. When performing the opening operation, referring to two drawings of Fig. 12, the new damper for sliding doors or windows moves with the door body towards a direction distal to a side of the door frame, i.e., it moves to the right in the figure. The toggle block 3 moves towards the left end of the housing 1 under the force of the damping toggle block *a.* When the box 2 moves to the end of the housing 1, the second restricting member 5 is opposite to the restricting hole 41. The second restricting member 5 releases the rotation restriction of the toggle block 3. The toggle block 3 is rotated downward and sunk by gravity to the sinking position when losing the force of the second restricting member 5. The restricting member 5 is inserted into the restricting hole 41. Then the toggle block 3 may be prevented from moving back under the force of the tension spring by the blocking and restricting action of the restricting hole 41 to return to its initial state.

**[0066]** Preferably, in the present embodiment, in order to improve the structural strength and reduce the production cost, the second restricting member 5 and the toggle block 3 are formed integrally. Admittedly, in some other embodiments, the second restricting member 5 and the toggle block 3 may, but is not limited to, adopt such as a screw connection and a welding connection, which is sufficient to select according to the actual demand.

**[0067]** Preferably, in the present embodiment, in order to enable the second restricting member 5 to smoothly move relative to the restricting hole 41, the restricting hole 41 is an oblong hole. Admittedly, in some other embodiments, the restricting hole 41 may be, but is not limited to, such as a circular hole and square hole, which is sufficient to select according to the actual demand.

**[0068]** In summary, in the new damper for sliding doors or windows provided in the present disclosure, there is no need to provide a guiding slot on the housing 1. Besides sheet metal parts, other high-strength and high-performance materials may be adopted as materials of the housing 1. The overall structural strength of the housing 1 is high and the structural stability is good, avoiding structural deformation of the housing 1 in case of long-term use. Further, since there is no need to provide structures such as guiding blocks and guiding slots, there is no need to process the housing 1 in two separate halves, which may be directly formed integrally in the production process. The assembly process of the damper of the present disclosure is greatly simplified, which is not easy to be scrapped in the assembly process, and the structure of the housing 1 formed by integrated machining is of higher strength, which further avoids structural deformation in the case of long-term use.

**[0069]** Additionally, the new damper for sliding doors or windows provided in the present disclosure is provided with a first restricting member 4 and a second restricting member 5 provided within the housing 1, so that the toggle block 3 is rotated downward centered on the first rotating shaft 6 and sunk by gravity (i.e., sinks) when the second restricting member 5 releases the restriction on the rotation of the toggle block 3. A first restricting member 4 provided within the housing 1 keeps the toggle block 3 at the sinking position, so that the toggle block 3 does not move back under the force of the tension spring. The structure is designed without providing a vertical corner section of the guiding slot, avoiding the technical problem that it is difficult to re-toggle the toggle block 3 to the interior due to the corner section being too close to vertical. When the toggle block 3 is rotated upwardly centered on the first rotating shaft 6 under the force of the damping toggle block a, the first restricting member 4 releases the movement restriction on the toggle block 3, and the second restricting member 5 may follow the movement to the supporting position, and the toggle block 3 may be kept at the upper position and unable to be rotated downwardly under the supporting effect of the second restricting member 5 so that the box 2 is restored to a movable state inside the housing 1.

**[0070]** It is worth mentioning that the new damper of the present disclosure may be applied to a sliding door, a sliding window, or other sliding door or window products. For the sake of avoiding redundancy, in the above four embodiments, the terms "door body" and "door leaf" are uniformly used to refer to the structure of the door or window of a wide range of sliding door or window products.

## Claims

1. A new damper for sliding doors or windows, comprising:

   a housing (1) and a box (2), the box (2) being movable provided within the housing (1), an interior of the housing (1) being provided with a first restricting member (4); and

   a toggle block (3) and a second restricting member (5), the toggle block (3) being rotatably provided within the box (2) by a first rotating shaft (6), the second restricting member (5) being configured to be movable between a supporting position and a releasing position,

   wherein the second restricting member (5) restricts a rotation of the toggle block (3) so that the toggle block (3) is kept at an upper position when the second restricting member (5) is positioned at the supporting position, and

   the second restricting member (5) releases a rotation restriction of the toggle block (3) when the second restricting member (5) is positioned at the releasing position, an end of the toggle block (3) distal to the first rotating shaft (6) being

rotated down and sunk by gravity so that the toggle block (3) is rotated to a sinking position, the first restricting member (4) being configured to keep the toggle block (3) at the sinking position.

**2.** The new damper for sliding doors or windows according to claim 1, wherein the second restricting member (5) comprises a restricting end (51) and a controlling end (52) provided on two ends thereof;

when the controlling end (52) is not in contact with objects, the restricting end (51) is close to the toggle block (3) and is abutted against the toggle block (3) so that the second restricting member (5) is positioned at the supporting position; and
when the controlling end (52) is compressed, the restricting end (51) is away from the toggle block (3) and is not in contact with the toggle block (3) so that the second restricting member (5) is positioned at the releasing position, and an end of the toggle block (3) distal to the first rotating shaft (6) is abutted against the first restricting member (4).

**3.** The new damper for sliding doors or windows according to claim 2, wherein an interior of the box (2) is also provided with a first elastic member (8), and the first elastic member (8) is used for providing an elastic force for the restricting end (51) towards the toggle block (3).

**4.** The new damper for sliding doors or windows according to claim 3, wherein the second restricting member (5) is rotatably provided within the box (2) by a second rotating shaft (7), the restricting end (51) and the controlling end (52) being positioned on two sides of the second rotating shaft (7) respectively;

the first elastic member (8) is a compression spring, an end of the first elastic member (8) abutting against the box (2), an opposite end of the first elastic member (8) being connected to the restricting end (51); or
the first elastic member (8) is a torsion spring, the first elastic member (8) being sleeved on the second rotating shaft (7) and acting on the second restricting member (5).

**5.** The new damper for sliding doors or windows according to claim 4, wherein the first elastic member (8) is a compression spring, an end that the restricting end (51) connected to the first elastic member (8) being provided with a protruding structure (53), the protruding structure (53) being inserted into the first elastic member (8).

**6.** The new damper for sliding doors or windows according to claim 2, wherein the toggle block (3) is provided with a first restricting slot (31); and when the restricting end (51) is abutted against the toggle block (3), the restricting end (51) is snap-fitted in the first restricting slot (31) to restrict a rotation of the toggle block (3).

**7.** The new damper for sliding doors or windows according to claim 2, wherein the toggle block (3) is provided with a second restricting slot (32); and when the first restricting member (4) is abutted against the toggle block (3), the first restricting member (4) is snap-fitted in the second restricting slot (32) to restrict the box (2) to move within the housing (1).

**8.** The new damper for sliding doors or windows according to claim 1, wherein the second restricting member (5) is fixedly provided on an end of the toggle block (3) distal to the first rotating shaft (6), the first restricting member (4) being a restricting hole (41) provided on a bottom of the housing (1);

the second restricting member (5) is abutted against a bottom of the housing (1) so that the toggle block (3) is kept at the upper position when the second restricting member (5) is positioned at the supporting position, the second restricting member (5) and the toggle block (3) may slide relative to the housing (1) synchronously; and
the second restricting member (5) is opposite to the restricting hole (41) when the second restricting member (5) is positioned at the releasing position, the second restricting member (5) is inserted into the restricting hole (41) so that the toggle block (3) is rotated and kept at the sinking position.

**9.** The new damper for sliding doors or windows according to claim 8, wherein the second restricting member (5) and the toggle block (3) are integrally molded.

**10.** The new damper for sliding doors or windows according to claim 8, wherein the restricting hole (41) is an oblong hole.

**11.** The new damper for sliding doors or windows according to claim 1, wherein the toggle block (3) is provided with a restricting shaft (33), and the box (2) is provided with a second track (21), the restricting shaft (33) being slidably provided in the second track (21), and the second track (21) is used for providing guiding function for a rotation movement of the toggle block (3) centered on the first rotating shaft (6).

**12.** The new damper for sliding doors or windows ac-

cording to claim 1, wherein an interior of the housing (1) is provided with a first track (11) extending in a length direction of the housing (1), and the box (2) is slidably provided on the first track (11), wherein the first track (11) is used for providing guiding function for the box (2) to move within the housing (1).

**13.** The new damper for sliding doors or windows according to any one of claims 1-12, wherein the housing (1) is formed of an integral stretch-molded profile.

**14.** The new damper for sliding doors or windows according to claim 13, wherein the profile is an aluminum profile.

**15.** The new damper for sliding doors or windows according to any one of claims 1-12, the new damper for sliding doors or windows also comprising a damping tube (9) provided in an interior of the housing (1), and two ends of the damping tube (9) are directly or indirectly connected to the two toggle blocks (3) respectively.

**16.** The new damper for sliding doors or windows according to claim 15, the new damper for sliding doors or windows also comprising a second elastic member (10) provided in an interior of the housing (1), and two ends of the second elastic member (10) are directly or indirectly connected to two toggle blocks (3) respectively, wherein the second elastic member (10) and the damping tube (9) are provided in parallel.

**17.** The new damper for sliding doors or windows according to claim 16, wherein the second elastic member (10) is a tension spring, and the tension spring is used for providing the two toggle blocks (3) with elastic forces in opposite directions.

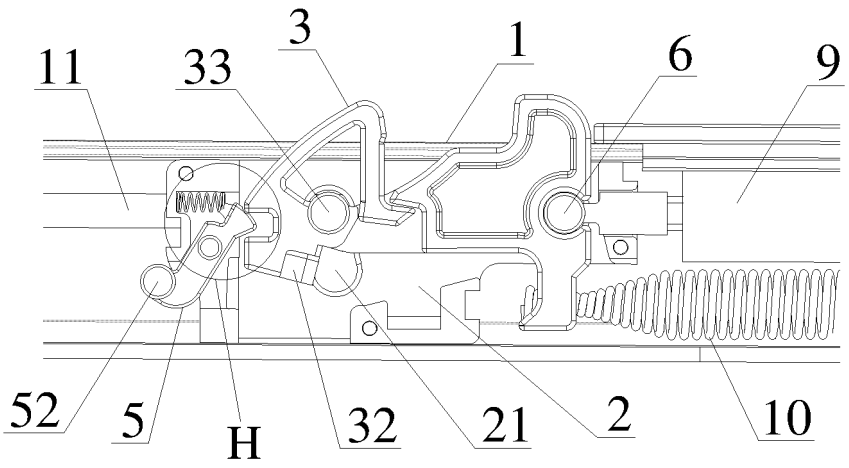


Fig. 1

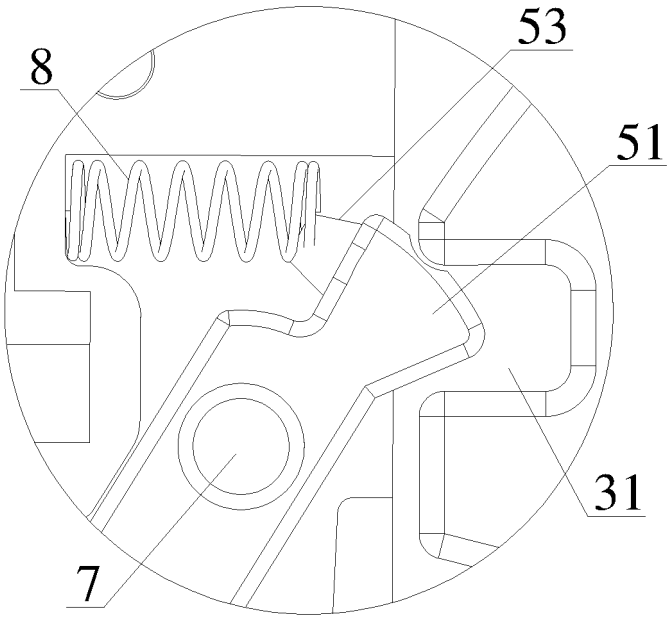


Fig. 2

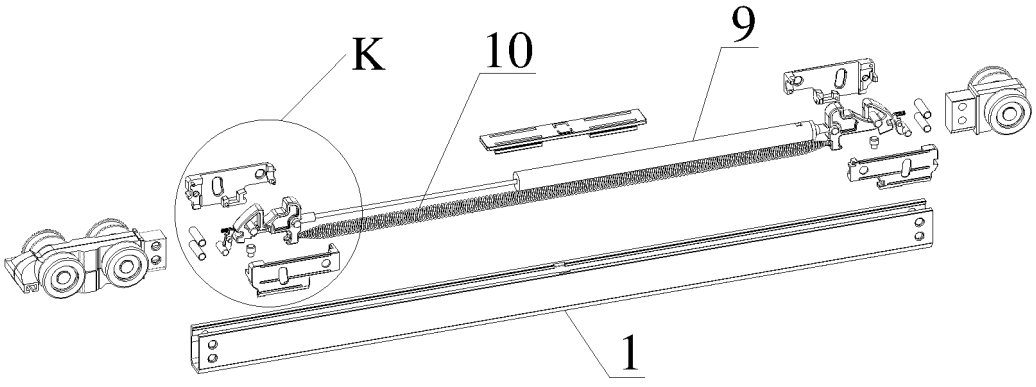


Fig. 3

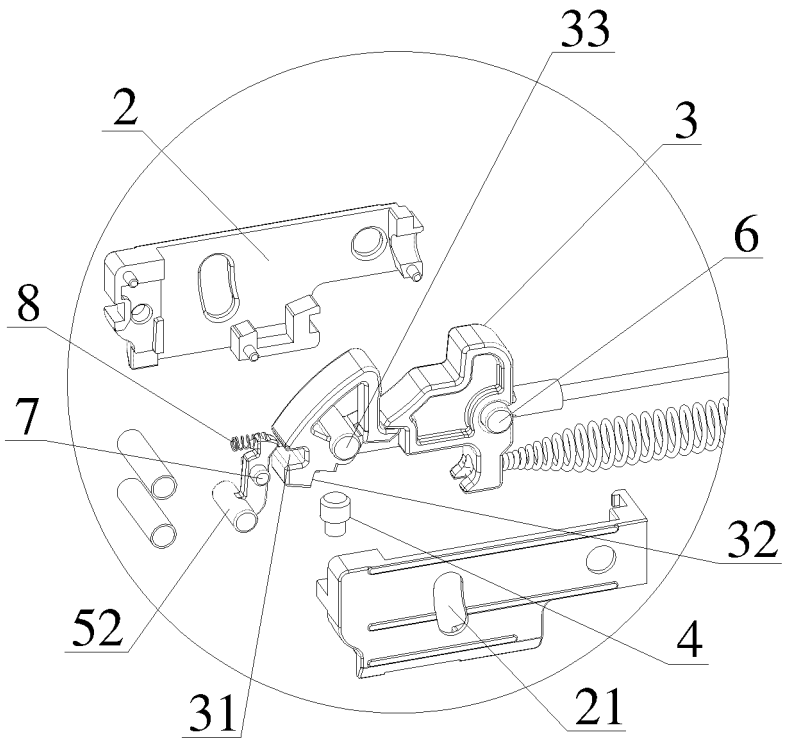


Fig. 4

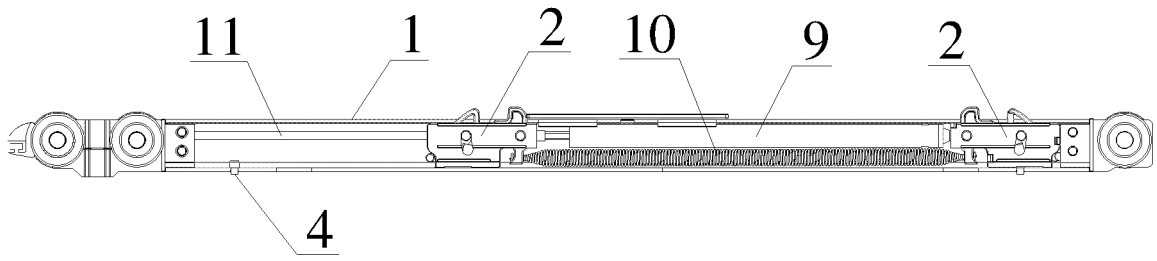


Fig. 5

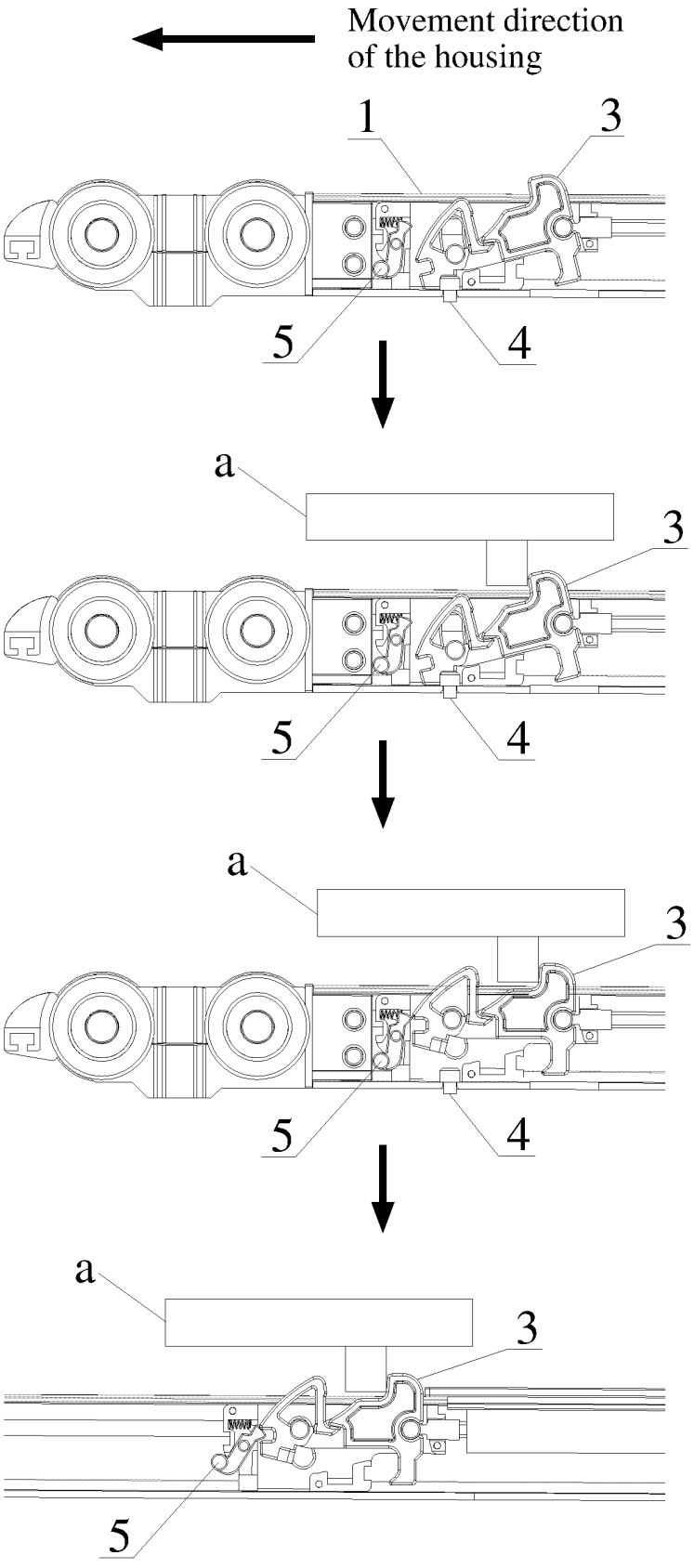


Fig. 6

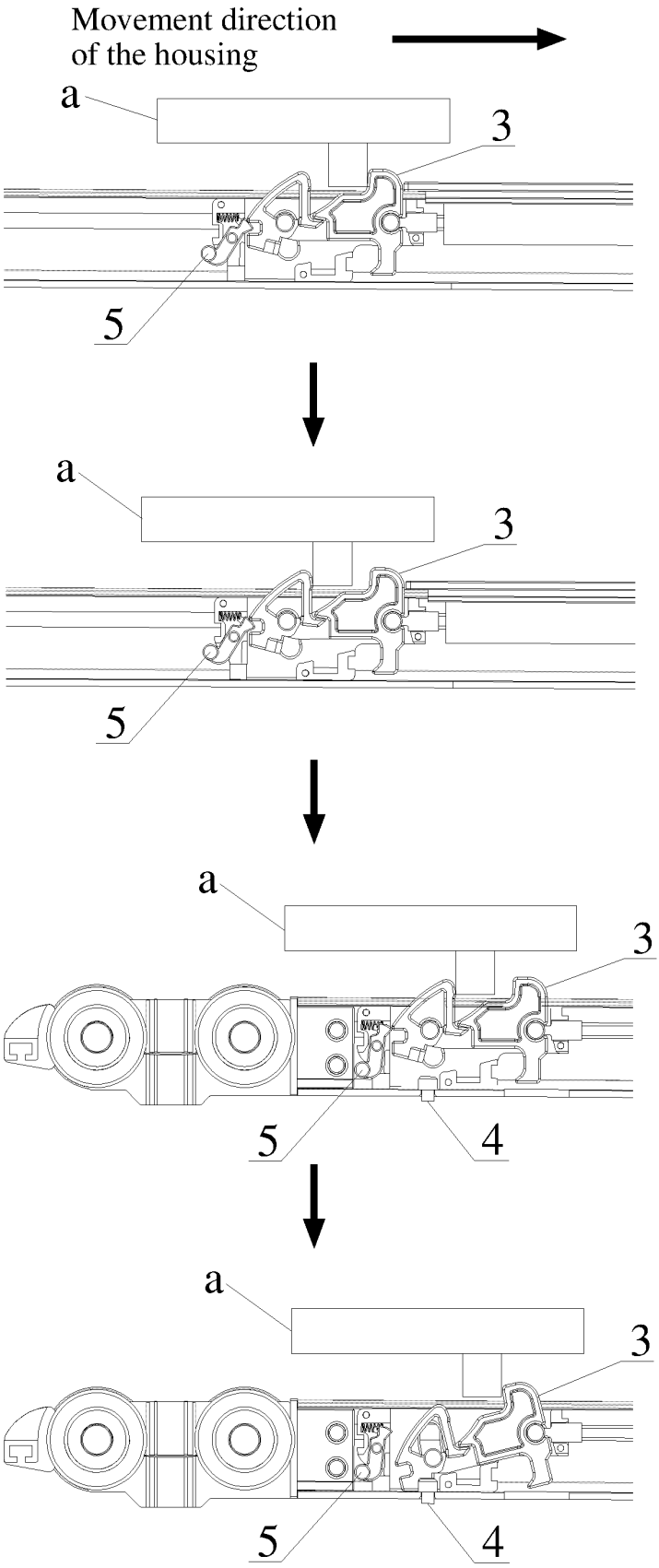


Fig. 7

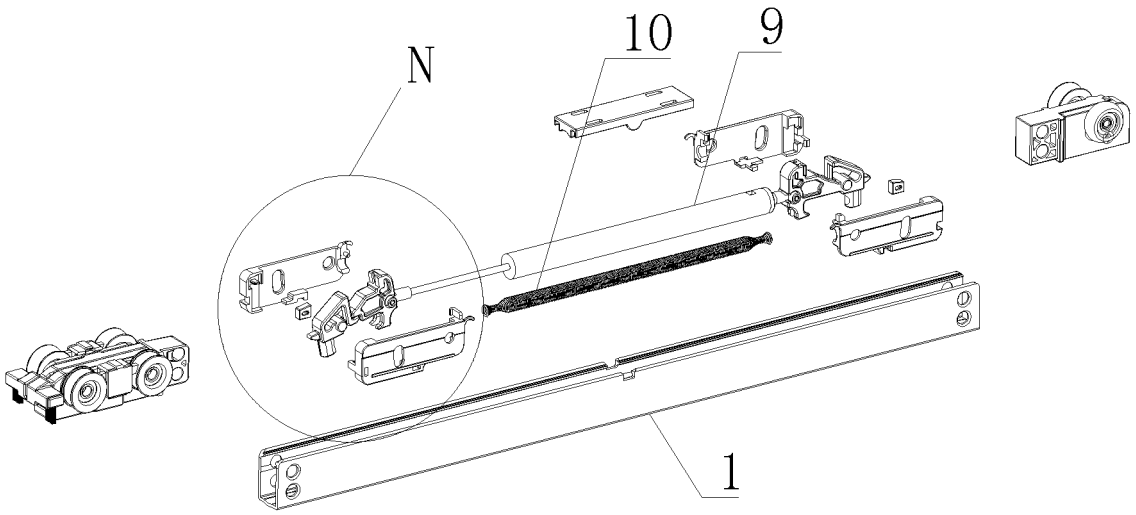


Fig. 8

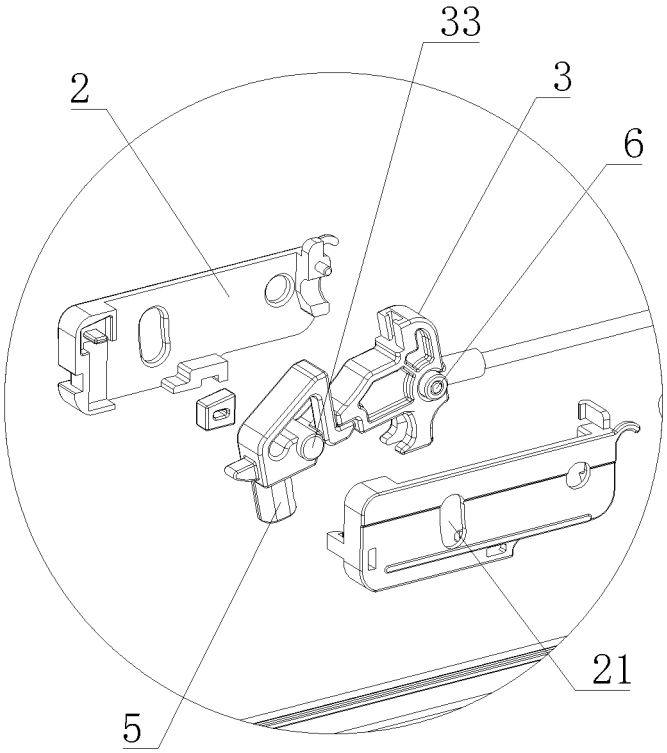


Fig. 9

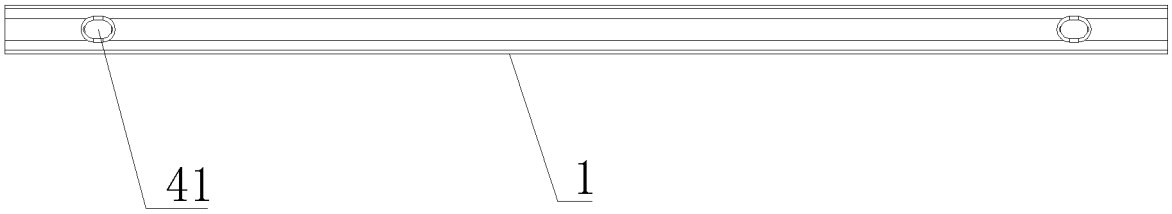


Fig. 10

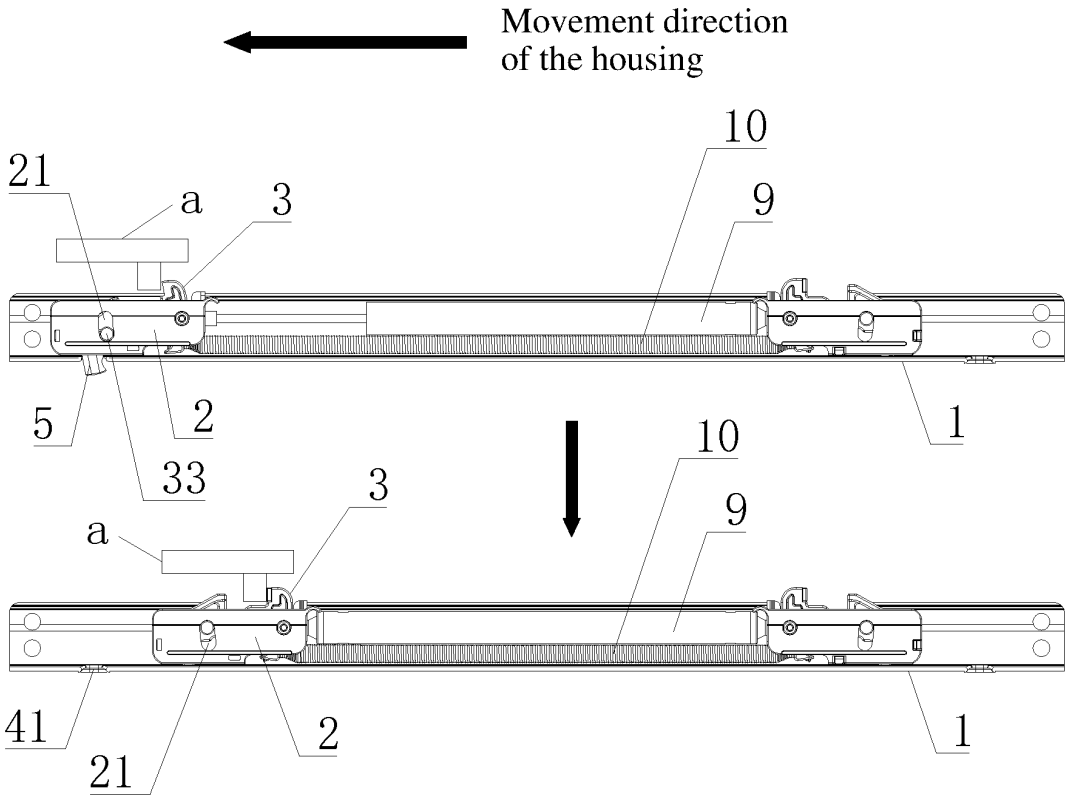
Movement direction
of the housing
21
a
3
10
9
5
2
1
33
3
10
a
9
41
21
2
1

Fig. 11

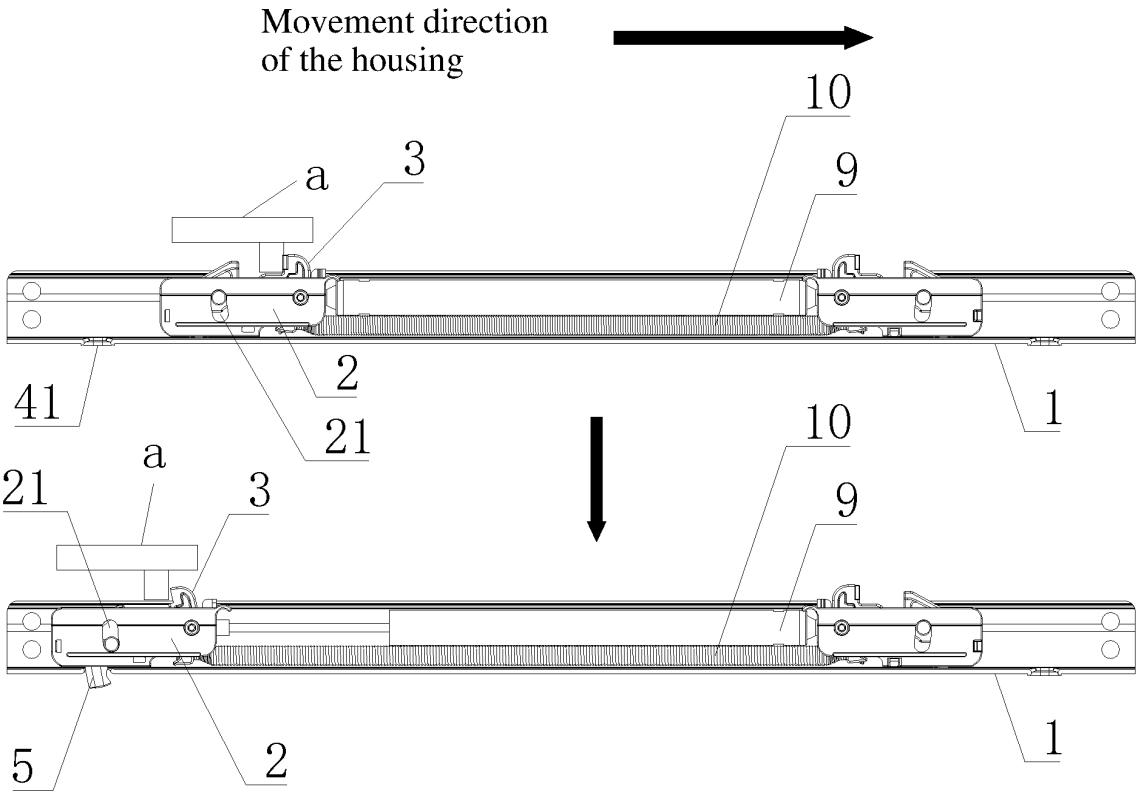
Movement direction
of the housing
10
a
3
9
41
2
1
21
10
21
a
3
9
5
2
1

Fig. 12

## INTERNATIONAL SEARCH REPORT

International application No.
**PCT/CN2023/098085**

**A. CLASSIFICATION OF SUBJECT MATTER**

E05F5/02(2006.01)i; E05F5/08(2006.01)i; E05D13/00(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)

IPC: E05F

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)

CNTXT; ENTXTC; VEN; CNKI: 阻尼, 壳体, 拨动, 限位, 槽, 一体, damping, housing, toggle, limit, slot, integral,

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| PX | CN 218117550 U (GUANGDONG OPK SMART HOME TECHNOLOGY CO., LTD.) 23 December 2022 (2022-12-23)<br>claims 1-12, and description, specific embodiments | 1-17 |
| PX | CN 115095238 A (GUANGDONG OPK SMART HOME TECHNOLOGY CO., LTD.) 23 September 2022 (2022-09-23)<br>claims 1-12, and description, specific embodiments | 1-17 |
| E | CN 219733143 U (GUANGDONG OPK SMART HOME TECHNOLOGY CO., LTD.) 22 September 2023 (2023-09-22)<br>claims 1-17 | 1-17 |
| Y | CN 207228872 U (ZHONSHAN OPIKE HARDWARE PRODUCTS CO., LTD.) 13 April 2018 (2018-04-13)<br>description, specific embodiments, and figures 1-8 | 1-17 |
| Y | CN 208456355 U (FOSHAN NANHAI SONGGANG HAONENG HARDWARE PLASTIC CO., LTD.) 01 February 2019 (2019-02-01)<br>description, specific embodiments, and figures 1-11 | 1-17 |

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

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"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| **27 September 2023** | **29 September 2023** |
| Name and mailing address of the ISA/CN<br>**China National Intellectual Property Administration (ISA/CN)**<br>**China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088** | Authorized officer<br><br>Telephone No. |

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/098085

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | CN 216240225 U (ZHONSHAN OPIKE HARDWARE PRODUCTS CO., LTD.) 08 April 2022 (2022-04-08)<br>entire document | 1-17 |
| A | WO 2018070656 A1 (3G TECHNOLOGY CO., LTD.) 19 April 2018 (2018-04-19)<br>entire document | 1-17 |

Form PCT/ISA/210 (second sheet) (July 2022)

**INTERNATIONAL SEARCH REPORT**
**Information on patent family members**

International application No.
**PCT/CN2023/098085**

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## REFERENCES CITED IN THE DESCRIPTION

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