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(54) **DOOR CLOSER AND REFRIGERATOR COMPRISING SAME**

(57) A door closer according to the present invention comprises a hinge plate, a hinge shaft disposed on the hinge plate, and an adapter disposed rotatably around the hinge shaft. The door closer further comprises a cam disposed on the hinge shaft, a peripheral side of the cam retracts inward the cam to form a first recessed region, an elastic mechanism is provided in the adapter, and the

elastic mechanism has an abutting end for elastically abutting against the periphery of the cam; during the turning of the adapter, the abutting end moves relative to the periphery of the cam, and when the adapter turns to the side of the first recessed region of the cam, the abutting end enters the first recessed region to lock a positional relationship between the adapter and the hinge plate.

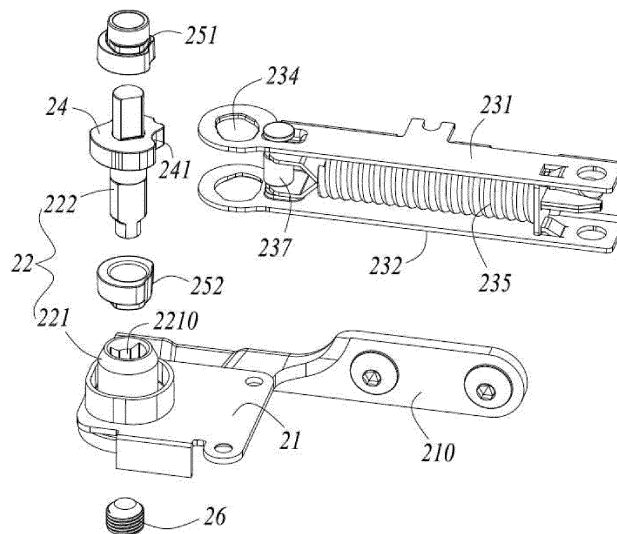


FIG. 4

## Description

**[0001]** The present application claims the priority of Chinese Patent Application No. 201810374364.4, filed on April 24, 2018, and entitled "Door closer and refrigerator with same", the content of which is incorporated herein by reference in its entirety.

## TECHNICAL FIELD

**[0002]** The present invention relates to the field of household appliances and in particular to a door closer and a refrigerator having the same.

## BACKGROUND

**[0003]** Referring to FIG. 1 and FIG. 2, they show a hinge assembly structure in the prior art. The hinge assembly includes a hinge plate 11 and an adapter 12 rotatably connected to the hinge plate 11. The hinge plate 11 is fixed on a cabinet of the refrigerator, and a door body of the refrigerator is fixed on the adapter 12, thereby achieving the rotatably connection of the cabinet and the door body. In the prior art, a hook-shaped stop 120 is generally formed on the adapter 12, and a protrusion 110 corresponding to the stop 120 is formed on the hinge plate 11; referring to FIG. 2, based on the above structure, after the door body of the refrigerator is closed, the hook of the stop 120 can catch the protrusion 110, thereby keeping the closed state of the door body. However, this technical means of keeping the door body closed has the following disadvantages:

**[0004]** In the prior art, the stop 120 needs to be deformed during the door body closing process to catch the protrusion 110 of the hinge plate 11. If the size of the hook of the stop 120 is too small, after the door body is closed, loss fitting might occur between the stop 120 and the protrusion 110 and cause the door body not to be closed tightly; if the size of the hook of the stop 120 is too large, the stop 120 needs to be deformed greatly when the door body is closed so that the stop 120 wears seriously and even is directly broken during use of the refrigerator.

**[0005]** In view of the above problems, it is necessary to provide a door closer and a refrigerator having the same to solve the above problems.

## SUMMARY

**[0006]** The present invention aims to at least solve one of the technical problems existing in the prior art. In order to achieve said object of the present invention, the present invention provides a door closer whose specific design manner is as follows.

**[0007]** A door closer comprises a hinge plate, a hinge shaft disposed on the hinge plate, and an adapter disposed rotatably around the hinge shaft. The door closer further comprises a cam disposed on the hinge shaft, a

peripheral side of the cam retracts inward the cam to form a first recessed region, an elastic mechanism is provided in the adapter, and the elastic mechanism has an abutting end for elastically abutting against the periphery of the cam; during the turning of the adapter, the abutting end moves relative to the periphery of the cam, and when the adapter turns to the side of the first recessed region of the cam, the abutting end enters the first recessed region to lock a positional relationship between the adapter and the hinge plate.

**[0008]** Optionally, wherein the adapter is a housing, the housing comprises a top plate and a bottom plate which are arranged opposite to each other, a receiving cavity for receiving the elastic mechanism is formed between the top plate and the bottom plate, the top plate and bottom plate extend towards the hinge shaft to form a top plate extension and a bottom plate extension located above and below the cam, respectively, and both the top plate extension and the bottom plate extension are provided with a rotational hole enabling the adapter to turn about the hinge shaft.

**[0009]** Optionally, wherein the elastic mechanism comprises a spring and an elastic force release portion, the spring is compressed and disposed in the receiving cavity in a radial direction of the hinge shaft, and an end of the spring away from the hinge shaft is fixedly disposed relative to the housing; the elastic force release portion is located between the spring and the cam to apply the elastic force of the spring to the periphery of the cam, and the abutting end is formed at an end of the elastic force release portion adjacent to the hinge shaft.

**[0010]** Optionally, wherein the elastic force release portion comprises a bracket and a roller, the bracket is disposed abutting against the spring, a bracket tail extending into the spring is formed on a side of the bracket adjacent to spring, the roller is rotatably disposed at the end of the bracket away from the spring and constitutes the abutting end, and an axis of rotation of the roller is parallel to an axis of rotation of the adapter.

**[0011]** Optionally, wherein the top plate and the bottom plate are formed with elongated guide holes in a radial direction of the hinge shaft, and both ends of the roller respectively have guide fitting portions which extend into the guide holes to limit the movement of the roller in the radial direction of the hinge shaft.

**[0012]** Optionally, wherein an upper bushing and a lower bushing sleeved around the hinge shaft are disposed on an upper side and a lower side of the cam, respectively, and the top plate extension and the bottom plate extension are fitted outside the upper bushing and the lower bushing through the rotational holes, respectively.

**[0013]** Optionally, wherein a second recessed region is formed on a side of the periphery of the cam opposite to the first recessed region; when the adapter turns to the side of the second recessed region of the cam, the abutting end enters the second recessed region to lock a positional relationship between the adapter and the hinge plate.

**[0014]** Optionally, wherein the surface of the periphery of the cam on which the abutting end moves is further formed with at least one third recessed region which is located between the first recessed region and the second recessed region; when the adapter turns to the third recessed region of the cam, the abutting end enters the third recessed region to lock a positional relationship between the adapter and the hinge plate.

**[0015]** Optionally, wherein the hinge shaft comprises a first shaft body and a second shaft body, the first shaft body is fixed on the hinge plate and a fitting hole is formed therein in a height direction, and the second shaft body is rod-shaped and its lower end is non-rotatably fitted in the fitting hole.

**[0016]** Optionally, wherein the fitting hole is vertically through, an internal thread of the fitting hole is connected to a screw whose height is adjustable, and the lower end of the second shaft body abuts against a top of the screw.

**[0017]** The present invention further provides a refrigerator which comprises a cabinet having an accommodating compartment and a door body for closing the accommodating compartment, the refrigerator further comprises the abovementioned door closer, the hinge plate of the door closer is fixed on the cabinet, and the door body is fixed on the adapter; when the door body is closed, the adapter turns to the side of the first recessed region of the cam to keep the door body in a closed state.

**[0018]** An advantageous effect of the present invention is as follows: based on the door closer structure provided by the present invention, in the application scenario where the door body is closed, the door closer can ensure that the door body can be closed tightly without damaging component parts, and meet the user's requirements for long-term and reliable use.

## BRIEF DESCRIPTION OF THE DRAWINGS

### [0019]

FIG. 1 illustrates a plan view of a hinge assembly when a door body is opened in the prior art;

FIG. 2 illustrates a perspective view of a hinge assembly when a door body is closed in the prior art;

FIG. 3 illustrates a schematic diagram showing the overall structure of a door closer according to the present invention;

FIG. 4 illustrates an exploded view of the door closer shown in FIG. 3;

FIG. 5 illustrates an exploded view of the elastic mechanism;

FIG. 6 illustrates a cross-sectional view taken along line A-A' of FIG. 3;

FIG. 7 illustrates a schematic diagram of the rotation of an adapter;

FIG. 8 illustrates a schematic diagram before a cam, an upper bushing and a lower bushing are fitted with a second shaft body;

FIG. 9 illustrates a schematic structural diagram in

which the cam in FIG. 8 is fitted on the second shaft body;

FIG. 10 illustrates a cross-sectional view taken along line B-B' in FIG. 3;

FIG. 11 illustrates a schematic diagram before the door closer is fitted with the door body according to the present invention;

FIG. 12 illustrates an enlarged view of part c in FIG. 11;

FIG. 13 illustrates a partial schematic view after the door closer is fitted with the door body.

## DETAILED DESCRIPTION

**[0020]** Hereinafter, the present invention will be described in detail with reference to the embodiments shown in the figures. Referring to FIG. 3 through FIG. 13, they are some preferred embodiments of the present invention.

**[0021]** With reference to FIG. 11, FIG. 12 and FIG. 13, the refrigerator according to the present invention includes a cabinet (not shown) having an accommodating compartment, a door body 3 for closing the accommodating compartment, and a door closer 200 connecting the cabinet with the door body 3. As shown in the figures, the hinge plate 21 of the door closer 200 is fixed on the cabinet, and the door body 3 is fixed on an adapter 23. Specifically, in the present embodiment, the underside of the door body 3 is recessed upward to form a groove 30, and the adapter 23 is embedded and fixed in the groove 30 to realize the connection between the door body 3 and the door closer 200; the door closer 200 is fixed on the cabinet via a fixing portion 210 on the hinge plate 21. Specifically, in this embodiment, fixing holes (not shown) are provided on the fixing portion 210, and screws pass through the through holes to fix the hinge plate 21 on the refrigerator. The door closer 200 according to the present invention will be further described below.

**[0022]** Referring to FIG. 1 and FIG. 2, the door closer 200 according to the present invention includes a hinge plate 21, a hinge shaft 22 provided on the hinge plate 21, and an adapter 23 rotatably disposed around the hinge shaft 22.

**[0023]** Specifically, in the present embodiment, the hinge shaft 22 includes a first shaft body 221 and a second shaft body 222. The first shaft body 221 is fixed on the hinge plate 21 and a fitting hole 2210 is formed therein in a height direction. As shown in FIG. 10, the second shaft body 222 is rod-shaped and its lower end is non-rotatably fitted in the fitting hole 2210 of the second shaft body 222. In other embodiments of the present invention, the hinge shaft 22 may be integrally formed, or formed by splicing more shaft bodies, which will not be described in detail here.

**[0024]** The door closer 200 according to the present invention further includes a cam 24 provided on the hinge shaft 22. Specifically, in the present embodiment, a fitting

hole 240 (not shown) is formed in the middle of the cam 24, and the second shaft body 222 passes through the fitting hole 240 fixes the cam 24. Referring to FIG. 4, a peripheral side of the cam 24 retracts inward the cam 24 to form a first recessed region 241; an elastic mechanism is provided in the adapter 23, and the elastic mechanism has an abutting end for elastically abutting against the periphery of the cam 24; During the rotation of the adapter 23, the abutting end of the elastic mechanism moves relative to the periphery of the cam 24, and when the adapter 23 turns to the side of the first recessed region 241 of the cam 24, the abutting end enters the first recessed region 241 to lock the positional relationship between the adapter 23 and the hinge plate 21. When the door body 3 is closed relative to the refrigerator, the adapter 23 exactly turns to the side of the first recessed region 241 of the cam 24, so that the door body 3 can be kept in the closed state.

**[0025]** In the specific implementation process, the first recessed region 241 gradually retracts inward the cam from the periphery of the cam 24 to form an indented arc surface. In the closing process of the door body 3, when the abutting end of the elastic mechanism approaches the edge of the first recessed region 241, the abutting end can move inward the first recessed region 241 under the action of the elastic force of the elastic mechanism, thereby achieving the complete closing of the door body 3. To ensure that the door body 3 is tightly closed relative to the cabinet, this specific embodiment also has the following optimized settings: referring to FIG. 7, when the door body 3 is completely closed, the abutment end of the elastic mechanism protrudes into the first recessed region 241. At this time, in the direction of closing the door body 3, the first recessed region 241 has a recessed space continuing to extend inward the cam 24. As such, after the door body 3 is completely closed, the elastic mechanism can further provide the door body 3 with a force that drives it to continue to turn in the closing direction of the door body 3, thereby ensuring that the door body 3 is closed tightly.

**[0026]** In the present embodiment, in order to ensure smoothness in the opening process of the door body 3, a side surface in contact with the abutting end during the opening process of the door body 3 is a circular arc surface. With reference to FIG. 6 and FIG. 7, due to the arrangement of the arc surface, during the opening of the door body 3, a spring 235, as an elastic force providing element of the elastic mechanism, does not have a compression or decompression process, so that the adapter 23 can smoothly turn about the hinge shaft 22, i.e., can ensure smoothness in the opening process of the door body 3.

**[0027]** In the specific implementation process of the present invention, as shown in FIG. 3, FIG. 4 and FIG. 5, the adapter 23 is a housing, and the housing includes a top plate 231 and a bottom plate 232 which are arranged opposite to each other. A receiving cavity 230 for receiving the elastic mechanism is formed between the top

plate 231 and the bottom plate 232. The top plate 231 and bottom plate 232 extend towards the hinge shaft 22 to form a top plate extension 2310 and a bottom plate extension 2320 located above and below the cam 24, respectively. Both the top plate extension 2310 and the bottom plate extension 2320 are provided with a rotational hole 234 enabling the adapter 23 to turn about the hinge shaft 22.

**[0028]** Furthermore, with reference to FIG. 5 and FIG. 6, the elastic mechanism includes a spring 235 and an elastic force release portion, the spring 235 is compressed and disposed in the receiving cavity 230 in a radial direction of the hinge shaft 222, and an end of the spring 235 away from the hinge shaft 222 is fixedly disposed relative to the housing. Specifically, in the present embodiment, a baffle 233 is provided in the housing at an end far away from the top plate extension 2310 and the bottom plate extension 2320, and the end of the spring 235 away from the hinge shaft 222 abuts against and is fixed on a side of the baffle 233.

**[0029]** The elastic force release portion in the present invention is located between the spring 235 and the cam 24 to apply the elastic force of the spring 235 to the periphery of the cam 24. The end of the elastic force release portion adjacent to the hinge shaft 222 constitutes the abutting end described above.

**[0030]** Specifically in the present embodiment, the elastic force release portion includes a bracket 236 and a roller 237. With reference to FIG. 5 and FIG. 6, the bracket 236 abuts against the spring 235, a bracket tail 2360 extending into the spring 235 is formed on a side of the bracket 236 adjacent to spring 235, and the bracket tail 2360 can ensure that the bracket 236 does not disengage from the spring 235; the roller 237 is rotatably disposed at the end of the bracket 236 away from the spring 235. In the present embodiment, the roller 237 constitutes the abutting end described above.

**[0031]** In the specific implementation process, a rolling shaft 2371 allowing the roller 237 to rotate is formed in the roller 237, a pair of support sheets (not shown) are formed vertically opposite to each other on the side of the bracket 236 away from the spring 235, a receiving notch 2361 fitted with the rolling shaft 2371 is formed on each of the pair of support sheets, and the rolling shaft 2371 is fitted in the receiving notch 2361 to abut against the periphery of the cam 24 under the action of the elastic force of the spring 235. In the present embodiment, the axis of the rotation of the roller 237 is parallel to the axis of rotation of the adapter 23. When the roller 237 moves along the periphery of the cam 24, the rolling arrangement of the roller 237 may reduce the friction force when the abutting end slides on the peripheral surface of the cam 24, which is beneficial to the rotation of the door body of the refrigerator.

**[0032]** As a preferred embodiment of the present invention, as shown in FIG. 4 and FIG. 5, the top plate 231 and the bottom plate 232 are formed with elongated guide holes 238 in a radial direction of the hinge shaft 22, and

upper and lower ends of the rolling shaft 2371 of the roller 237 respectively extend into the guide holes 238 of the top plate 231 and the bottom plate 232; the upper and lower ends of the rolling shaft 2371 in the present embodiment form a guide fitting portion that limits the movement of the roller 237 in the radial direction of the hinge shaft 22.

**[0033]** With reference to FIG. 8, FIG. 9 and FIG. 10, in the present embodiment, an upper bushing 251 and a lower bushing 252 sleeved around the hinge shaft 22 are disposed on an upper side and a lower side of the cam 24, respectively. The top plate extension 2310 and the bottom plate extension 2320 are fitted outside the upper bushing 251 and the lower bushing 252 through the rotational holes 234, respectively.

**[0034]** Specifically, the upper bushing 251, the cam 24 and the lower bushing 252 are sleeved around the second shaft body 222 in turn from top to bottom. The cam 24 in the present invention is not rotatable with respect to the second shaft body 222. Based on this, the fitting hole 240 in the middle of the cam 24 is set to be non-circular, and the second shaft body 222 is provided with a cam fitting portion 2220 that matches the fitting hole 240; an upper bushing fitting portion 2221 and a lower bushing fitting portion 2222 for fitting the upper bushing 251 and the lower bushing 252 are provided on an upper side and a lower side of the fitting portion 2220, respectively, wherein the lower bushing fitting portion 2222 has a projection (not shown) projecting from the surface of the fitting portion 2220, thereby avoiding downward movement of the cam 24 along the second shaft body 222.

**[0035]** In the present embodiment, the upper bushing 251 and the lower bushing 252 are both disposed rotatable relative to the second shaft body 222, and the top plate extension 2310 and the bottom plate extension 2320 are fixedly disposed with respect to the upper bushing 251 and the lower bushing 252, respectively. In the specific implementation process, the rotational hole 234 is provided as a non-circular profiled hole. The upper bushing 251 and the lower bushing 252 are respectively formed with an upper rotational hole mating portion 2510 and a lower rotational hole mating portion 2520 that mate with the rotational hole 234, thereby preventing the adapter 23 from rotating relative to the upper bushing 251 and the lower bushing 252.

**[0036]** Certainly, in other embodiments of the present invention, the upper bushing 251 and the lower bushing 252 are also set to be non-rotatable relative to the second shaft body 222, and the rotational holes 234 on the top plate extension 2310 and the bottom plate extension 2320 are set to be circular, thereby implementing rotatable arrangement of the adapter 23 relative to the hinge shaft 22.

**[0037]** With reference to FIG. 6 and FIG. 7, as a preferred embodiment of the present invention, a second recessed region 242 is formed on a side of the periphery of the cam 24 opposite to the first recessed region 241.

When the adapter 23 turns to the side of the second recessed region 242 of the cam, the abutting end (namely, the roller 237) enters the second recessed region 242 to lock the positional relationship between the adapter 23 and the hinge plate 21. Corresponding to the opening process of the door body 3 of the refrigerator, after the door body 3 opens to a certain angle, for example, 180°, the roller 237 enters the second recessed region 242 to position the door body 3 at the certain opening angle, so that the door body 3 does not rotate freely when the user places items into or remove items from the refrigerator.

**[0038]** In order to stop the door body 3 at different opening angles, such as 45°, 90°, etc., the surface of the periphery of the cam 24 on which the roller 237 rolls is further formed with at least one third recessed region (not shown) which is located between the first recessed region and the second recessed region. When the adapter 23 turns to the third recessed region of the cam 24, the roller 237 enters the third recessed region to lock the positional relationship between the adapter 23 and the hinge plate 21; in a specific implementation process, as a preferred embodiment, the depth of the third recessed region is smaller than the depth of the first recessed region 241 and the second recessed region 242, so that after the door body 3 is stopped, the user may re-rotate the door body 3 with only a slight force.

**[0039]** With reference to FIG. 4, FIG. 9 and FIG. 10, the fitting hole 2210 of the first shaft body 221 is a non-circular hole, and the lower end 2223 of the second shaft body 222 matches the non-circular hole, thereby avoiding the relative rotation of the first shaft body 221 and the second shaft body 222. As a preferred embodiment of the present invention, the fitting hole 2210 is vertically through, an internal thread of the fitting hole 2210 is connected to a screw 26 whose height is adjustable, and the lower end of the second shaft body 222 abuts against the top of the screw 26. Based on this arrangement manner, if the door body 3 sags during the use of the refrigerator, the height position of the second screw 222 and the adapter 23 may be raised by rotating the screw 26 upward, thereby indirectly adjusting the height of the door body 3.

**[0040]** It should be understood that although the description is described according to the embodiments, not every embodiment only includes one independent technical solution, that such a description manner is only for the sake of clarity, that those skilled in the art should take the description as an integral part, and that the technical solutions in the embodiments may be suitably combined to form other embodiments understandable by those skilled in the art.

**[0041]** The detailed descriptions set forth above are merely specific illustrations of feasible embodiments of the present invention, and are not intended to limit the scope of protection of the present invention. All equivalent embodiments or modifications that do not depart from the art spirit of the present invention should fall within the scope of protection of the present invention.

**Claims**

1. A door closer, comprising a hinge plate, a hinge shaft disposed on the hinge plate, and an adapter disposed rotatably around the hinge shaft, wherein the door closer further comprises a cam disposed on the hinge shaft, a peripheral side of the cam retracts inward the cam to form a first recessed region, an elastic mechanism is provided in the adapter, and the elastic mechanism has an abutting end for elastically abutting against the periphery of the cam; during the turning of the adapter, the abutting end moves relative to the periphery of the cam, and when the adapter turns to the side of the first recessed region of the cam, the abutting end enters the first recessed region to lock a positional relationship between the adapter and the hinge plate.
  2. The door closer according to claim 1, wherein the adapter is a housing, the housing comprises a top plate and a bottom plate which are arranged opposite to each other, a receiving cavity for receiving the elastic mechanism is formed between the top plate and the bottom plate, the top plate and bottom plate extend towards the hinge shaft to form a top plate extension and a bottom plate extension located above and below the cam, respectively, and both the top plate extension and the bottom plate extension are provided with a rotational hole enabling the adapter to turn about the hinge shaft.
  3. The door closer according to claim 2, wherein the elastic mechanism comprises a spring and an elastic force release portion, the spring is compressed and disposed in the receiving cavity in a radial direction of the hinge shaft, and an end of the spring away from the hinge shaft is fixedly disposed relative to the housing; the elastic force release portion is located between the spring and the cam to apply the elastic force of the spring to the periphery of the cam, and the abutting end is formed at an end of the elastic force release portion adjacent to the hinge shaft.
  4. The door closer according to claim 3, wherein the elastic force release portion comprises a bracket and a roller, the bracket is disposed abutting against the spring, a bracket tail extending into the spring is formed on a side of the bracket adjacent to spring, the roller is rotatably disposed at the end of the bracket away from the spring and constitutes the abutting end, and an axis of rotation of the roller is parallel to an axis of rotation of the adapter.
  5. The door closer according to claim 4, wherein the top plate and the bottom plate are formed with elongated guide holes in a radial direction of the hinge shaft, and both ends of the roller respectively have guide fitting portions which extend into the guide
- holes to limit the movement of the roller in the radial direction of the hinge shaft.
6. The door closer according to claim 2, wherein an upper bushing and a lower bushing sleeved around the hinge shaft are disposed on an upper side and a lower side of the cam, respectively, and the top plate extension and the bottom plate extension are fitted outside the upper bushing and the lower bushing through the rotational holes, respectively.
  7. The door closer according to claim 1, wherein a second recessed region is formed on a side of the periphery of the cam opposite to the first recessed region; when the adapter turns to the side of the second recessed region of the cam, the abutting end enters the second recessed region to lock a positional relationship between the adapter and the hinge plate.
  8. The door closer according to claim 7, wherein the surface of the periphery of the cam on which the abutting end moves is further formed with at least one third recessed region which is located between the first recessed region and the second recessed region; when the adapter turns to the third recessed region of the cam, the abutting end enters the third recessed region to lock a positional relationship between the adapter and the hinge plate.
  9. The door closer according to claim 1, wherein the hinge shaft comprises a first shaft body and a second shaft body, the first shaft body is fixed on the hinge plate and a fitting hole is formed therein in a height direction, and the second shaft body is rod-shaped and its lower end is non-rotatably fitted in the fitting hole.
  10. The door closer according to claim 1, wherein the fitting hole is vertically through, an internal thread of the fitting hole is connected to a screw whose height is adjustable, and the lower end of the second shaft body abuts against a top of the screw.
  11. A refrigerator, comprising a cabinet having an accommodating compartment and a door body for closing the accommodating compartment, wherein the refrigerator further comprises the door closer according to claim 1, the hinge plate of the door closer is fixed on the cabinet, and the door body is fixed on the adapter; when the door body is closed, the adapter turns to the side of the first recessed region of the cam to keep the door body in a closed state.

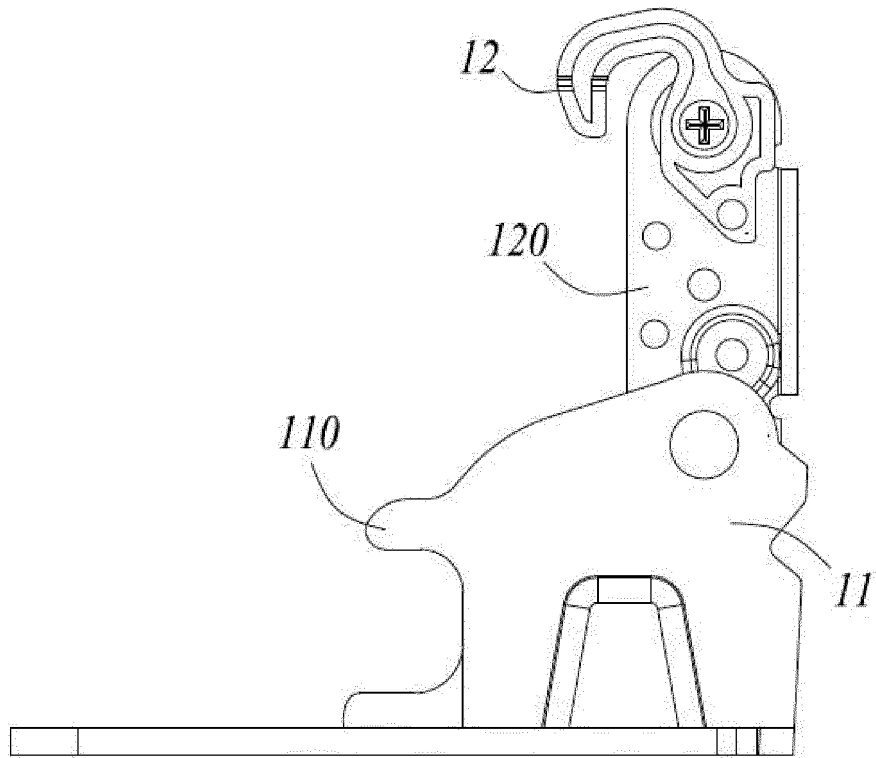


FIG. 1

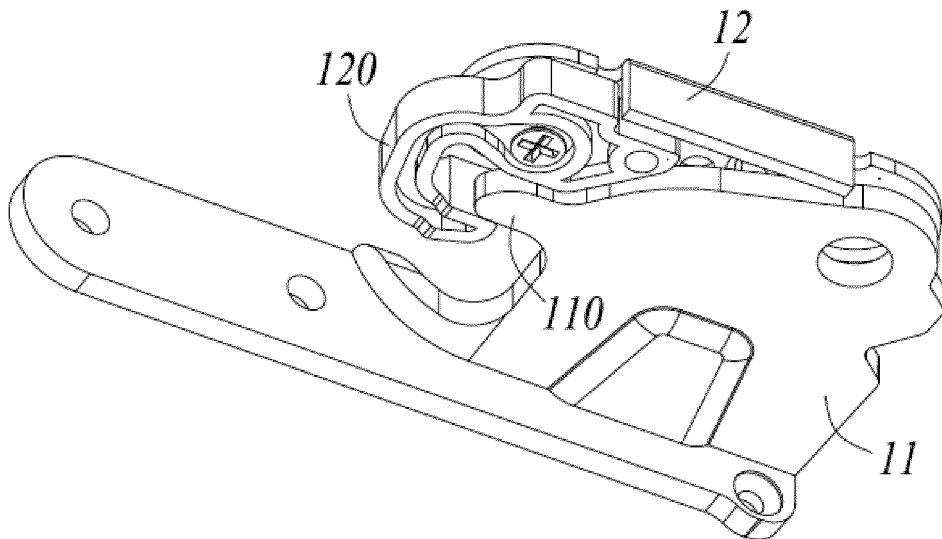


FIG. 2

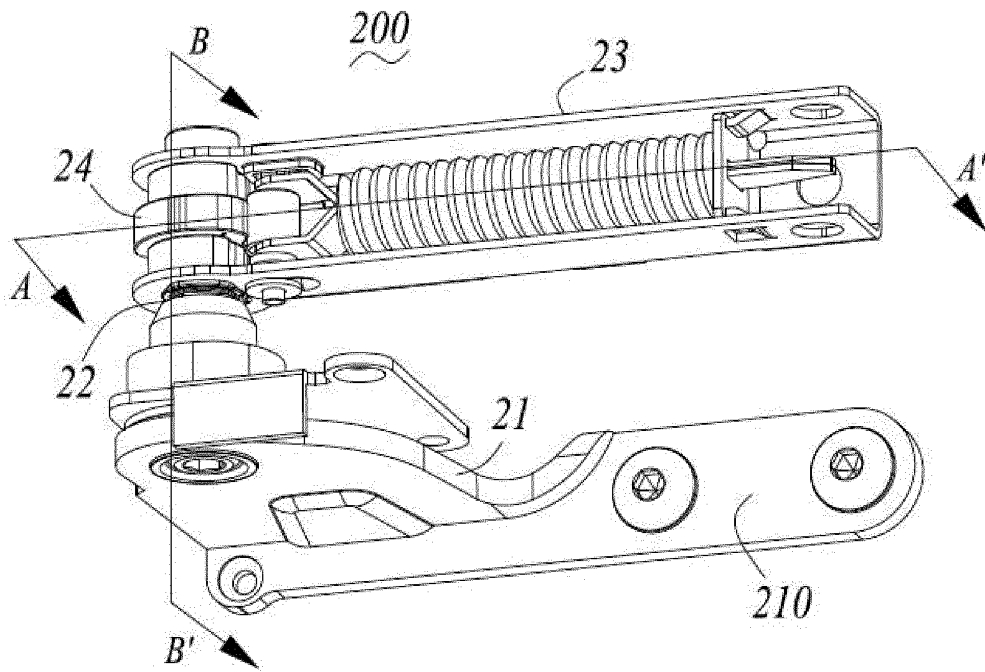


FIG. 3

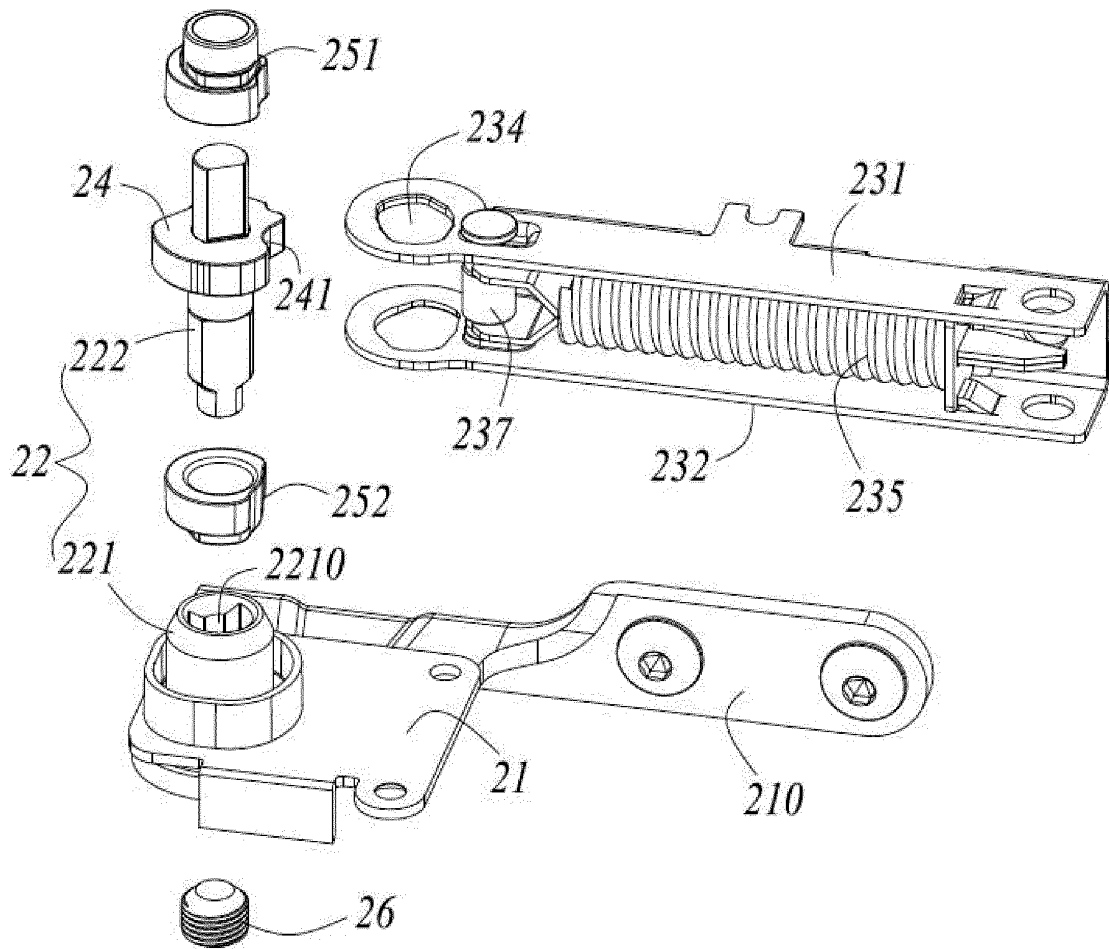


FIG. 4

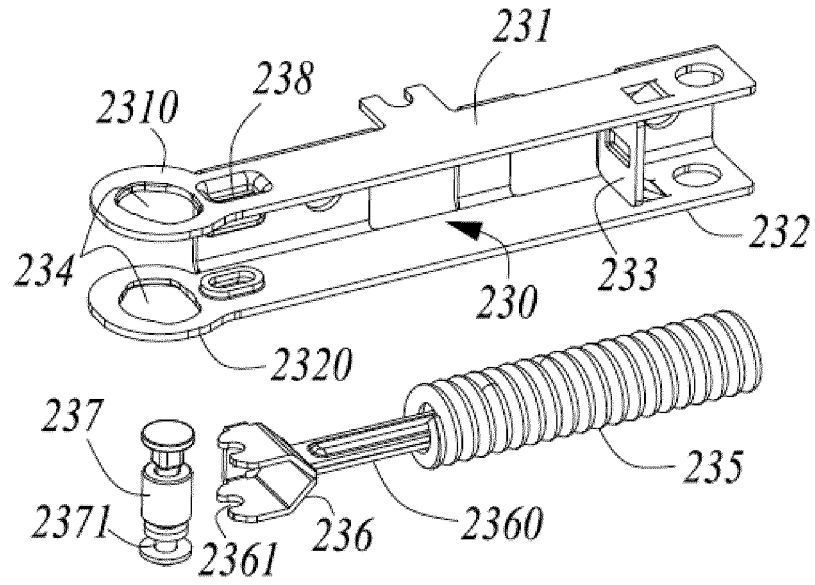


FIG. 5

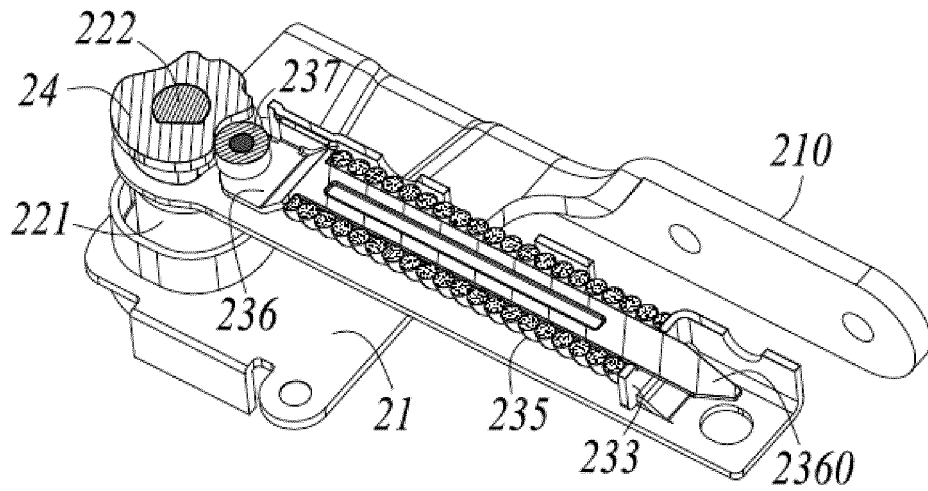


FIG. 6

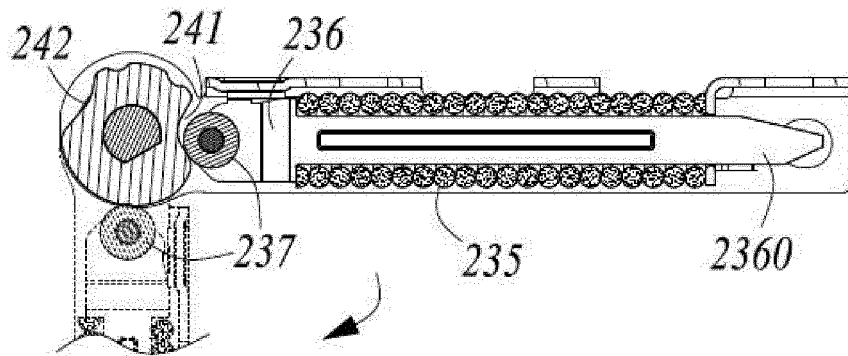


FIG. 7

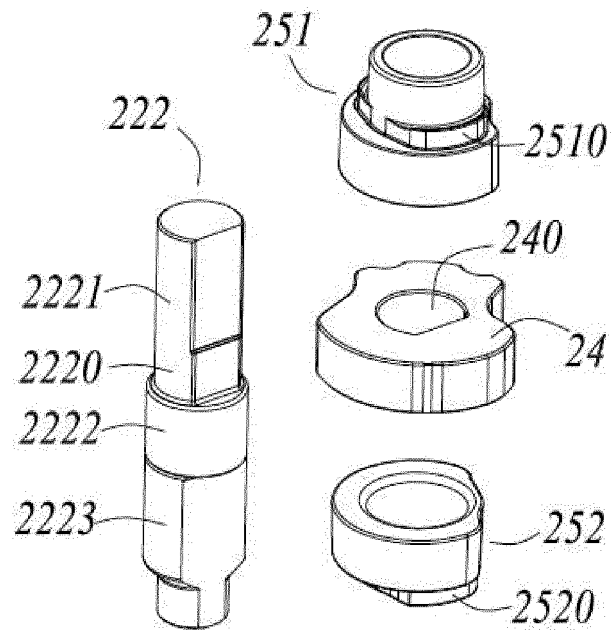


FIG. 8

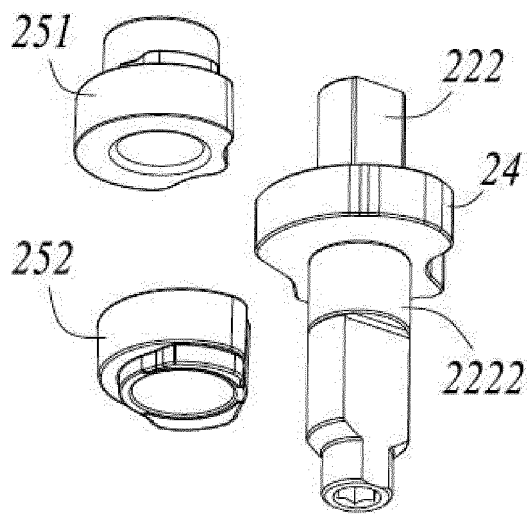


FIG. 9

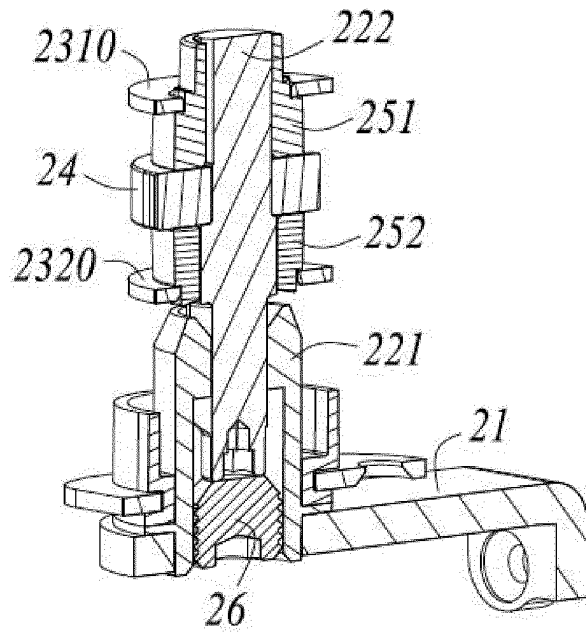


FIG. 10

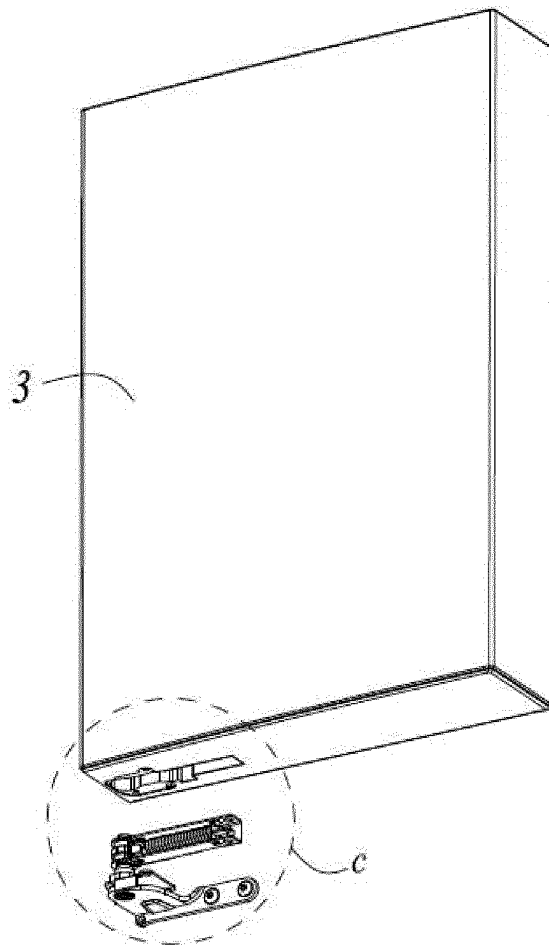


FIG. 11

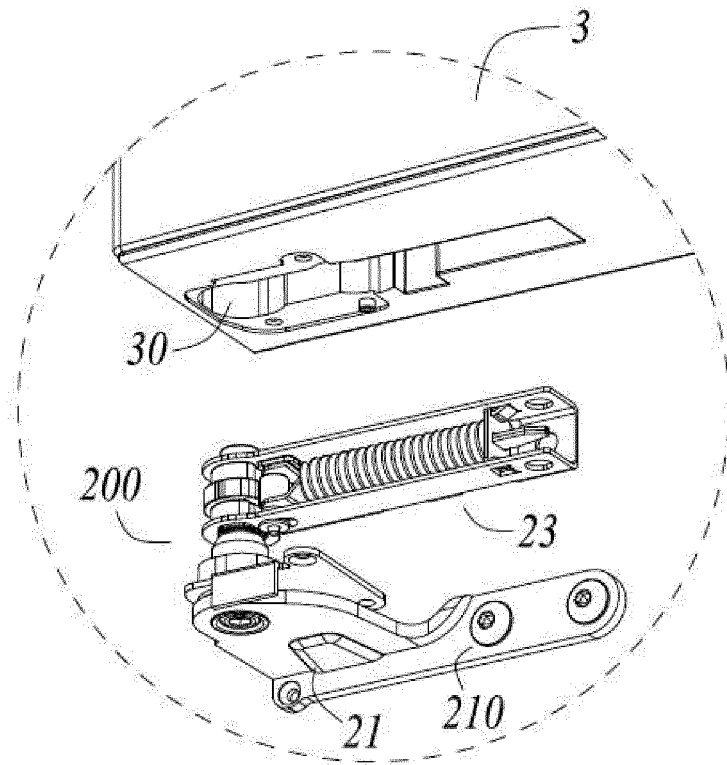


FIG. 12

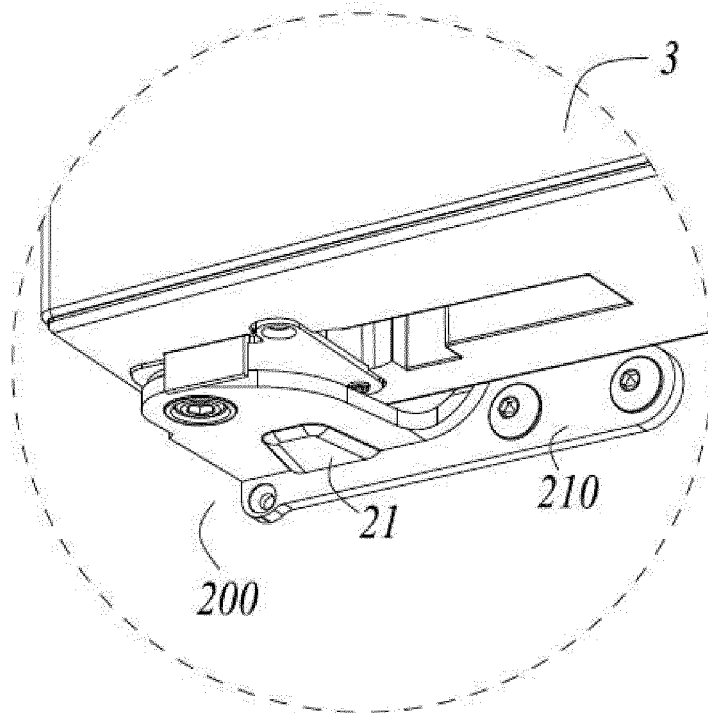


FIG. 13

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2019/083724

5	<b>A. CLASSIFICATION OF SUBJECT MATTER</b> E05D 3/02(2006.01)i; E05D 11/10(2006.01)i; E05D 7/00(2006.01)i; E05F 1/10(2006.01)i  According to International Patent Classification (IPC) or to both national classification and IPC	
10	<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) E05F; E05D  Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched	
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPODOC, WPI, CNPAT, CNKI: 铰链, 板, 闭门器, 轴, 凸轮, 凹陷, 弹性, 弹簧, 转动, 锁定, 定位, 抵接, 腔, 衬套, 孔, 冰箱, refrigerator, hinge, plate, door closer, shaft, cam, hollow, spring, elastic, rotate, lock, limit, abut, cavity, bush, hole	
20	<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>	
25	Category*	Citation of document, with indication, where appropriate, of the relevant passages
30	X	CN 107217937 A (QINGDAO HAIER CO., LTD.) 29 September 2017 (2017-09-29) description, paragraphs 0038-0051, and figures 1-6
35	Y	CN 107217937 A (QINGDAO HAIER CO., LTD.) 29 September 2017 (2017-09-29) description, paragraphs 0038-0051, and figures 1-6
40	Y	CN 106460427 A (OL.MI S.R.L.) 22 February 2017 (2017-02-22) description, paragraphs 0030-0110, and figures 1-7
45	A	US 2016083993 A1 (KASON INDUSTRIES, INC.) 24 March 2016 (2016-03-24) entire document
50	<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.	
55	* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
50	Date of the actual completion of the international search <b>09 July 2019</b>	Date of mailing of the international search report <b>17 July 2019</b>
55	Name and mailing address of the ISA/CN <b>State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088 China</b> Facsimile No. (86-10)62019451	Authorized officer  Telephone No.

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

International application No.  
**PCT/CN2019/083724**

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				CA	2905199	A1	22 March 2016

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**REFERENCES CITED IN THE DESCRIPTION**

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