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RETRACTABLE TUBE MECHANISM AND STROLLER

Abstract

The present application discloses a retractable tube mechanism and a stroller. The retractable tube mechanism includes: an outer tube; an inner tube inserted into the outer tube and axially movable relative to the outer tube; and a locking device including a locking member and a pulling member both arranged in the inner tube. The locking member is operably connected to the pulling member. The locking member has a locked state in which an axial movement of the inner tube relative to the outer tube is restrained, and an unlocked state in which the axial movement of the inner tube is allowed. When the pulling member moves under the action of a pulling force, the pulling member drives the locking member to switch from the locked state to the unlocked state. When the pulling force is removed, the locking member tends to return from the unlocked state to the locked state.

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Background/Summary

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application is the national phase under 35 U.S.C. § 371 of PCT International Application No. PCT/EP2023/060825, which has an international filing date of Apr. 25, 2023, and claims priority of Chinese patent application No. 202210443174.X filed on Apr. 25, 2022. The contents of the above identified PCT international application and Chinese patent application are hereby incorporated in their entireties by reference for all purposes.

DESCRIPTION

[0002] The present application relates to a retractable tube mechanism and a stroller.

[0003] Strollers can provide convenience for parents to carry infants and young children out. The stroller is provided with a handle for the parent to push. Usually, the handle is manufactured to have a height according to the average height of adults, which is not friendly to the parent who have a height less than the average height or greater than the average height.

[0004] An object of the present application is to provide a retractable tube mechanism, so that users can adjust the length of a tube as needed. For the tube arranged inclinedly, adjusting the length of the tube can change the height of the tube from the ground. The present application further provides a stroller with the retractable tube mechanism.

[0005] In an aspect, the present application provides a retractable tube mechanism. The retractable tube mechanism includes: an outer tube; an inner tube inserted into the outer tube and axially movable relative to the outer tube; and a locking device including a locking member and a pulling member both arranged in the inner tube. The locking member is operably connected to the pulling member. The locking member has a locked state in which an axial movement of the inner tube relative to the outer tube is restrained, and an unlocked state in which the axial movement of the inner tube is allowed. When the pulling member moves under the action of a pulling force, the pulling member drives the locking member to switch from the locked state to the unlocked state. When the pulling force is removed, the locking member tends to return from the unlocked state to the locked state.

[0006] Further, an inner wall of the outer tube is arranged with a rack extending in an axial direction. The locking member includes a gear supported by the inner tube. The gear is meshed with the rack through an opening on a tube wall of the inner tube. The locking member further includes a locking fork. The locking fork is connected to the pulling member. When the pulling force is removed, the locking fork is jointed to the gear, to restrain rotation of the gear; and when the pulling force is applied, the locking fork is driven by the pulling member to disjoint from the gear, thereby allowing the gear to rotate.

[0007] Further, the locking fork includes an engagement portion. The locking fork restrains the rotation of the gear by engagement of the engagement portion with the gear.

[0008] Further, the locking fork is adapted to move along an axial direction of the inner tube, so that the engagement portion is engaged with the gear or disengaged from the gear.

[0009] Further, the locking fork is arranged with a first guide hole and a second guide hole spaced from the first guide hole. The engagement portion is positioned between the first guide hole and the second guide hole. A central shaft of the gear extends through the first guide hole. A pin shaft extends through the second guide hole. The pin shaft is fixed to the inner tube.

[0010] Further, the locking device further includes a first elastic member. The first elastic member is configured to maintain the engagement of the engagement portion with the gear. A first end of the pulling member is connected to the locking fork, and a second end of the pulling member is an

operating end.
[0011] Further, the first elastic member includes a first spring. The first spring is sleeved on the locking fork. A first end of the first spring is adjacent to the central shaft, and is limited by a limiting step on the locking fork; and a second end of the first spring is limited by the pin shaft.
[0012] Further, the locking fork includes a shank, and a U-shaped structure positioned at an end of the shank. The engagement portion is arranged on a base wall of the U-shaped structure. Another end of the shank is connected to the pulling member. The gear is positioned in the U-shaped structure. The first guide hole is arranged in each of two opposite sidewalls of the U-shaped structure. The second guide hole is arranged in the shank.
[0013] Further, the locking fork is pivotally connected to the inner tube through a pivot. The locking fork is adapted to rotate around the pivot, so that the engagement portion is engaged with the gear or disengaged from the gear.
[0014] Further, the engagement portion includes at least one protruding tooth. The at least one protruding tooth is adapted to be engaged with a teeth portion of the gear.
[0015] Further, a plurality of protruding portions are arranged on at least one end surface of the gear at intervals in a circumferential direction. A locked position is formed between every two adjacent protruding portions. The engagement portion is adapted to be inserted into the locked position to be engaged with the gear.
[0016] Further, the outer tube is provided with at least two positioning holes in an axial direction. The locking member includes a base portion and a pin portion connected to the base portion. The locking device further includes a blocking member, a second elastic member, and a third elastic member all arranged in the inner tube. The blocking member is connected to a first end of the pulling member. A second end of the pulling member is an operating end. The blocking member is adapted to be driven by the second elastic member or the pulling force to move to a locked position or an unlocked position in an axial direction of the inner tube. When the blocking member moves toward the locked position, the base portion is driven by the blocking member to move in a first radial direction of the inner tube, so that the pin portion is inserted into the corresponding positioning hole; when the blocking member moves toward the unlocked position, the base portion is driven by the third elastic member to move in a second radial direction of the inner tube, so that the pin portion is withdrawn from the corresponding positioning hole.
[0017] Further, the base portion is provided with a first pushing portion. The locking member is provided with a second pushing portion adapted to abut against the first pushing portion. At least one of the first pushing portion and the second pushing portion is a slope. When the first pushing portion abuts against the second pushing portion, a direction of a radial force applied by the second elastic member on the base portion is opposite to a direction of a radial force applied by the third elastic member on the base portion. The radial force applied by the second elastic member on the base portion is greater than the radial force applied by the third elastic member on the base portion.
[0018] Further, the base portion includes a first top portion connected to the first pushing portion. The blocking member includes a second top portion connected to the second pushing portion. At least one of the first top portion and the second top portion is planar. When the blocking member is at the locked position, the second top portion abuts against the first top portion.
[0019] Further, when the blocking member is at the locked position, the blocking member includes a portion interposed between a wall of the inner tube and the base portion. The portion restrains the pin portion from being withdrawn from the corresponding positioning hole.
[0020] Further, the locking device further includes a fixing member mounted in the inner tube. The blocking member is slidably fitted with the fixing member. The second elastic member is arranged between the blocking member and the fixing member. The base portion is slidably fitted with the fixing member. The third elastic member is arranged between the base portion and the fixing member.
[0021] Further, the fixing member includes a receiving portion. A base wall of the receiving portion

is provided with a first through hole. A tube wall of the inner tube is provided with a second through hole. A sidewall of the base portion is slidably fitted with a sidewall of the receiving portion. The pin portion is slidably fitted with the first through hole and the second through hole. The third elastic member is interposed between the base wall of the receiving portion and the base portion.

[0022] Further, the fixing member includes a first baffle; the blocking member includes a second baffle. The first baffle and the second baffle face each other, and are spaced from each other in the axial direction of the inner tube. The second elastic member is interposed between the first baffle and the second baffle.

[0023] Further, the base portion and the pin portion are integrally formed by injection molding or overmolding.

[0024] Further, a first end of the pulling member is operably connected to the locking member, and a second end of the pulling member is an operating end. The second end of the pulling member is connected to a driving member arranged in the inner tube. A first operating member is mounted on the inner tube. The first operating member is operably connected to the driving member. When being subjected to a force, the first operating member is adapted to drive the driving member to move, thereby applying the pulling force to the pulling member. Or, the second end of the pulling member is connected to a second operating member that is sleeved on the inner tube. The second operating member is adapted to move along the inner tube when being subjected to a force, so as to apply the pulling force to the pulling member.

[0025] Further, the first operating member is provided with a first guide slope. The driving member is provided with a second guide slope. The second guide slope is kept in cooperation with the first guide slope.

[0026] In another aspect, the present application provides a stroller. The stroller is provided with the retractable tube mechanism as described above. The outer tube is a frame tube of the stroller; and the inner tube is retractable handle tube.

[0027] In the retractable tube mechanism according to the present application, by applying or removing the pulling force to the pulling member, the locking member can be switched between the unlocked state and the locked state. When the locking member is switched to the unlocked state, the axial position of the inner tube relative to the outer tube can be adjusted. When the inner tube is adjusted to a proper position, the locking member can be switched to the locked state, and the locking member locks the axial position of the inner tube relative to the outer tube.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] FIG. **1** is a perspective view schematically showing a stroller according to an embodiment of the present application.

[0029] FIG. **2** is a partial cross-sectional view schematically showing a retractable tube mechanism according to a first embodiment of the present application, where a locking member is in a locked state.

[0030] FIG. **3** is a partial cross-sectional view schematically showing the retractable tube mechanism according to the first embodiment of the present application, where the locking member is in an unlocked state.

[0031] FIG. **4** is a perspective exploded view schematically showing a locking device of the retractable tube mechanism according to the first embodiment of the present application.

[0032] FIG. **5** is a perspective view schematically showing the locking device of the retractable tube mechanism according to the first embodiment of the present application.

[0033] FIG. **6** is a side view schematically showing partial structure of a retractable tube

mechanism according to a second embodiment of the present application, where a locking member is in an unlocked state.
[0034] FIG. **7** is a perspective view schematically showing a stroller according to another embodiment of the present application.
[0035] FIG. **8** is a cross-sectional view schematically showing a retractable tube mechanism according to a third embodiment of the present application, where a locking member is in a locked state.
[0036] FIG. **9** is a cross-sectional view schematically showing the retractable tube mechanism according to the third embodiment of the present application, where a locking member is in an unlocked state.
[0037] FIG. **10** is a perspective exploded view schematically showing a locking device of the retractable tube mechanism according to the third embodiment of the present application, from a perspective.
[0038] FIG. **11** is a side view schematically showing the locking device and a second operating member of the retractable tube mechanism according to the third embodiment of the present application, where the locking device is in a locked state.
[0039] FIG. **12** is a side view schematically showing the locking device and the second operating member of the retractable tube mechanism according to the third embodiment of the present application, where the locking device is in an unlocked state.
[0040] FIG. **13** is a perspective exploded view schematically showing the locking device of the retractable tube mechanism according to the third embodiment of the present application, from another perspective different than FIG. **10**.
[0041] FIG. **14** is a cross-sectional view schematically showing a retractable tube mechanism according to a fourth embodiment of the present application, where a locking member is in a locked state.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0042] FIGS. **2** to **5** show a structure of a retractable tube mechanism according to a first embodiment of the present application. FIG. **1** shows a stroller **100** according to the embodiment of the present application. The retractable tube mechanism according to the first embodiment of the present application is applied in the stroller **100**. Specifically, the retractable tube mechanism is applied between a frame tube (an outer tube **1**) and a retractable handle tube (an inner tube **2**) of the stroller **100**, so that the retractable handle tube can be extended and retracted relative to the frame tube, such that a height H of a handle **20** connected to the retractable handle tube can be changed to meet different requirements of the parents of different heights for the height of the handle.
[0043] The retractable tube mechanism according to the first embodiment of the present application will be described in detail below. Referring to FIGS. **2** and **4**, the retractable tube mechanism may include an outer tube **1**, an inner tube **2**, and a locking device **3**. The inner tube **2** is inserted in the outer tube **1** and axially movable relative to the outer tube **1**. The locking device **3** includes a locking member **31** and a pulling member **32** both arranged in the inner tube **2**. The locking member **31** is operably connected to the pulling member **32**. The locking member **31** is in a locked state under normal conditions, to restrain an axial movement of the inner tube **2** relative to the outer tube **1**, and lock an axial position of the inner tube **2** relative to the outer tube **1**. Referring to FIG. **3**, when it is necessary to adjust the axial position of the inner tube **2** relative to the outer tube **1**, a pulling force F can be applied to the puling member **32**, so that the pulling member **32** moves under the action of the pulling force F, while driving the locking member **31** to switch from the locked state to an unlocked state. The locking member **31** in the unlocked state allows the inner tube **2** to move axially relative to the outer tube **1**. When the inner tube **2** moves to a proper position, the pulling force F is removed, and the locking member **31** tends to return from the unlocked state to the locked state. When the locking member **31** returns to the locked state, the inner tube **2** is locked at an adjusted axial position. When the retractable tube mechanism is used in a stroller, a parent can

adjust an extension length of the inner tube **2** relative to the outer tube **1** according to their actual needs, so that the handle **20** is positioned at a suitable height H, which is convenient for the parent to push and pull the stroller.

[0044] Referring to FIGS. **2** to **4**, in this embodiment, an inner wall of the outer tube **1** may be arranged with a rack **11** extending in an axial direction. The rack **11** may be fixed on the inner wall of the outer tube **1** by fasteners (not shown), for example. The locking member **31** can also include a gear **311** arranged in the inner tube **2** and supported by the inner tube **2**. A central shaft **3113** of the gear **311** can be fixed in a positioning hole **202** of the inner tube **2**. The gear **311** is meshed with the rack **11** through an opening **201** on a tube wall of the inner tube **2**.

[0045] Continuing to refer to FIGS. **2** to **4**, the locking member **31** may further include a locking fork **312**. The locking fork **312** is connected to the pulling member **32**. When the pulling force F is removed, the locking fork **312** is jointed to (for example, engaged with, as described below) the gear **311**, to limit the rotation of the gear **311**, so that the gear **311** cannot move along the rack **11**, thereby locking the axial position of the inner tube **2** relative to the outer tube **1**. It can be understood that the locking fork **312** being jointed to the gear **311** corresponds to the locked state of the locking member **31**. When the pulling force F is applied, the pulling member **32** can drive the locking fork **312** to disjoint from the gear **311**, thereby allowing the gear **311** to rotate, so that the gear **311** can move along the rack **11**, thereby adjusting the axial position of the inner tube **2** relative to the outer tube **1**. It can be understood that the locking fork **312** being disjointed from the gear **311** corresponds to the unlocked state of the locking member **31**. In this embodiment, the meshing fit between the rack **11** and the gear **311** can provide enough adjustable positions for the inner tube **2**, which can improve the user experience. In addition, during the moving process of the inner tube **2**, the tightly meshed rack **11** and gear **311** will not generate a large impact noise, and can also prevent the inner tube **2** from swinging when sliding up and down relative to the outer tube **1**.

[0046] Referring to FIGS. **2** and **3**, the locking fork **312** may include an engagement portion **3121**. The locking fork **312** restrains the rotation of the gear **311** by engagement of the engagement portion **3121** with the gear **311**. The locking device **3** may further include a first elastic member **331**. The engaging state of the engagement portion **3121** with the gear **311** is maintained by the first elastic member **331**. A first end **321** of the pulling member **32** is connected to the locking fork **312**, and a second end **322** of the pulling member **32** is an operating end. A user can apply the pulling force F to the pulling member **32** by operating the second end **322** of the pulling member **32**, to drive the engagement portion **3121** to disengage from the gear **311** through the pulling member **32**. It can be understood that when the pulling force F is removed, the engagement portion **3121** can return to the state of being engaged with the gear **311** driven by the first elastic member **331**.

[0047] It can be seen from FIGS. **2** and **3** that, in this embodiment, when the locking fork **312** is driven by the pulling member **32** or the first elastic member **331**, the locking fork **312** is adapted to move along an axial direction of the inner tube **2**, so that the engagement portion **3121** is engaged with the gear **311** or disengaged from the gear **311**. More specifically, the pulling member **32** drives the locking fork **312** to move along the axial direction x**1** when subjected to the pulling force F, until the engagement portion **3121** is disengaged from the gear **311** (as shown in FIG. **3**), and the engagement portion **3121** will not affect the rotation of the gear **311**. When the pulling force F is removed, the first elastic member **331** will drive the locking fork **312** to move along an axial direction x**2**, so that the engagement portion **3121** is engaged with the gear **311** (as shown in FIG. **2**). Since the moving direction of the locking fork **312** is limited to the axial direction, after the engagement portion **3121** is engaged with the gear **311**, the rotation of the gear **311** is restrained by the engagement portion **3121**. The axial movement of the locking fork **312** can be realized in many ways, and some preferred ways are listed below. In addition, a preferred embodiment of the engagement portion **3121** is shown in the figures. The engagement portion **3121** may include one or more protruding teeth. The one or more protruding teeth and part of a teeth portion of the gear

311 may be directly engaged with each other, and in this way, additional modifications to gear **311** are not required.

[0048] Referring to FIGS. **2** to **5**, this embodiment illustrates a preferred implementation for realizing the axial movement of the locking fork **312**. The locking fork **312** can be arranged with a first guide hole **3123** and a second guide hole **3124** spaced from the first guide hole **3123**. The first guide hole **3123** and the second guide hole **3124** both extend in the axial direction of the inner tube **2**. The engagement portion **3121** is positioned between the first guide hole **3123** and the second guide hole **3124**. The central shaft **3113** of the gear **311** extends through the first guide hole **3123**, and the central shaft **3113** is slidably fitted with the first guide hole **3123**. A pin shaft **3101** extends through the second guide hole **3124**. The pin shaft **3101** is slidably fitted with the second guide hole **3124**. Both ends of the pin shaft **3101** are fixed in a positioning hole **203** of the inner tube **2**. In this way, the locking fork **312** can slide smoothly in the axial direction of the inner tube **2** by utilizing the sliding fit between the central shaft **3113** and the first guide hole **3123** and the sliding fit between the pin shaft **3101** and the second guide hole **3124**. In addition to supporting the gear **311**, the central shaft **3113** is used to guide the axial movement of the locking fork **312**, which also plays a role in simplifying the structure. Certainly, there are many implementations to realize the axial movement of the locking fork **312** in the inner tube **2**, and which are not limited to the above embodiments. For example, in some unillustrated embodiments, guide grooves and guide ribs that extends in the axial direction are respectively arranged on the locking fork **312** and the inner tube **2**. The guide groove and the guide rib are slidably fitted with each other, to guide the axial movement of the locking fork.

[0049] Referring to FIG. **5** below, a preferred structure of locking fork **312** is illustrated in this embodiment. The locking fork **312** can include a shank **3120**, and a U-shaped structure **3122** that is positioned at an end of the shank **3120**. Another end of the shank **3120** is connected to the first end **321** of the pulling member **32**. The engagement portion **3121** can be arranged on a base wall (not denoted in the figure) of the U-shaped structure **3122**. The first guide hole **3123** may be arranged in each of two opposite sidewalls of the U-shaped structure **3122**. The second guide hole **3124** may be arranged in the shank **3120**. The gear **311** is positioned in the U-shaped structure **3122**. Two ends of the central shaft **3113** extends through the corresponding first guide hole **3123**, and then, the central shaft **3113** is fixed in the positioning hole **202**. By disposing the U-shaped structure **3122**, when a teeth portion of the gear **311** is engaged with the engagement portion **3121**, both the gear **311** and the locking fork **312** are in a stable state of force balance.

[0050] Referring to FIGS. **2** to **4**, this embodiment also illustrates a preferred implementation of the first elastic member **331**. The first elastic member **331** may include a first spring, for example, the first spring is sleeved on the locking fork **312**. A first end of the first spring is adjacent to the central shaft **3113**, and is limited by a limiting step **3125** on the locking fork **312**. A second end of the first spring can be limited by the pin shaft **3101**. When the pulling member **32** is subjected to the pulling force F, the pulling member **32** pulls the locking fork **312** to move in the axial direction x**1**, so that the first spring is compressed. When the pulling force F is removed, the first spring pushes the locking fork **312** to move in the axial direction x**2**, so that the engagement portion **3121** is engaged with the teeth portion of the gear **311**, and the pulling member **32** is reset. It can be understood that in other embodiments, the first elastic member **331** can also be implemented in other ways, as long as the first elastic member **331** can drive the locking fork **312** to move so that the engagement portion **3121** is engaged with the gear **311** when the pulling force F is removed. For example, in an unillustrated implementation, the second end of the first spring may not be limited by the central shaft **3113**, but radial projections may be arranged on the inner wall of the inner tube **2** to limit the second end of the first spring.

[0051] Referring to FIGS. **4** and **5**, preferably, one or more wedge-shaped bumps **3127** may be arranged on the shank **3120** of the locking fork **312**. As can be seen from FIGS. **2** and **3**, the maximum outer diameter of the wedge-shaped bump **3127** is greater than an inner diameter of the

first spring (the first elastic member **331**). In this way, when the first spring is assembled on the locking fork **312**, the first spring can be easily sleeved on the shank **3120** under the guidance of an inclined surface of the wedge-shaped bump **3127**, and then, the first spring is limited between the limiting step **3125** and the wedge-shaped bump **3127**, which avoid the failure of the function of the first spring due to the first spring sliding to other incorrect positions.

[0052] Referring again to FIGS. **4** and **5**, this embodiment also illustrates a preferred structure for applying the pulling force F to the pulling member **32**. As shown in the figure, the pulling member **32** may be a flexible rope. A first end **321** of the pulling member **32** is connected to a connection position **3103** (for example, a connection hole **3103**) on the shank **3120** of the locking fork **31**. The second end **322** is connected to a connection position **49** (for example, a connection hole **49**) of a driving member **4** arranged in the inner tube **2**. Correspondingly, a first operating member **5** is mounted on the inner tube **2**. The first operating member **5** is, for example, a button and is operably connected to the driving member **4**. When being subjected to a force, the first operating member **5** drives the driving member **4** to move (for example, move axially), thereby applying the pulling force to the pulling member **32**. More specifically, a fixed housing **7** can be mounted on the inner tube **2**. The fixed housing **7** is provided with a mounting hole **71** and a through hole **72**. The first operating member **5** is provided with an elastic arm **51**, and a central post **52** with a first guide slope **521**. The elastic arm **51** extends through the mounting hole **71** and mounts the first operating member **5** on the fixed housing **7**. The central post **52** extends through the through hole **72** and enters the inner tube **2**. The driving member **4** is provided with a second guide slope **42**. The second guide slope **42** is kept in cooperation with the first guide slope **521**. When the first operating member **5** is pressed, the first guide slope **521** pushes the second guide slope **42**, so that the driving member **4** moves upward, thereby applying the pulling force F to the pulling member **32**, causing the engagement portion **3121** of the locking fork **312** to be disengaged from the gear **311**. When the pressing on the first operating member **5** is released, the first elastic member **331** drives the locking fork **312** to return to the state where the engagement portion **3121** is engaged with the gear **311**, and in this case, the second guide slope **42** pushes the first guide slope **521**, so that the first operating member **5** is reset. It can be understood that the pulling force F can also be applied to the pulling member **32** in many other ways. In some embodiments (refer to the description of the third embodiment below), the pulling member **32** can be a pull rod and integrated with the locking fork **312**. A second operating member **6** can be sleeved on the inner tube **2**. The second operating member **6** can slide along the inner tube **2** in a preset stroke range. The second end **322** of the pulling member **32** is connected to the second operating member. The second operating member **6** is adapted to move along the inner tube **2** when being subjected to a force, so as to apply the pulling force F to the pulling member **32**.

[0053] It should be noted that although in this embodiment, the locking fork **312** is moved in the axial direction of the inner tube **2** to realize the engagement of the engagement portion **3121** and the gear **311** or the disengagement of the engagement portion **3121** from the gear **311**, in some other embodiments, the locking fork **312** can also be moved in other ways to realize the engagement of the engagement portion **3121** and the gear **311** or the disengagement of the engagement portion **3121** from the gear **311**. For example, in some unillustrated embodiments, the locking fork **312** is pivotally connected to the inner tube **2** through a pivot, and the locking fork **312** is adapted to rotate around the pivot, so that the engagement portion **3121** is engaged with the gear **311** or disengaged from the gear **311**. The locking fork **312** is held at a position where the engagement portion **3121** thereof is engaged with the gear **311**, under the action of the first elastic member (such as a torsion spring), for example. When the pulling member **32** is subjected to the pulling force, the pulling member **32** can drive the locking fork **312** to rotate around the pivot, so that the engagement portion **3121** is disengaged from the gear **311**. When the pulling force is removed, the locking fork **312** returns back to the position where the engagement portion **3121** of the locking fork **312** is engaged with the gear **311** under the action of the first elastic member **331**.

[0054] FIG. **6** shows a partial structure of a retractable tube mechanism according to a second embodiment of the present application. The difference between this embodiment and the above first embodiment mainly lies in the structure of the locking fork **312**, and descriptions of the same or similar structures between this embodiment and the above first embodiment will not be repeated herein.

[0055] Referring to FIG. **6**, the locking fork **312** includes a shank **3120**, a side plate **3128** connected to an end of the shank **3120**, and a columnar engagement portion **3121**. The gear **311** is positioned between the side plate **3128** and the engagement portion **3121**. The first guide hole **3123** is arranged on the side plate **3128**. The central shaft **3113** of the gear **311** extends through the first guide hole **3123**. A plurality of protruding portions **3112** are arranged on an end surface **3111** of the gear **311** at intervals in a circumferential direction. A locked position is formed between every two adjacent protruding portions **3112**. When the pulling force F is removed, the engagement portion **3121** is inserted into the locked position to be engaged with the gear **311**, thereby limiting the rotation of the gear **311**. When the pulling force F is applied to the pulling member **32**, the locking fork **312** will move in the axial direction of the inner tube, so that the engagement portion **3121** is disengaged from the gear **311**, and thus the gear **311** can rotate.

[0056] FIGS. **8** to **13** show a structure of a retractable tube mechanism according to a third embodiment of the present application. FIG. **7** shows another stroller **100** according to the embodiment of the present application. The retractable tube mechanism according to the third embodiment of the present application is applied in the stroller **100**. As in the aforementioned first embodiment, the height of the handle **20** of the stroller **100** can be adjusted under the action of the retractable tube mechanism.

[0057] The retractable tube mechanism according to the third embodiment of the present application will be described in detail below. Referring to FIGS. **8** to **10**, in this embodiment, the outer tube **1** is provided with two or more positioning holes **10** in an axial direction. The locking member **31** may include a base portion **35** and a pin portion **36** connected to the base portion **35**. The base portion **35** is arranged in the inner tube **2** and can move in the radial direction of the inner tube **2**, so that the pin portion **36** is inserted into the corresponding positioning hole **10** or is withdrawn from the corresponding positioning hole **10**. It can be understood that when the pin portion **36** is inserted into the positioning hole **10**, the locking member **31** is in the locked state, and when the pin portion **36** is withdrawn from the corresponding positioning hole **10**, the locking member **31** is in the unlocked state. The base portion **35** and the pin portion **36** may be integrally formed, for example, by overmolding.

[0058] Referring to FIGS. **8** and **9**, the locking device **3** may further include a blocking member **37**, a second elastic member **332**, and a third elastic member **333** all arranged in the inner tube **2**. The blocking member **37** is connected to the first end **321** of the pulling member **32** and is operably connected to the base portion **35** of the locking member **31**. The blocking member **37** has a locked position and an unlocked position. The second end **322** of the pulling member **32** is an operating end, and the user can apply the pulling force F to the pulling member **32** by operating the second end **322** of the pulling member **32**. When the pulling member **32** is subjected to the pulling force F, the pulling member **32** will drive the blocking member **37** to move to the unlocked position in the axial direction x**1** of the inner tube **2**. When the pulling force F on the pulling member **32** is removed, the blocking member **37** is driven by the second elastic member **332** to move toward the locked position in the axial direction x**2** of the inner tube **2**. During the process of the blocking member **37** moving to the locked position, the base portion **35** is driven by the blocking member **37** to move in a first radial direction r**1** of the inner tube **2**, so that the pin portion **36** is inserted into the corresponding positioning hole **10**. When the blocking member **37** is driven by the pulling force F to overcome the force of the second elastic member **332** and move to the unlocked position, the base portion **35** is driven by the third elastic member **333** to move in a second radial direction r**2** of the inner tube **2**, so that the pin portion **36** is withdrawn from the corresponding positioning hole

10.

[0059] Referring to FIGS. **8** to **13**, in order to convert the axial movement of the blocking member **37** into the radial movement of the base portion **35**, the base portion **35** may be provided with a first pushing portion (see a first pushing portion **3511**, and a first pushing portion **3521** below), the blocking member **37** may be provided with a second pushing portion adapted to abut against the first pushing portion (see a second pushing portion **371**, and a second pushing portion **376** below). At least one of the first pushing portion and the second pushing portion is a slope. When the blocking member **37** moves axially, the base portion **35** is driven to move radially by cooperation of the first pushing portion, the second pushing portion, the second elastic member **332**, and the third elastic member **333**. It can be understood that when the first pushing portion abuts against the second pushing portion, an axial force applied by the second elastic member **332** on the blocking member **37** is converted to a radial force applied to the base portion **35** in the first radial direction r**1**, through the pushing of the first pushing portion and the pushing of the second pushing portion. A direction of such radial force is opposite to a direction of a radial force applied by the third elastic member **333** on the base portion **35** in the second radial direction r**2**. The radial force applied by the second elastic member **332** on the base portion **35** is greater than the radial force applied by the third elastic member **333** on the base portion **35**, so that when the pulling force F is removed, the second elastic member **332** can overcome the resistance and push the blocking member **37** in the direction of x**2**, and drives the pin portion **36** together with the base portion **35** to the locked position.

[0060] Preferably, in this embodiment, two sets of the first pushing portion and the second pushing portion may be provided. Referring to FIGS. **8** to **10**, a set of a first pushing portion **3511** and a second pushing portion **371** are shown. More specifically, the base portion **35** may include the first pushing portion **3511**, and a first top portion **3512** connected to the first pushing portion **3511**. The blocking member **37** can be provided with the second pushing portion **371**, and a second top portion **372** connected to the second pushing portion **371**. The first pushing portion **3511** and the second pushing portion **371** can both be slopes. At least one or both of the first top portion **3512** and the second top portion **372** is planar. When the blocking member **37** is driven by the second elastic member **332** to move from the unlocked position to the locked position in the axial direction x**2**, the second pushing portion **371** pushes the first pushing portion **3511**, so that the pin portion **36** is inserted into the corresponding positioning hole **10**. When the blocking member **37** is at the locked position, the second pushing portion **371** completely passes over the first pushing portion **3511**, so that the second top portion **372** abuts against the first top portion **3512**. In this way, even if the pin portion **36** is pressed from the outside of the outer tube **1**, the second top portion **372** and the first top portion **3512** will contact each other, and in close contact, so that the pin portion **36** will not be withdrawn from the positioning hole **10**, which can effectively avoid accidental unlocking from the inner tube **2**.

[0061] Referring to FIGS. **11** to **13**, another set of a first pushing portion **3521** and a second pushing portion **376** is shown. More specifically, the base portion **35** may further include the first pushing portion **3521**, and a first top portion **3522** connected to the first pushing portion **3521**. The first pushing portion **3521** may be a slope, and the first top portion **3522** may be planar. As can be seen from FIGS. **11** to **13**, the blocking member **37** may be provided with the second pushing portion **376**, and a second top portion **377** connected to the second pushing portion **376**. The second pushing portion **376** may be an arc surface, and the second top portion **377** may be planar. When the blocking member **37** is driven by the second elastic member **332** to move from the unlocked position to the locked position in the axial direction x**2**, the second pushing portion **376** pushes the first pushing portion **3521**, so that the pin portion **36** is inserted into the corresponding positioning hole **10**. When the blocking member **37** is at the locked position, the second pushing portion **376** completely passes over the first pushing portion **3521**, so that the second top portion **377** abuts against the first top portion **3522** (as shown in FIG. **11**). In this way, even if the pin portion **36** is

pressed from the outside of the outer tube **1**, the pin portion **36** will not be withdrawn from the positioning hole **10**, so that the accidental unlocking from the inner tube **2** can be effectively avoided.

[0062] Referring to FIG. **8**, when the blocking member **37** is at the locked position, the blocking member **37** may include a portion **379** interposed between the wall of the inner tube **2** and the base portion **35**. The portion **379** may include the above second top portion **372**. On the one hand, this portion **379** limits the pin portion **36** to withdraw from the corresponding positioning hole **10** when being subjected to external pressure. On the other hand, this portion **379** fills a gap between the inner tube **2** and the base portion **35** in the radial direction, which can improve the swing of the inner tube **2** relative to the outer tube **1**.

[0063] Referring again to FIGS. **8** to **13**, in order to facilitate the mounting of the second elastic member **332** and the third elastic member **333**, the locking device **3** further includes a fixing member **38** mounted in the inner tube **2**. The fixing member **38** is a protruding post mounted on an end of the inner tube **2** for example. The blocking member **37** is slidably fitted with the fixing member **38**. The second elastic member **332** is arranged between the blocking member **37** and the fixing member **38**. The second elastic member **332** is, for example, a spring arranged in the axial direction of the inner tube **2**. The base portion **35** is slidably fitted with the fixing member **3**. The third elastic member **333** is arranged between the base portion **35** and the fixing member **38**. The third elastic member **333** is, for example, a spring arranged in the axial direction of the inner tube **2**. Certainly, the implementations of the second elastic member **332** and the third elastic member **333** are not limited to the above embodiments, and the second elastic member **332** and the third elastic member **333** can have any suitable modification on the basis of meeting their functional requirements.

[0064] Referring to FIGS. **8** and **9**, preferably, the fixing member **38** may include a receiving portion **381**. A base wall **3811** of the receiving portion **381** is provided with a first through hole **3810**. The tube wall of the inner tube **2** is provided with a second through hole **206**. The first through hole **3810** is in communication with the second through hole **206**. A sidewall of the base portion **35** is slidably fitted with a sidewall **3812** of the receiving portion **381**. The pin portion **36** is slidably fitted with the first through hole **3810** and the second through hole **206**, so that the base portion **35** can move in the radial direction of the inner tube **2**, and the pin portion **36** can be inserted into or withdrawn from the positioning hole **10**. The third elastic member **333** may be interposed between the base wall **3811** of the receiving portion **381** and the base portion **35**. Preferably, the base wall **3811** and/or the base portion **35** may be provided with a protruding post for positioning an end of the third elastic member **333**.

[0065] Referring to FIG. **9**, preferably, the fixing member **38** may include a first baffle **383**. The blocking member **37** may include a second baffle **373**. The first baffle **383** and the second baffle **373** face each other, and are spaced from each other in the axial direction of the inner tube **2**. The second elastic member **332** is interposed between the first baffle **383** and the second baffle **373**. Preferably, the first baffle **383** and/or the second baffle **373** may be provided with a protruding post for positioning an end of the second elastic member **332**. Preferably, the fixing member **38** may also be provided with a third baffle **385**. The third baffle **385** is used to limit the movement of the second baffle **373** in the axial direction x**2**.

[0066] Referring to FIGS. **8** to **9** and **10**, this embodiment also illustrates a preferred structure for applying the pulling force F to the pulling member **32**. As shown in the figure, the pulling member **32** can be a pull rod, and integrated with the blocking member **37**. The second operating member **6** can be sleeved on the inner tube **2**. The second operating member **6** can slide along the inner tube **2** in a preset stroke range. The second end **322** of the pulling member **32** is, for example, directly or indirectly connected to the second operating member **6**. The second operating member **6** slides along the inner tube **2** in the axial direction x**1** when being subjected to a pull force, thereby applying the pulling force F on the pulling member **32**. The pulling member **32** drives the blocking

member **37** to move to the unlocked position, and the locking member **31** switches to the unlocked state. When the pull force on the second operating member **6** is removed, the second elastic member **332** drives the blocking member **37** to return to the locked position, the locking member **31** switches to the locked state, and the pulling member **32** resets along with the movement of the blocking member **37**, and the second operating member **6** resets along with the movement of the pulling member **32**. It can be understood that there can be many structures for applying the pulling force F to the pulling member **32**. For example, in some alternative embodiments, the structure of the flexible rope and the first operating member **5** described in the first embodiment above can be used.

[0067] FIG. **14** shows a partial structure of a retractable tube mechanism according to a fourth embodiment of the present application. The difference between this embodiment and the above third embodiment mainly lies in the structure of the locking member **31**, in this embodiment, the base portion **35** and the pin portion **36** are integrally formed by injection molding, for example. It should be noted that regardless of the base portion **35** and the pin portion **36** being integrally formed by overmolding or integrally formed by injection molding, the base portion **35** and the pin portion **36** are contributed to reducing the noise when the inner tube **2** moves relative to the outer tube **1**.

[0068] Embodiments of the present application further provides a stroller **100**. The stroller **100** can be provided with the retractable tube mechanism according to any of the embodiments of the present application, and thus, the height of the handle **20** of the stroller **100** can be adjusted according to the actual needs of the parents. It can be understood that the application scope of the retractable mechanisms for tubes according to the embodiments of the present application is not limited to strollers, and which can also be applied to any other suitable products.

[0069] The technical features of the above-described embodiments can be combined arbitrarily. To simplify the description, not all possible combinations of the technical features in the above embodiments are described. However, all of the combinations of these technical features should be considered as being fallen within the scope of the present application, as long as such combinations do not contradict with each other.

[0070] The foregoing embodiments merely illustrate some embodiments of the present application, and descriptions thereof are relatively specific and detailed. However, it should not be understood as a limitation to the patent scope of the present application. It should be noted that, a person of ordinary skill in the art may further make some variations and improvements without departing from the concept of the present application, and the variations and improvements falls in the protection scope of the present application. Therefore, the protection scope of the present application shall be subject to the appended claims.

Claims

1. A retractable tube mechanism, comprising: an outer tube; an inner tube inserted into the outer tube and axially movable relative to the outer tube; and a locking device comprising a locking member and a pulling member both arranged in the inner tube, the locking member being operably connected to the pulling member; wherein the locking member has a locked state in which an axial movement of the inner tube relative to the outer tube is restrained, and an unlocked state in which the axial movement of the inner tube is allowed; wherein when the pulling member moves under the action of a pulling force, the pulling member drives the locking member to switch from the locked state to the unlocked state; and wherein when the pulling force is removed, the locking member tends to return from the unlocked state to the locked state.

2. The retractable tube mechanism according to claim 1, wherein an inner wall of the outer tube is arranged with a rack extending in an axial direction; wherein the locking member comprises a gear supported by the inner tube, and the gear is meshed with the rack through an opening on a tube wall

of the inner tube; wherein the locking member further comprises a locking fork connected to the pulling member; wherein when the pulling force is removed, the locking fork is jointed to the gear, to restrain rotation of the gear, and when the pulling force is applied, the locking fork is driven by the pulling member to disjoint from the gear, thereby allowing the gear to rotate; and wherein the locking fork comprises an engagement portion, and the locking fork restrains the rotation of the gear by engagement of the engagement portion with the gear rotate.

3. (canceled)

4. The retractable tube mechanism according to claim 2, wherein the locking fork is adapted to move along an axial direction of the inner tube, so that the engagement portion is engaged with the gear or disengaged from the gear.

5. The retractable tube mechanism according to claim 4, wherein the locking fork is arranged with a first guide hole and a second guide hole spaced from the first guide hole, and the engagement portion is positioned between the first guide hole and the second guide hole; and wherein a central shaft of the gear extends through the first guide hole, a pin shaft extends through the second guide hole, and the pin shaft is fixed to the inner tube.

6. The retractable tube mechanism according to claim 5, wherein the locking device further comprises a first elastic member configured to maintain the engagement of the engagement portion with the gear; and wherein a first end of the pulling member is connected to the locking fork, and a second end of the pulling member is an operating end.

7. The retractable tube mechanism according to claim 6, wherein the first elastic member comprises a first spring sleeved on the locking fork; and wherein a first end of the first spring is adjacent to the central shaft, and is limited by a limiting step on the locking fork, and a second end of the first spring is limited by the pin shaft.

8. The retractable tube mechanism according to claim 5, wherein the locking fork comprises a shank, and a U-shaped structure positioned at an end of the shank, the engagement portion is arranged on a base wall of the U-shaped structure, and another end of the shank is connected to the pulling member; and the gear is positioned in the U-shaped structure, the first guide hole is arranged in each of two opposite sidewalls of the U-shaped structure, and the second guide hole is arranged in the shank.

9. The retractable tube mechanism according to claim **3**, wherein the locking fork is pivotally connected to the inner tube through a pivot; and wherein the locking fork is adapted to rotate around the pivot, so that the engagement portion is engaged with the gear or disengaged from the gear.

10. The retractable tube mechanism according to claim 2, wherein the engagement portion comprises at least one protruding tooth adapted to be engaged with a teeth portion of the gear; or wherein a plurality of protruding portions are arranged on at least one end surface of the gear at intervals in a circumferential direction, and wherein a locked position is formed between every two adjacent protruding portions, and the engagement portion is adapted to be inserted into the locked position to be engaged with the gear.

11. (canceled)

12. The retractable tube mechanism according to claim 1, wherein the outer tube is provided with at least two positioning holes in an axial direction; wherein the locking member comprises a base portion and a pin portion connected to the base portion; wherein the locking device further comprises a blocking member, a second elastic member, and a third elastic member all arranged in the inner tube; wherein the blocking member is connected to a first end of the pulling member, and a second end of the pulling member is an operating end; wherein the blocking member is adapted to be driven by the second elastic member or the pulling force to move to a locked position or an unlocked position in an axial direction of the inner tube; wherein when the blocking member moves toward the locked position, the base portion is driven by the blocking member to move in a first radial direction of the inner tube, so that the pin portion is inserted into the corresponding

positioning hole; and wherein when the blocking member moves toward the unlocked position, the base portion is driven by the third elastic member to move in a second radial direction of the inner tube, so that the pin portion is withdrawn from the corresponding positioning hole.

13. The retractable tube mechanism according to claim 12, wherein the base portion is provided with a first pushing portion, the locking member is provided with a second pushing portion adapted to abut against the first pushing portion, and at least one of the first pushing portion and the second pushing portion is a slope; wherein when the first pushing portion abuts against the second pushing portion, a direction of a radial force applied by the second elastic member on the base portion is opposite to a direction of a radial force applied by the third elastic member on the base portion; and wherein the radial force applied by the second elastic member on the base portion is greater than the radial force applied by the third elastic member on the base portion.

14. The retractable tube mechanism according to claim 13, wherein the base portion comprises a first top portion connected to the first pushing portion, the blocking member comprises a second top portion connected to the second pushing portion, and at least one of the first top portion and the second top portion is planar; and wherein when the blocking member is at the locked position, the second top portion abuts against the first top portion.

15. The retractable tube mechanism according to claim 12, wherein when the blocking member is at the locked position, the blocking member comprises a portion interposed between a wall of the inner tube and the base portion, and the portion restrains the pin portion from being withdrawn from the corresponding positioning hole.

16. The retractable tube mechanism according to claim 12, wherein the locking device further comprises a fixing member mounted in the inner tube, the blocking member is slidably fitted with the fixing member, the second elastic member is arranged between the blocking member and the fixing member, the base portion is slidably fitted with the fixing member, and the third elastic member is arranged between the base portion and the fixing member.

17. The retractable tube mechanism according to claim 16, wherein the fixing member comprises a receiving portion, and a base wall of the receiving portion is provided with a first through hole, and a tube wall of the inner tube is provided with a second through hole; and wherein a sidewall of the base portion is slidably fitted with a sidewall of the receiving portion, the pin portion is slidably fitted with the first through hole and the second through hole, and the third elastic member is interposed between the base wall of the receiving portion and the base portion.

18. The retractable tube mechanism according to claim 16, wherein the fixing member comprises a first baffle, the blocking member comprises a second baffle, the first baffle and the second baffle face each other, and are spaced from each other in the axial direction of the inner tube, and the second elastic member is interposed between the first baffle and the second baffle.

19. The retractable tube mechanism according to claim 12, wherein the base portion and the pin portion are integrally formed by injection molding or overmolding.

20. The retractable tube mechanism according to claim 1, wherein a first end of the pulling member is operably connected to the locking member, and a second end of the pulling member is an operating end; wherein the second end of the pulling member is connected to a driving member arranged in the inner tube, a first operating member is mounted on the inner tube, the first operating member is operably connected to the driving member, and the first operating member is adapted to, when being subjected to a force, drive the driving member to move, so as to apply the pulling force to the pulling member; or wherein the second end of the pulling member is connected to a second operating member sleeved on the inner tube, and the second operating member is adapted to, when being subjected to a force, move along the inner tube, so as to apply the pulling force to the pulling member.

21. The retractable tube mechanism according to claim 20, wherein the first operating member is provided with a first guide slope; and wherein the driving member is provided with a second guide slope kept in cooperation with the first guide slope.

22. A stroller, comprising the retractable tube mechanism according to claim 1, wherein the outer tube is a frame tube of the stroller; and the inner tube is a retractable handle tube.