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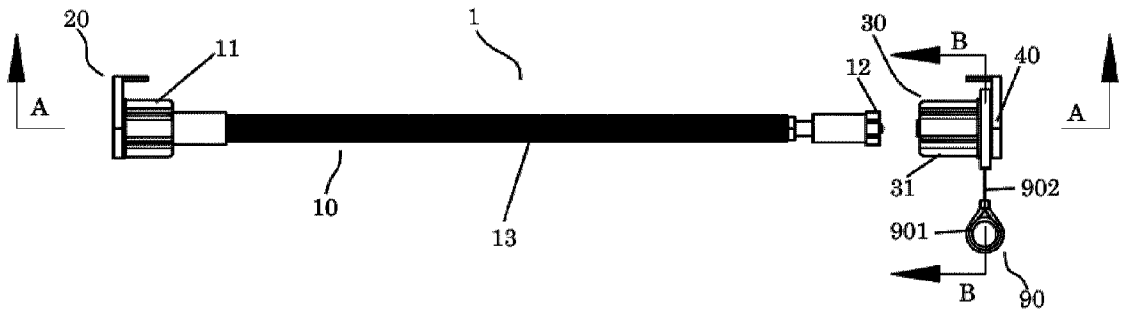

(57) Abrégé/Abstract:
A cordless roller shade mechanism is provided that holds at a desired position when no force is imparted thereon. When the roller shade is expanded, energy is stored in the roller shade. When the roller shade is to be retracted, a string is pulled to and the energy stored in the roller shade causes the roller shade to retract without the user imparting a rotational force on the roller shade.

ABSTRACT

A cordless roller shade mechanism is provided that holds at a desired position when no force is imparted thereon. When the roller shade is expanded, energy is stored in the roller shade. When the roller shade is to be retracted, a string is pulled to and the energy stored in the roller shade causes the roller shade to retract without the user imparting a rotational force on the roller shade.

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Cordless Roller Shade Mechanism

TECHNICAL FIELD

[0001] This disclosure relates generally to coverings for building openings. In particular, this disclosure relates to a roller mechanism for roller blinds or shades.

BACKGROUND

[0002] Roller shades are commonly used to cover the windows or other building openings to control the amount of light intruding therefrom. A roller shade typically includes a length of fabric that is wound around a roller tube, which is supported between a pair of brackets that are installed to a wall or ceiling that are adjacent to the building opening so that the shade may cover the opening.

[0003] A roller shade also includes a mechanism to rotate the roller tube so that fabric can be deployed or retracted. Traditionally, this mechanism includes a cord or chain, which is in a loop, that is connected to a clutch mechanism disposed at one end of the roller tube. When the cord or chain is pulled, the clutch mechanism transforms the pulling force to rotating force so that the roller tube is rotated.

[0004] Although convenient to use, the cord or chain poses a strangulation hazard, especially to small children and pets. As a result, many jurisdictions impose restrictions on the cords or chains, for example, by requiring them to be rigidly mounted to minimize any strangulation risks. However, such mounting requires additional components and increases the costs.

[0005] As such, there is a need for a mechanism that removes the cords or chains.

SUMMARY

[0006] A roller shade mechanism and the method of use thereof is provided.

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[0007] The mechanism includes a tensioner, a stopper and a releaser. Each of the tensioner and the stopper is at least partially disposed in the roller tube, and engages the roller tube such that the tensioner, the stopper, and the roller tube rotate together.

[0008] The tensioner is tensioned when the roller tube is rotated to deploy the shade disposed on the roller tube.

[0009] The stopper is switchable between a stop position that stops the roller tube from rotating without an external force and a release position that allows the roller tube to rotate.

[0010] When the stopper is in the release position, the tensioner causes the roller tube to rotate such that the shade is retracted.

[0011] In some embodiments, the tensioner includes an axle housing, an axle core that is at least partially received in the axle housing, and a bias member. The axle housing is rotatable about the axle core. The bias member is connected to the axle housing and the axle core such that the bias member is tensioned when the axle housing rotates about the axle core. When the tensioner is mounted to an end bracket, the axle core is prevented from rotating.

[0012] In some embodiments, the stopper includes a housing and a second bias member disposed in the housing. The second bias member is switchable between a stop position and a release position. The second bias member engages the housing when it is in the stop position, and disengages from the housing when it is in the release position. A pin limiter is disposed in the housing. A coupler is at least partially disposed in the housing, and the coupler is rotatable relative to the pin limiter. The second bias member is connected to the pin limiter and the coupler such that the second bias member is deformed to switch between the stop and the release positions when the coupler rotates relative to the pin limiter.

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[0013] In some embodiments, the stopper also includes an end housing, which is connected to the pin limiter. When the stopper is mounted on an end bracket, the end housing is prevented from rotating, as is the pin limiter.

[0014] A shaft pin is partially received in the pin limiter such that it rotates with the pin limiter. The shaft pin is received through a hole in the housing such that the housing is rotatable about the shaft pin.

[0015] The housing engages the roller tube such the housing rotates with the roller tube.

[0016] In some embodiments, the releaser includes a pull ring and a string that is operatively connected to the coupler such that when sufficient force is imparted on the string, the coupler rotates.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Reference will now be made, by way of example, to the accompanying drawings which show example embodiments of the present application, and in which:

[0018] FIG. 1A shows one embodiment of the mechanism.

[0019] FIG. 1B shows the view from the stopper end of the mechanism of FIG. 1A.

[0020] FIG. 2 shows a A-A sectional view of the embodiment of FIG. 1A.

[0021] FIG. 3 shows one embodiment of the end bracket on which the stopper is disposed.

[0022] FIG. 4 shows one embodiment of the shaft pin.

[0023] FIG. 5A shows the perspective view of one embodiment of the housing of the stopper.

[0024] FIG. 5B shows a top view of the housing of FIG. 5.

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[0025] FIG. 5C shows a A-A sectional view of the housing of FIG. 5A.

[0026] FIG. 6A shows a perspective view of one embodiment of the pin limiter.

[0027] FIG. 6B is a top view of the pin limiter of FIG. 6A.

[0028] FIG. 6C shows a bottom view of the pin limiter of FIG. 6A.

[0029] FIG. 6D shows a B-B sectional view of the pin limiter of FIG. 6C.

[0030] FIG. 7A shows a perspective view of the coupler.

[0031] FIG. 7B shows a front plan view of the coupler.

[0032] FIG. 7C shows a side view of the coupler.

[0033] FIG. 7D shows a back plan view of the coupler, in which the hole is shown in a sectional view.

[0034] FIG. 8A shows a perspective view of one embodiment of the end housing of the stopper.

[0035] FIG. 8B shows a front view of the end housing of FIG. 8A.

[0036] FIG. 8C shows a sectional view along the A-A line of FIG. 8A.

[0037] FIG. 8D shows a back view of the end housing of FIG. 8A.

[0038] FIG. 9 shows an enlarged view of the portion I of FIG. 2.

[0039] FIG. 10 shows an embodiment of the end bracket on which the axle is installed.

[0040] FIG. 11 shows a perspective view of the axle core.

[0041] FIG. 12 shows an enlarged view of the portion II of FIG. 2.

DETAILED DESCRIPTION

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[0042] It is noted that in the following detailed description features or components of different embodiments, which are identical or at least functionally identical to the corresponding features or components of another embodiment, are furnished with the same reference numerals. To avoid unnecessary repetitions, features or components that have already been explained on the basis of a previously described embodiment are no longer explained in detail at subsequent points.

[0043] Furthermore, it is noted that the following described embodiments only represent a limited selection of possible variations of embodiments of the invention. In particular, it is possible to combine the features of individual embodiments in a suitable manner, such that a multitude of different embodiments can be viewed as obviously disclosed for the person skilled in the art with the embodiments explicitly described here.

[0044] Reference is now made to FIG. 1A, which shows one embodiment of the mechanism 1.

[0045] The mechanism 1 includes a tensioner 10 and a stopper 30. The tensioner 10 is installed on a bracket 20. The stopper 30 is installed on a bracket 40. A releaser 90 is operatively connected to the stopper 30. The releaser 90 includes a pull ring 901 and a string 902 that connects the pull ring 901 to the stopper 30.

[0046] The brackets 20 and 40 are installed on the wall or ceiling for installation of the roller blind or shade.

[0047] The mechanism 1 is configured to be received in a roller tube. The protrusions 11 and 12 of the tensioner 10 and the protrusions 31 of the stopper 30 engages the roller tube such that the tensioner 10 and the stopper 30 rotate when the roller tube rotates and vice versa.

[0048] FIG. 1B shows the view of the mechanism from the stopper end. The pull ring 901 is connected by the string 902 to the stopper 30.

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[0049] FIG. 2 shows the A-A sectional view of the mechanism of FIG. 1A.

[0050] The tensioner 10 includes an axle 13. The protrusions 12 are configured on one portion of the axle 13, for example, at one end of the axle 13 distal from the bracket 20.

[0051] A bias member 14 is disposed on the axle 13. In some embodiments, the bias member 14 is a spring. In some embodiments, the bias member 14 is an elastic band.

[0052] One end of the bias member 14 is connected to the axle housing 132 of the axle 13. The protrusions 12 are disposed on the axel housing 132. Imparting a rotational force on the protrusions 12 causes the axle housing 132 to rotate. The other end of the bias member 14 is connected to the axle core 131. The axle housing 132 is rotatable about the axle core 131.

[0053] The protrusions 11 are disposed on one portion of the axle housing 132, for example, at one end of the axle 13 distal from the protrusions 12.

[0054] When the mechanism 1 is installed in a roller tube, the protrusions 11, 12, and 31 engage the roller tube. When the shade on the roller tube is pulled to deploy the shade, the axle 13 and the stopper 30 rotate. The bias member 14 is tensioned. When the shade is released, the stopper 30 stops the roller tube from rotating. When the releaser 90 is pulled by sufficient force, the stopper 30 is switched to a release position, allowing the roller tube to rotate, while the bias member 14 retracts to release the tension stored therein and cause the roller tube to rotate so that the shade is retracted. When the shade is retracted to a desired position, the releaser 90 may be released so that the stopper 30 is switched to the stop position so that the roller tube stops rotating, and the shade is stopped from deploying or retracting.

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[0055] When the bias member 14 comprises a spring, the spring is stretched when the shade is deployed. When the stopper 30 is switched the release position, the spring begins to return to its original position and causes the shade to retract.

[0056] In some embodiments, the bias member 14 can be pre-tensioned so that the speed of the retraction of the roller shade can be adjusted as desired.

[0057] FIG. 3 shows one embodiment of the end bracket 40, on which the stopper 30 is disposed.

[0058] The bracket 40 includes a body 401. A projection 402 extends from the body 401 substantially perpendicularly. Tabs 403 are configured on the projection 402. The projection 402 is substantially a rectangular prism.

[0059] Holes 405 are configured on the ledge 404 such that the end bracket 405 can be installed on the ceiling or wall.

[0060] Reference is now made to FIG. 4, which shows an embodiment of the shaft pin 6.

[0061] The shaft pin 6 includes a head 61, a neck 63 and a stem 62. Grooves 64 and ridges 65 are formed on the stem 62, substantially along the length and axis of the stem 62. In some embodiments, the neck 63 and the stem 62 has the same cross-section.

[0062] Reference is now made to FIGs. 5A, 5B, and 5C.

[0063] The housing 7 includes a hole 71 and protrusions 31. The protrusions 31 are configured to engage the interior surface of a roller tube such that the housing 7 and the roller tube rotate simultaneously.

[0064] The housing 7 includes a cavity 72.

[0065] Reference is now made to FIGs. 6A, 6B, 6C, and 6D.

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[0066] The pin limiter 5 includes a platform 502. A body 501 extends through platform 502. A hole 504 is defined through the body 503. The body 501 extends beyond the platform 502 to form a head 503.

[0067] The body 501 and the platform 502 are is substantially cylindrical.

[0068] The platform 502 includes a substantially cylindrical exterior wall 508 that extends substantially parallel an axis of the body 501.

[0069] Walls 505 and 506 extend from the platform 502 between the body 501 and the exterior wall 508 and extend beyond the body 501. A gap 507 is formed between the walls 505 and 506. One end of the bias member 16 may be disposed in the gap 507 such that the bias member 16 is connected to the pin limiter 5.

[0070] At least a portion of the hole 504 has a cross-section that is configured to engage the shaft pin 6 such that the shaft pin 6 and the pin limiter 5 rotate together. The cross-section includes grooves 509 that are configured to engage the protrusions 65 of the shaft pin 6. The grooves 509 are configured between sections 510. In some embodiments, the sections 510 are arc-shaped. The shaft pin 6 and the pin limiter 5 may be of various shapes and sizes for the same purpose.

[0071] The portion of the pin limiter 5 with the cross-section that engages the shaft pin 6 extends through the head 503 and the platform 502.

[0072] Reference is now made to FIGs. 7A, 7B, 7C, and 7D.

[0073] The coupler 8 includes a platform 801, and a substantially cylindrical wall 802 extends from the platform 801. A substantially cylindrical body 803 is formed within the wall 802. The body 803 and the wall 802 are concentric.

[0074] The body 803 defines a bore 804.

[0075] Walls 805 and 806 extend from the platform 801 between the wall 802 and the body 803 beyond the body 803. A gap 807 is formed between the walls 805 and 806. One end of the bias member 16 may be disposed in the gap such that the bias

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member 16 is connected to the coupler 8. The wall 802 and the body 803 may strengthen the walls 805 and 806.

[0076] Two holes 808 are disposed on the platform 801. The holes 808 allow the string 902 to attach to the platform 801 such that the coupler 8 may be rotated by pulling the string 902. In some embodiments, there may be just one hole 808. In some embodiments, there may be more than two holes 808 disposed on the platform 801. In some embodiments, there may be other structures disposed on the platform 801 such that the string 902 can attach thereto. For example, there may be protrusions disposed on the platform 801 for the string 902 to attach to. The holes 808 are offset from the center of the bore 804 such that when the string 902 is pulled, a rotational force is imparted on the coupler 8.

[0077] A ledge 809 is disposed on the side of the platform 801 opposite the walls 805 and 806. The ledge 809 is in the form of an arc. The ledge may be of various shapes and sizes. A hole 810 is disposed on the ledge 809. The hole 810 is configured to allow the string 902 to pass through. The hole 810 is offset with respect to the bore 804 such that the coupler 8 rotates when the string 902 is pulled. In some embodiments, other structures such as protrusions, hooks, etc., are disposed on the platform 801 or the ledge 809 such that the string 902 can attach thereto.

[0078] In some embodiments, the coupler 8 does not include the holes 808. In some embodiments, the coupler 8 does not include the hole 810.

[0079] Reference is now made to FIGs. 8A, 8B, 8C, and 8D, which illustrate the end housing 9 of the stopper 30.

[0080] The end housing 9 includes a body 92, which has a wall 91 that extends therefrom. A hole 93 is defined in the wall 91. The hole 93 preferably faces downwards when the housing 9 is installed.

[0081] The end housing 9 includes a stem 910 that that extends substantially perpendicularly from the body 92, and a shaft 94 that extends substantially

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perpendicularly from the stem 910. A bore 95 is formed from the end the shaft 94 away from the body 92. The bore 95 is shaped and sized to receive a portion of the pin 6. For example, the bore 95 includes grooves 951 to receive the ridges 65 of the pin 6. As a result, if the end housing 9 does not rotate, the pin 6 does not rotate.

[0082] A ledge 96 is configured on the body 92, which may guide the string 902 of the releaser 90.

[0083] A bore 97 is formed in the stem 910 in a portion through the body 92. The stem 910 is larger in diameter than the shaft 904. In some embodiments, the stem 910 and the shaft 904 have the same diameter.

[0084] The bore 97 includes grooves 971 that is configured to receive the tabs 404 of the end bracket 40, such that the stationary end bracket 40 stops the end housing 9 from rotation.

[0085] A cavity 98 is formed in the between the bore 95 and the bore 97. A hole 99 is formed in the stem between the cavity 98 and the bore 95.

[0086] Reference is now made to FIG. 9, which shows an enlarged view of portion I of FIG. 2.

[0087] The stopper 30 includes a housing 7, and the protrusions 31 are configured on the exterior of the housing 7.

[0088] The housing 7 includes a hole 71, through which the shaft pin 6 is received. The shaft pin 6 includes a head 61 that is sized and shaped so that the head 61 cannot be received through the hole 71. The shaft pin 6 also includes a neck 63 that fit through the hole 71 so that the housing 7 may rotate about the shaft pin 6. The neck 63 and the hole 71 may have very similar diameters.

[0089] A pin limiter 5 is disposed in the cavity 72 of the housing 7. A portion of the stem 62 of the shaft pin 6 is received in the pin limiter 5 so that shaft pin 6 and the pin limiter 5 rotate together.

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[0090] A coupler 8 is partially disposed in the housing 7. The coupler 8 and the pin limiter 5 are connected by a bias member 16, which is a spring. The bias member 16 may be of other composition or structure, for example, an elastic band.

[0091] At least a portion of the wall 802 is disposed in the housing 7 such that the housing 7 is rotatable about the wall 802.

[0092] The stem 910 and shaft 94 of end housing 9 is partially disposed in the bore 804 of the coupler 8. The coupler 8 is rotatable about the shaft 94 of the end housing 9.

[0093] A portion of the stem 62 of shaft pin 6 is received in the cavity 95 of the end housing 9. A connector 15 is disposed through the hole 99 and connects the stem 62 of the shaft pin 6 and the end housing 9. The connector has an enlarged head 151 that is sized and shaped such that it cannot pass through the hole 99. Thus, the shaft pin 6 and the end housing 9 rotate together. When one of them does not rotate, the other does not rotate either.

[0094] The projection 402 of end bracket 40 is received in the bore 97 and the tab 403 is received in the groove 971 such that the rotation of the end housing 9 about the projection 402 is blocked. When the end bracket 40 is installed, the end housing 9, which is mounted on the end bracket 40, cannot rotate. The projection 402, the tab 403, and the bore 97 may be of other suitable shapes and sizes to achieve the same result.

[0095] The projection 402, tabs 403, the bore 97, and the grooves 971 may be of various sizes and shapes while the rotation of the end housing 9 about the projection 402 is blocked.

[0096] The bias member 16 is switchable between a stop position and a release position. In the stop position, the bias member 16 engages the interior surface of the housing 7 such that the rotation of the housing 7 is restricted. In the release position, the bias member 16 disengages from the interior surface of the housing 7

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such that the housing 7 can rotate. For example, the bias member 16 deforms to disengage from the interior surface of the housing 7.

[0097] When the bias member 16 includes a spring, the spring is stretched in the release position and the diameter of the spring is reduced, such that the friction between the bias member 16 and the housing 7 is reduced. Further stretching the bias member 16 causes the spring to disengage from the interior surface of the housing 7. When there is not sufficient force to stretch the spring, the spring engages the interior surface of the housing 7, and with reduced stretching force, the friction between the bias member 16 and the interior surface of the housing 7 increases. When there is no stretching force or the stretching force is smaller than a threshold value, the spring returns to the stop position such that the housing 70 does not rotate.

[0098] When the roller shade is pulled to be extended, a rotational force is imparted on the roller tube, which is transferred to the housing 7 through the protrusions 31. When this force is larger than the frictional force between the bias member 16 and the housing 7, the housing 7 rotates. In some embodiments, the frictional force between the bias member 16 and the housing 7 causes the speed of the extension of the roller shade to be in a controlled manner.

[0099] When the coupler 8 is rotated relative to the pin limiter 5, the bias member 16 is switched to the release position.

[0100] The housing 7, the shaft pin 6, the pin limiter 5, the coupler 8, and the shaft 94 of the end housing 9 are coaxial.

[0101] The string 902 of the releaser 90 is attached to the coupler 8. When the string 902 is pulled, a rotational force is imparted on the coupler 8. When the force is sufficient, i.e., larger than a threshold value, the coupler 8 rotates such that the bias member 16 is deformed.

[0102] Reference is now made to FIG. 10.

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[0103] The end bracket 20 includes a body 201. A projection 202 extends substantially perpendicularly from the body 201. Protrusions 203 are disposed on the sides of the projection 203. The projection 202 is substantially cylindrical.

[0104] A ledge 204 extends from the body 201. Holes 205 are configured on the ledge 204 such that the end bracket 20 can be installed on the ceiling or the wall.

[0105] FIG. 11 shows a perspective view of the axle core 131.

[0106] The axle core 131 includes the stem 1311 and an enlarged portion 1312. A groove 1313 is configured about the circumference of the enlarged portion.

[0107] FIG. 12 shows the sectional view of portion II of the embodiment of FIG. 2.

[0108] The projection 202 and the protrusions 203 are disposed in the cavity 1314 of the axle core 131. Thus, the rotation of the axle core 131 about the projection 202 is blocked.

[0109] The axle core 131 is received in the axle housing 132. The axle housing 132 and the axle core 131 are connected by connectors 17, which are disposed through the wall 1321 of the axle housing 132 into the groove 1313. As such, the axle housing 132 can rotate about the axle core 131, while the longitudinal movement of the axle housing 132 relative to the axle core 131 is blocked.

[0110] The protrusions 11 are disposed on the axle housing 132. The protrusions 11 engage the interior surface of a roller tube. When the roller tube is rotated, the axle housing 132 rotates about the axle core 131.

[0111] The axle housing 132 and the axle core 131 are coaxial.

[0112] A method for using the mechanism 1 is also provided. The end brackets 20 and 40 are installed on the wall or ceiling. The mechanism 1 is in a roller tube. Interreference fit is formed between the protrusions 11, 12, and 31 and the interior surface of the roller tube.

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[0113] When the user wants to extend the shade, the shade is pulled. When the force overcomes the frictional force between the bias member 16 and the housing 7, the roller tube rotates, and the bias member 14 is tensioned.

[0114] When the shade is extended to a desired position, the user releases the shade, and the frictional force between the bias member 16 and the housing 7 causes the housing 7 to stop rotating, thus stopping the roller tube from rotating.

[0115] When the user wants to retract the shade, the user pulls the pull ring 901, and a rotational force is imparted on the coupler 8 through the string 902. When this force overcomes the resistance force imparted by the bias member 16, the bias member 16 stretches, and the frictional force between the bias member 16 and the housing 7 is reduced. When the frictional force is reduced enough, for example, when the bias member 16 disengages from the housing 7, the tension stored in the bias member 14 causes the axle housing 132 to rotate, which in turn causes the roller tube to rotate, and the rotational force is transferred to the housing 7, which rotates as well. As a result, the shade is retracted.

[0116] When the shade is retracted to the desired position, the user releases the pull ring 901, the bias member 16 retracts and engages the interior surface the housing 7 such that the frictional force therebetween increases, causing the housing 7 to stop rotating, and the roller tube is stopped.

[0117] The preceding discussion provides many example embodiments. The disclosure includes all reasonably combinations of the elements of the various embodiments.

[0118] The term "connected," "attached to" or similar expression may indicate that the elements are directly connected to each other or connected through other components.

[0119] Although the embodiments have been described in detail, it should be understood that various changes, substitutions and alterations can be made herein.

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[0120] Furthermore, the scope of the present application is not intended to be limited to the particular embodiments of the process, machine, manufacture, composition of matter, means, methods and steps described in the specification. As persons skilled in the art will readily appreciate from the disclosure of the present invention, processes, machines, manufacture, compositions of matter, means, methods, or steps, presently existing or later to be developed, that perform substantially the same function or achieve substantially the same result as the corresponding embodiments described herein may be utilized. Accordingly, the appended claims are intended to include within their scope such processes, machines, manufacture, compositions of matter, means, methods, or steps.

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CLAIMS

1. A roller shade mechanism, comprising:

a stopper at least partially disposed in a roller tube and engages the roller tube such that stopper and the roller tube rotate together, and the stopper is switchable between a stop position and a release position, wherein

in the stop position, the stopper stops the roller tube from rotating, and

in the release position, the stopper allows the roller tube to rotate;

a tensioner at least partially disposed in a roller tube and engages the roller tube such that the tensioner and the roller tube rotate together,

the tensioner is tensioned when the roller tube is rotated such that a roller shade disposed on the roller tube is expanded, and

the tensioner causes the roller tube to rotate such that the roller shade is retracted when the stopper is in the release position;

and

a releaser operatively connected to the stopper, and imparting a force larger than a threshold value on the releaser causes the stopper to switch to the release position, while the stopper returns the stop position when the force is smaller or equal to the threshold value.

2. The mechanism of claim 1, wherein

the tensioner comprises:

an axle housing;

an axle core that is at least partially received in the axle housing; and

a bias member;

the axle housing is rotatable about the axle core;

a first end of the bias member is connected to the axle housing, a second end of the bias member is connected to the axle core, such that the bias member is tensioned when the axle housing rotates about the axle core.

3. The mechanism of claim 2, further comprising

a first end bracket that is installed on a wall or ceiling, and

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the axle is mounted on the first end bracket such that the axle core is stopped from rotating.

4. The mechanism of claim 2 or 3, wherein the axle housing engages the roller tube such that the axle housing and the roller tube rotate together.

5. The mechanism of any one of claims 1 to 4, wherein the stopper comprises:

a housing,

a second bias member received in the housing, the second bias member switchable between a stop position and a release position;

wherein

the second bias member engages the housing in the stop position, and the second bias member disengages from the housing in the release position.

6. The mechanism of claim 5, wherein the stopper further comprises:

a pin limiter disposed in the housing;

a coupler at least partially disposed in the housing, the coupler is rotatable relative to the pin limiter; and

a first end of the second bias member connected to the pin limiter, and a second end of the second bias member connected to the coupler such that when the coupler rotates relative to the pin limiter, the bias member is deformed to switch between the stop position and the release position.

7. The mechanism of claim 6, wherein the bias member is a spring, and the spring is stretched in the release position compared to the stop position.

8. The mechanism of claim 6 or 7, further comprising a releaser that is operatively attached to the coupler such that the coupler rotates when sufficient force is imparted on the releaser.

9. The mechanism of claim 8, wherein the releaser comprises a pull ring and a string that is connected to the coupler such that when the sufficient force is imparted on the pull ring, the coupler rotates.

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10. The mechanism of any one of claim 6 to 9, wherein the coupler comprises a substantially cylindrical wall that is at least partially disposed in the housing such that the housing is rotatable about the wall.

11. The mechanism of claim 10, further comprising an end housing that comprises an end housing shaft, and

the wall of the coupler defines a bore in which at least a portion of the end housing shaft is received such that the coupler is rotatable about the end housing shaft.

12. The mechanism of claim 11, further comprising a second end bracket on which the end housing is mounted such that the end housing is prevented from rotating about the second end bracket.

13. The mechanism of claim 11 or 12, wherein

the housing comprises a hole;

a shaft pin is disposed through the hole such that the housing is rotatable about the shaft pin, and the shaft pin is at least partially disposed in the pin limiter such that the shaft pin and pin limiter rotationally move together; and

the shaft pin is connected to the end housing such that the shaft pin and the end housing rotationally move together.

14. The mechanism of claim 13, wherein

the shaft pin comprises a head, a neck, a stem, and pin protrusions that disposed on at least a portion of the stem, and

the neck is disposed through the hole, at least a part of the stem is disposed in the pin limiter, and the head is sized and shaped to prevent the shaft pin from moving through the hole; and

the pin limiter includes grooves that receive the pin protrusions such that the pin limiter and the shaft pin rotationally move together.

15. A roller shade mechanism, comprising:

a tensioner, comprising:

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an axle housing, configure to be at least partially received in a roller tube and engages the roller tube such that the axle housing and the roller tube rotates together;

an axle core at least partially disposed in the axle housing, and the axle housing is rotatable about the axle core;

a bias member connected to the axle housing and the axle core such that the bias member is tensioned when the axle housing rotates about the axle core;

a stopper, comprising:

a stopper housing configured to be at least partially received in the roller tube and engage the roller tube such that the stopper and the roller tube rotate together,

a pin limiter disposed in the stopper housing;

a coupler at least partially disposed in the stopper housing, the coupler is rotatable relative to the pin limiter, and the stopper housing is rotatable about the coupler;

a second bias member that engages the stopper housing in a relaxed state such that the rotation of the stopper housing is restricted, and the second bias member is connected to the pin limiter and the coupler such that the second bias member is stretched when the coupler rotates relative to the pin limiter such that the second bias member disengages from the stopper housing;

an end housing at least partially received in the coupler such that the coupler is rotatable about the end housing, the end housing operatively connected to the pin limiter such that the pin limiter and the end housing rotate together; and

a shaft pin disposed through the stopper housing such that the stopper housing is rotatable about the shaft pin, and the shaft pin is at least partially received in the pin limiter such that the shaft pin and the pin limiter rotate together;

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a releaser operatively connected to the coupler such that the coupler rotates when a force is imparted on the releaser.

16. The mechanism of claim 15, further comprising:

a first end bracket that is installed on a wall or ceiling, and the axle core is mounted on the first end bracket such that a rotation of the axle core is prevented; and

a second end bracket that is installed on a wall or ceiling, and the end housing is mounted on the second end bracket such that a rotation of the end housing is prevented.

17. The mechanism of claim 15 or 16, wherein the first bias member comprises a spring.

18. The mechanism of any one of claims 15 to 18, wherein the second bias member comprises a spring.

19. The mechanism of any one of claims 15 to 18, wherein the axle core and the axle housing are coaxial.

20. The mechanism of any one of claims 15 to 19, wherein the stopper housing, the shaft pin, the limiter, are the coupler are coaxial.

21. A method for using a roller shade mechanism, comprising:

installing a first end bracket and a second end bracket;

inserting a tensioner and a stopper each into one end of a roller tube such that the tensioner and the stopper engage the roller tube;

imparting a force on a roller shade installed on the roller tube such that the roller shade is expanded and the tensioner is tensioned;

releasing the roller shade at a desired position such that the roller shade holds at the desired position.

22. The method of claim 15, further comprising:

pulling a releaser to switch the stopper to a release position such that the tensioner causes the roller shade to retract;

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releasing the releaser when the roller shade retracts a second desired position such that the stopper switches to a stop position and holds the roller shade at the second desired position.

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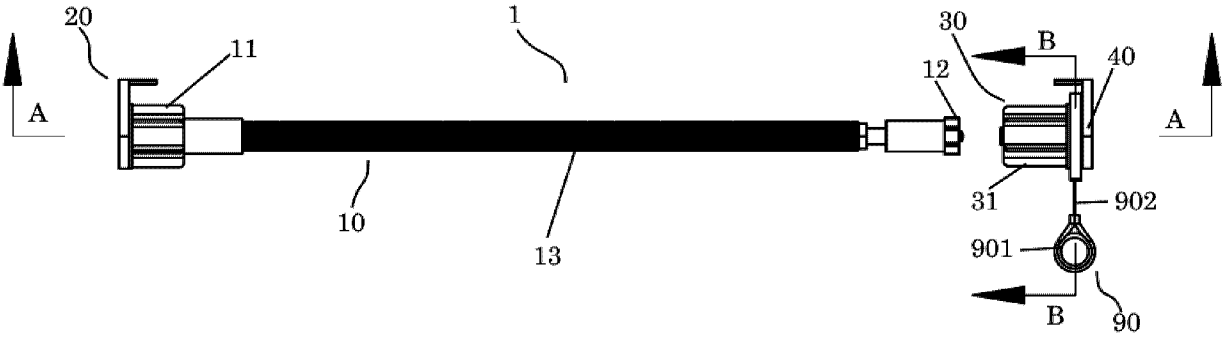

FIG. 1A

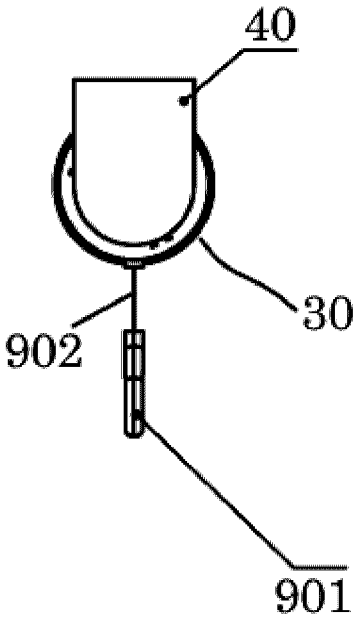

FIG. 1B

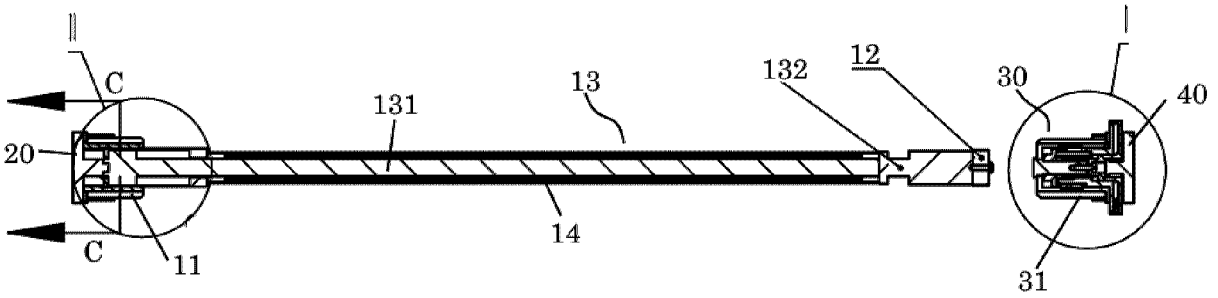

FIG. 2

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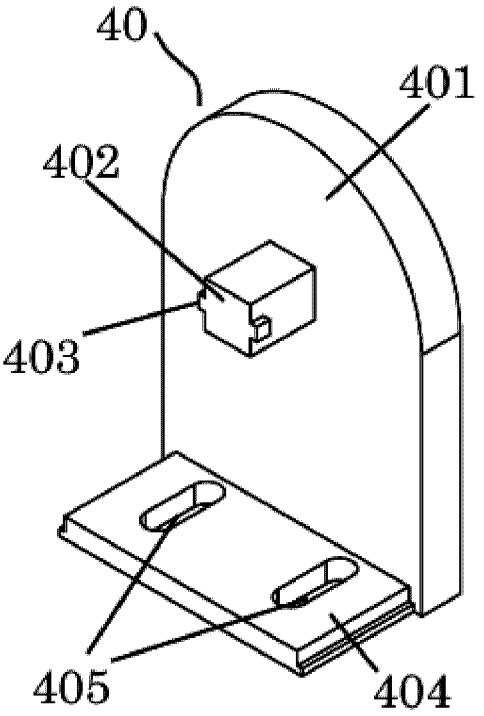

FIG. 3

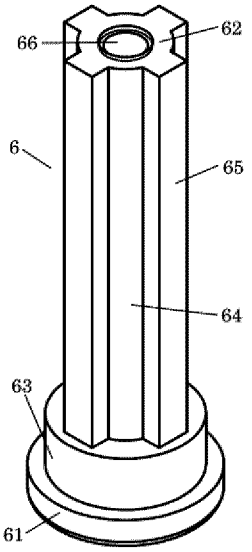

FIG. 4

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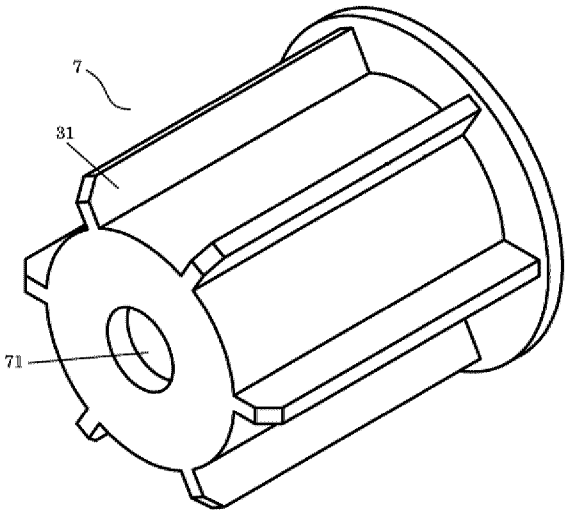

FIG. 5A

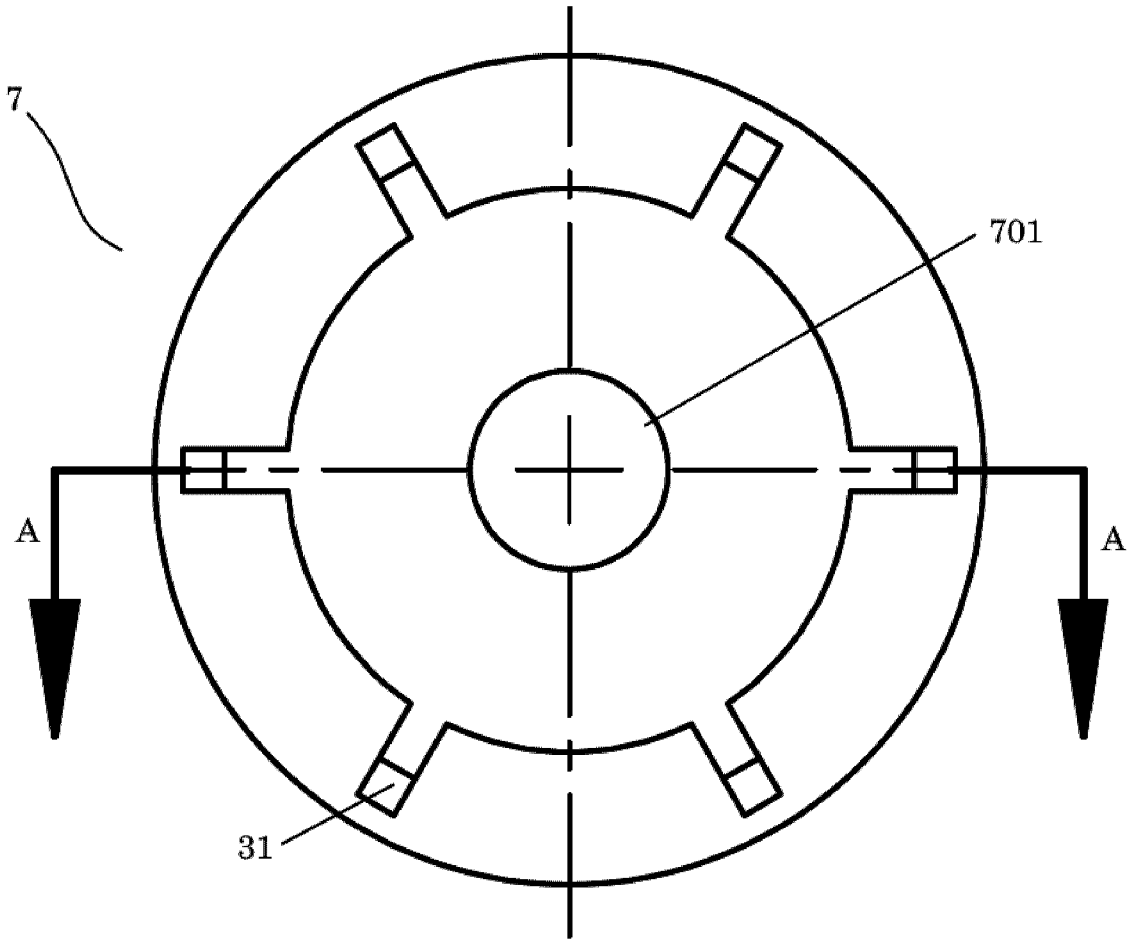

FIG. 5B

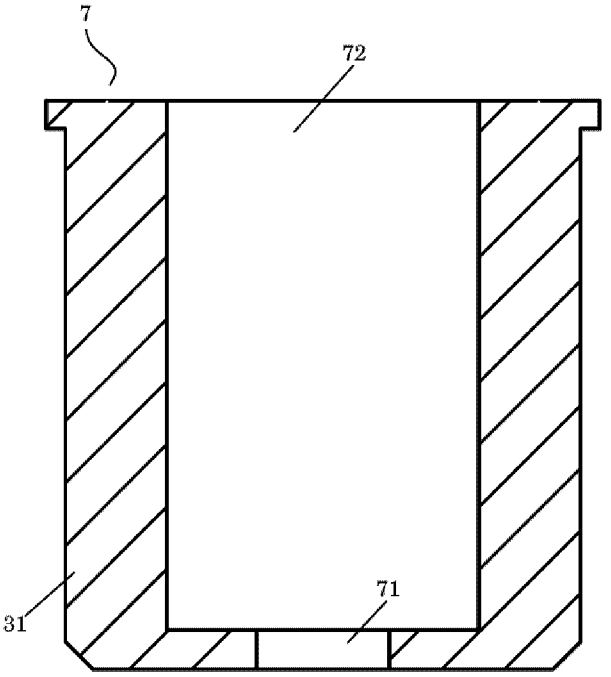

FIG. 5C

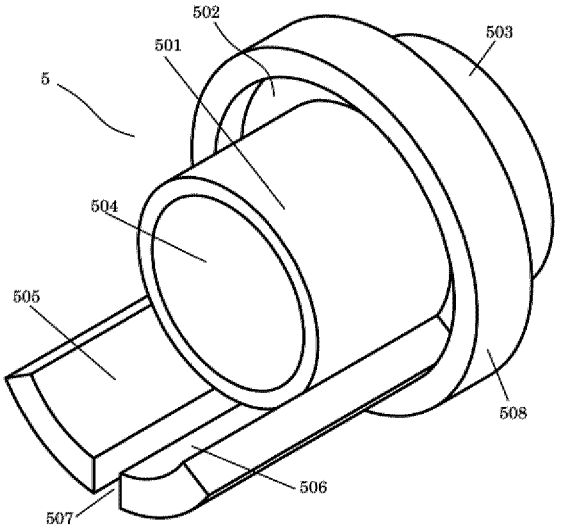

FIG. 6A

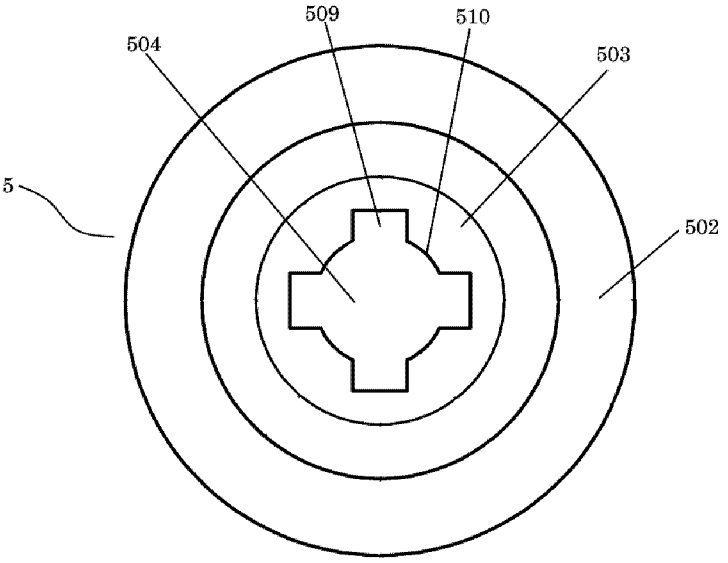

FIG. 6B

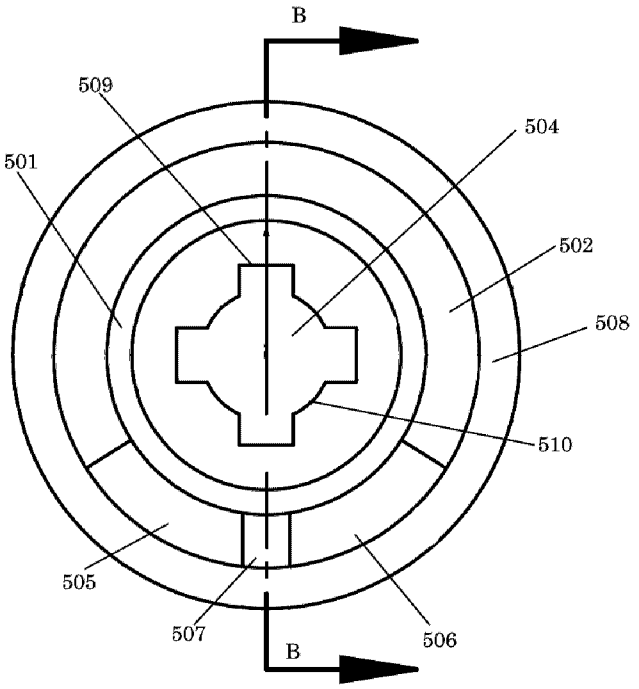

FIG. 6C

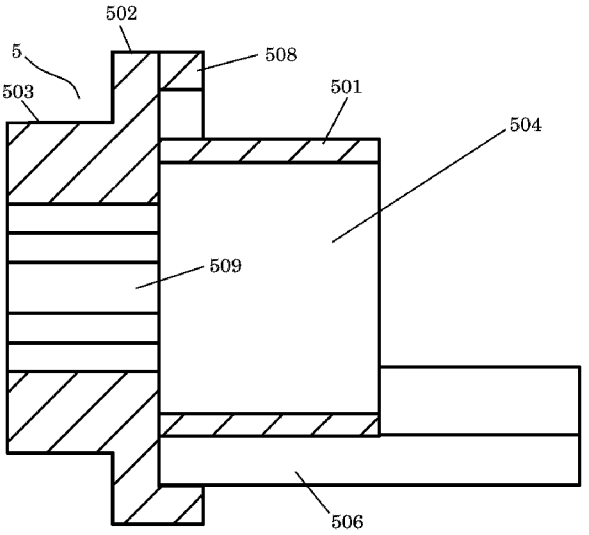

FIG. 6D

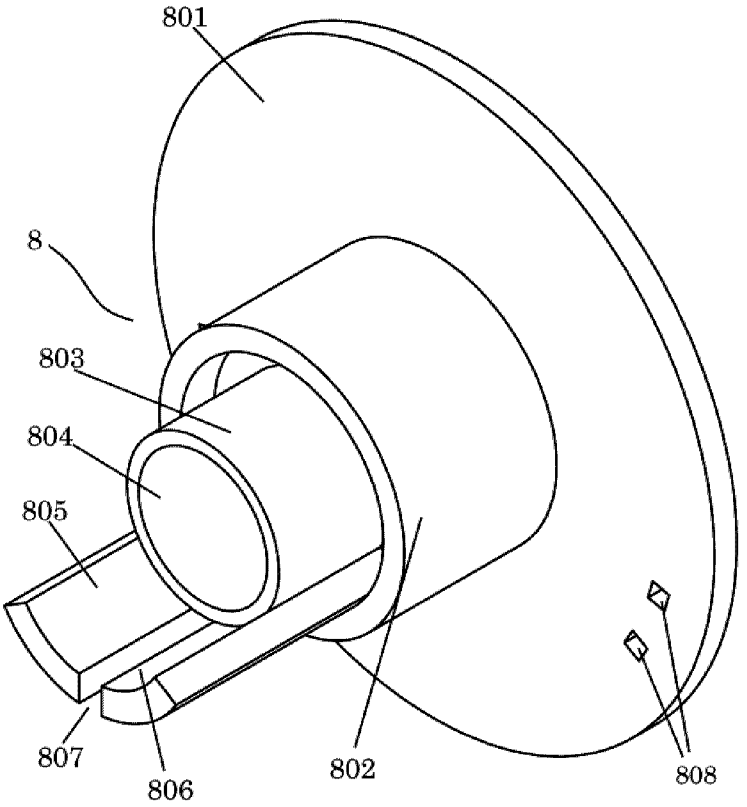

FIG. 7A

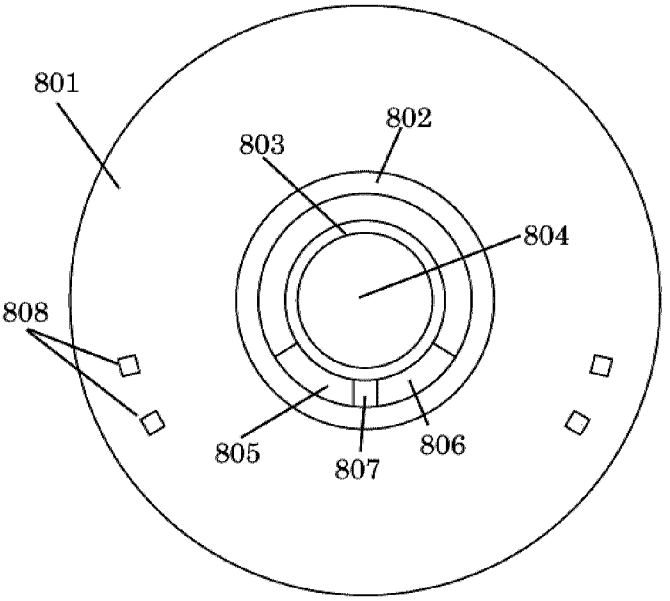

FIG. 7B

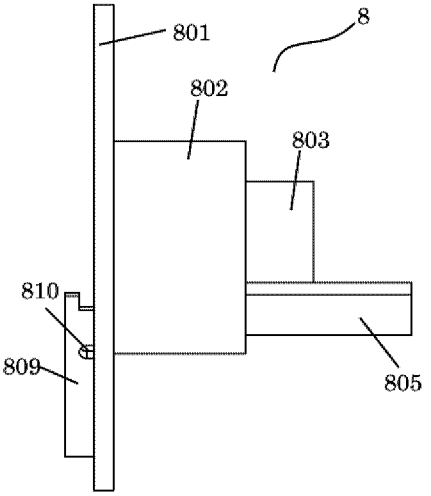

FIG. 7C

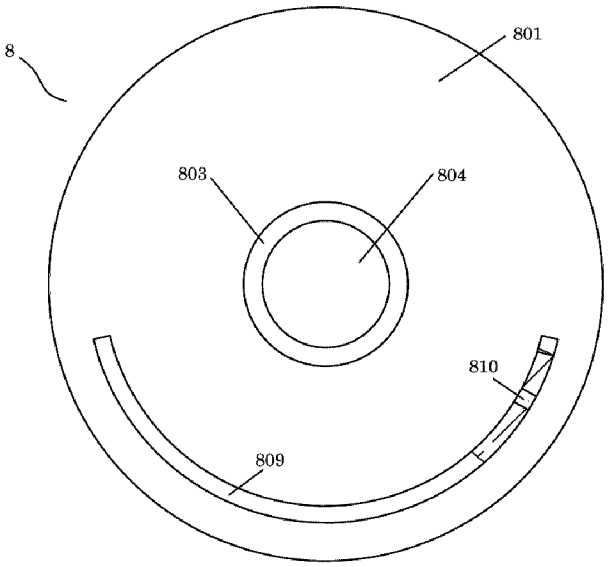

FIG. 7D

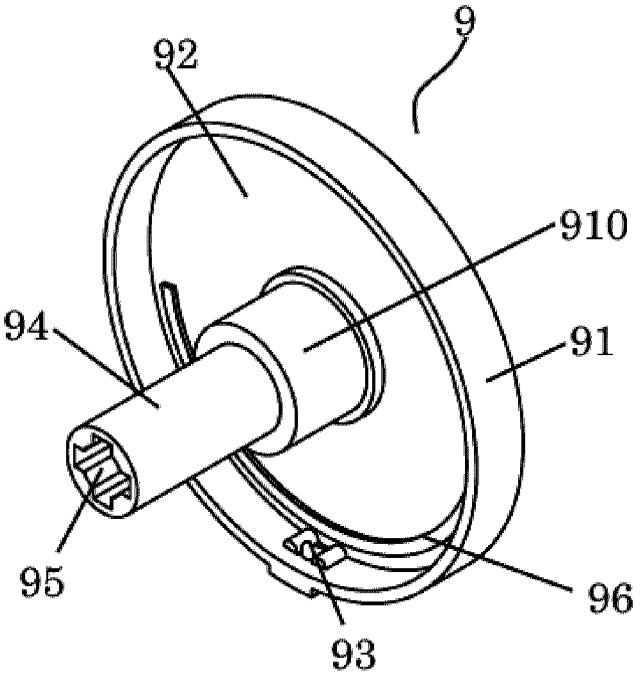

FIG. 8A

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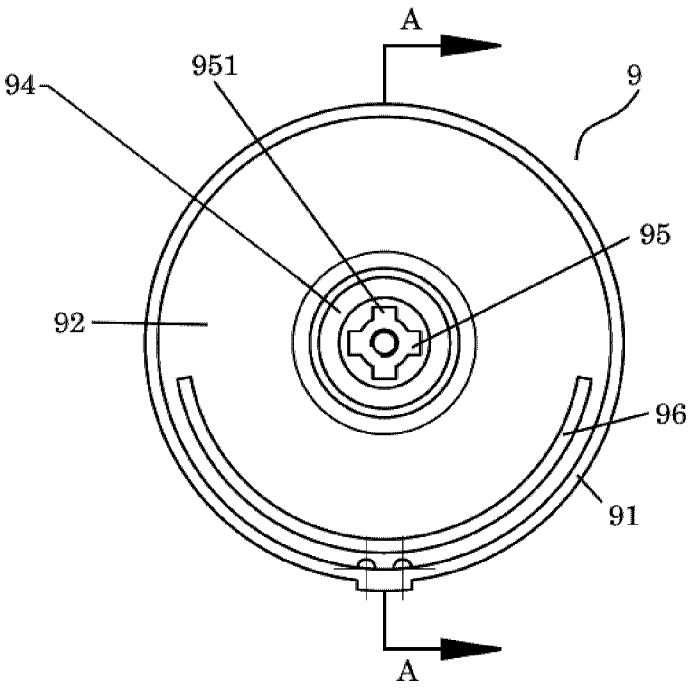

FIG. 8B

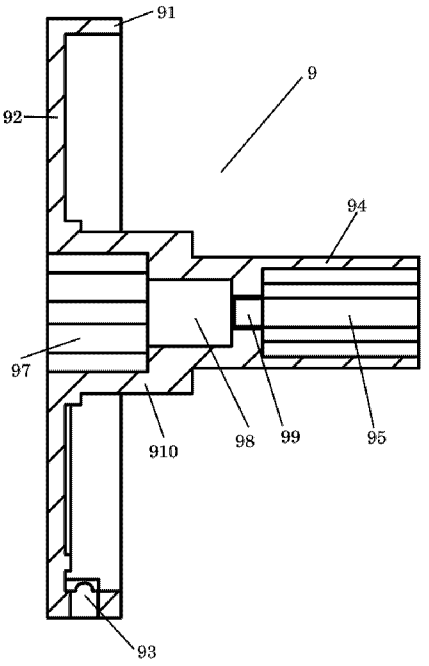

FIG. 8C

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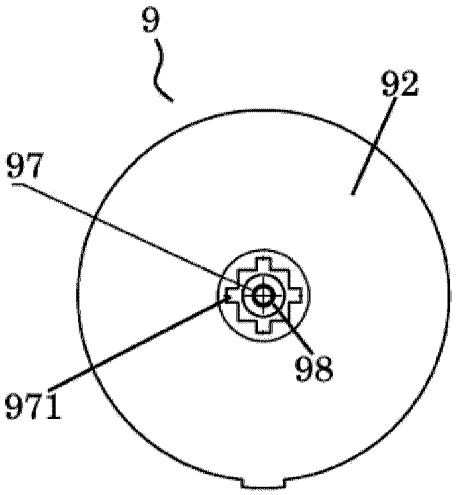
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FIG. 8D

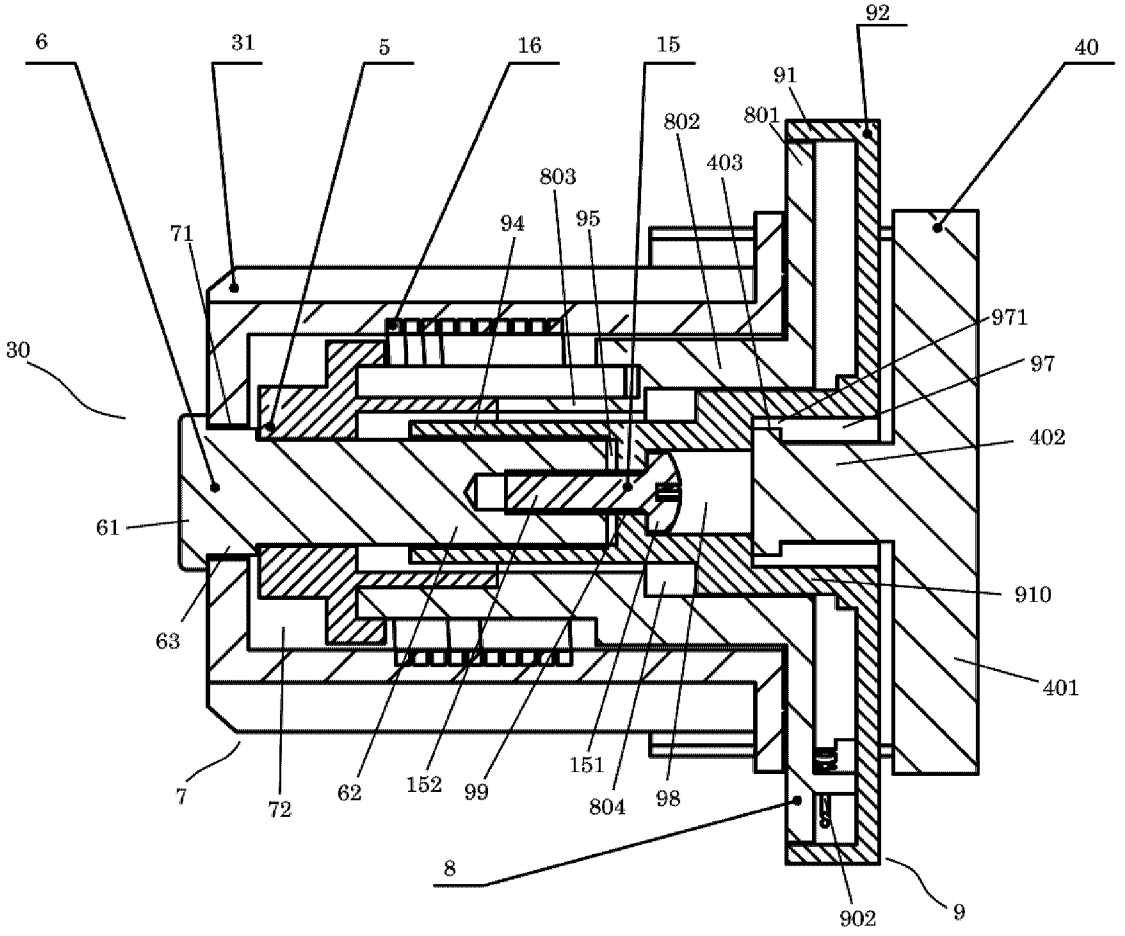
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FIG. 9

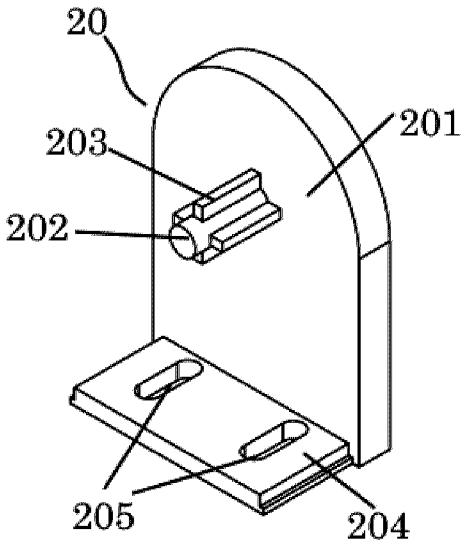

FIG. 10

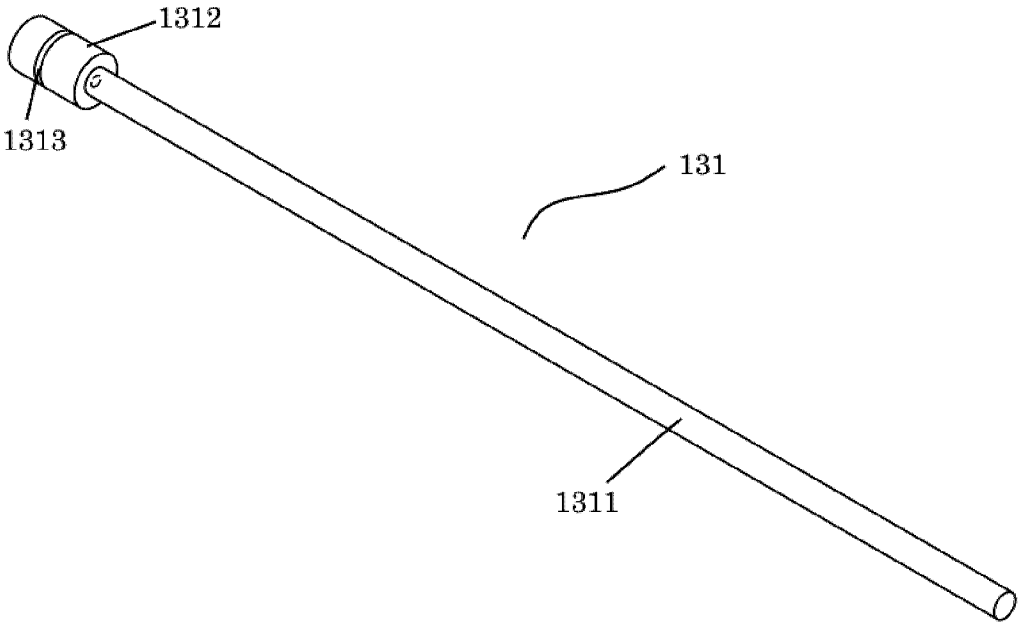

FIG. 11

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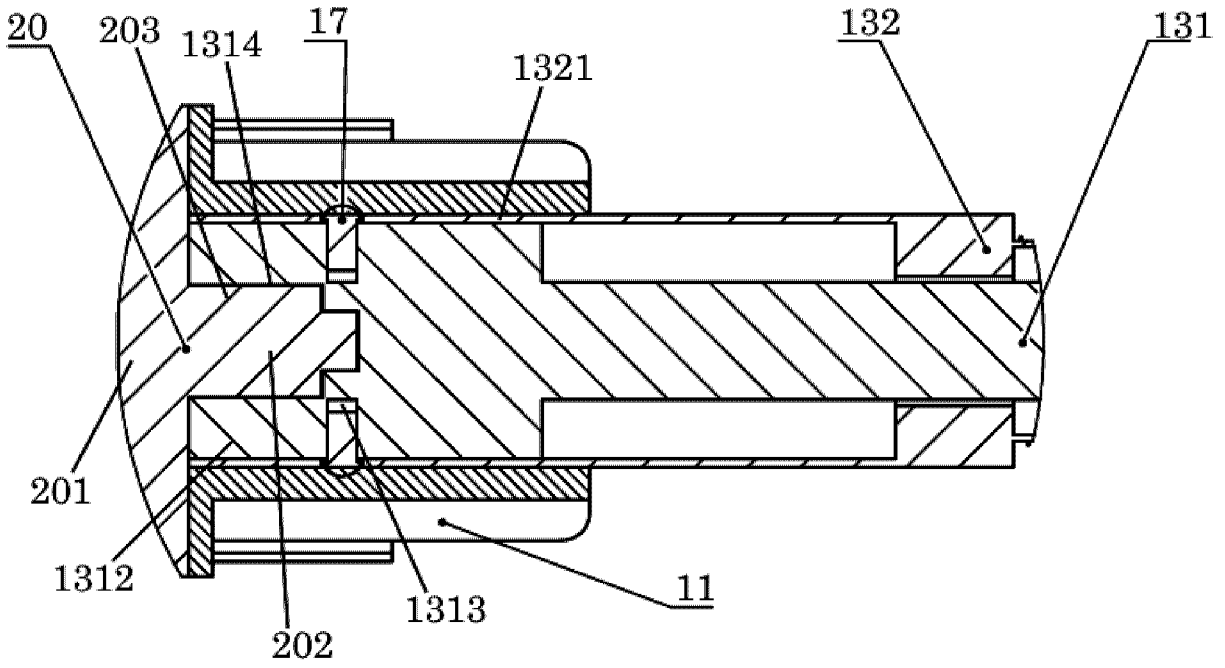

FIG. 12

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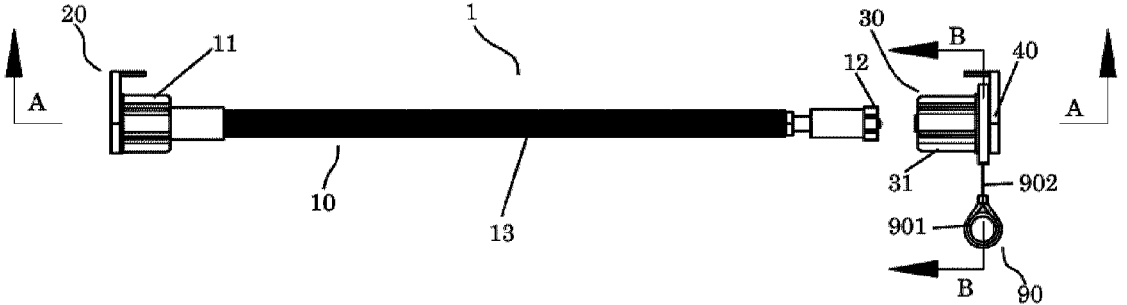
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