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(54) **OBJECT MOVING DEVICE**

(57) The present invention achieves an object moving device including a direction-changing portion for which strength is ensured with a simple structure. The object moving device includes: a drive section; a carrier plate; a guide member guiding the carrier plate; a cable connected to the carrier plate and transmitting a driving force of the drive section to the carrier plate; and a direction-changing member attached to the guide member. The direction-changing member includes the direction-changing portion changing a direction of the cable, a support portion supporting the direction-changing portion, and a rigid portion provided with the support portion. The guide member includes an attachment portion to which the direction-changing member is attached. The attachment portion includes a first fitting portion regulating movement of the direction-changing member in a direction in which the guide member extends, and a second fitting portion allowing the movement of the direction-changing member in the direction in which the guide member extends and regulating movement of the direction-changing member in a direction perpendicular to the direction in which the guide member extends. The direction-changing member is fixed to the attachment portion by winding of the cable around the direction-changing member and application of tension in a state in which the direction-changing member is attached to the attachment portion.

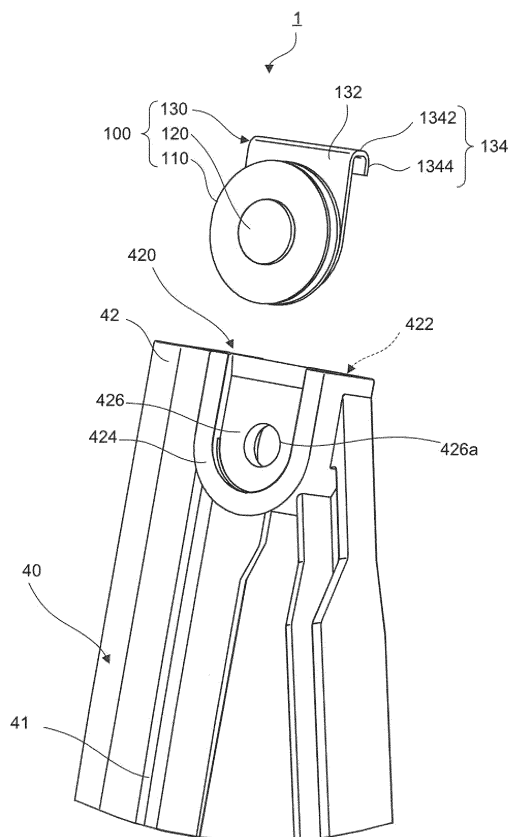


FIG. 5

Description

Technical Field

[0001] The present invention relates to an object moving device. 5

Background Art

[0002] In an object moving device that moves an object such as a window glass, a cable attached to the object is used in order to transmit a driving force. This cable is usually connected to a carrier plate attached to the object to be moved (hereinafter, referred to as "movement object") and a drive section, and is routed such that a direction in which the cable extends (hereinafter, referred to as "cable extending direction") is changed by a direction-changing portion such as a pulley. 10

[0003] Since a load when moving the object by driving of the drive section is applied to the direction-changing portion around which the cable is wound and which changes the cable extending direction, a portion supporting the direction-changing portion requires strength to prevent the direction-changing portion from coming off. For example, in a window regulator disclosed in Patent Literature (hereinafter, referred to as PTL) 1, an attempt to improve the strength is made through provision of a rib in a portion to which a pulley serving as the direction-changing portion is fixed. 15 20 25

Citation List

Patent Literature

[0004] PTL 1
Japanese Patent Application Laid-Open No. 2014-043696

Summary of Invention

Technical Problem

[0005] The window regulator of PTL 1 requires a complicated rib structure to be provided in addition to a range corresponding to the direction-changing portion to ensure strength. 45

[0006] An object of the present invention is to provide an object moving device including a direction-changing portion for which strength is ensured with a simple structure. 50

Solution to Problem

[0007] The object moving device of the present invention includes: 55

- a drive section;
- a carrier plate to which a movement object is con-

nected;

a guide member that guides the carrier plate;

a cable that is connected to the carrier plate and transmits a driving force of the drive section to the carrier plate; and

a direction-changing member attached to the guide member, wherein

the direction-changing member includes a direction-changing portion that changes a direction of the cable, a support portion supporting the direction-changing portion, and a rigid portion provided with the support portion,

the guide member includes an attachment portion to which the direction-changing member is attached,

the attachment portion includes a first fitting portion that regulates movement of the direction-changing member in a direction in which the guide member extends, and a second fitting portion that allows the movement of the direction-changing member in the direction in which the guide member extends and that regulates movement of the direction-changing member in a direction perpendicular to the direction in which the guide member extends, and

the direction-changing member is fixed to the attachment portion by winding of the cable around the direction-changing member and application of tension in a state in which the direction-changing member is attached to the attachment portion. 30

Advantageous Effects of Invention

[0008] According to the present invention, it is possible to achieve an object moving device including a direction-changing portion for which strength is ensured with a simple structure. 35

Brief Description of Drawings

[0009]

FIG. 1 is a front view of a configuration of a main portion of an object moving device according to an embodiment of the present invention;

FIG. 2 is a rear view of the configuration of the main portion of the object moving device according to the embodiment of the present invention;

FIG. 3 is a side view of the configuration of the main portion of the object moving device according to the embodiment of the present invention;

FIG. 4 is a partial perspective view of a first direction-changing member in the object moving device illustrated in FIG. 1;

FIG. 5 is a partial perspective view of a state in which the first direction-changing member is removed from a guide member in the object moving device illustrated in FIG. 1;

FIG. 6 is a cross-sectional view in an arrow direction taken along line A-A of FIG. 1;

FIG. 7 is a cross-sectional view of Variation 1 of the object moving device;

FIG. 8 is a cross-sectional view of Variation 2 of the object moving device; and

FIG. 9 is a partial perspective view of Variation 2 of the object moving device.

Description of Embodiment

[0010] Hereinafter, an embodiment of the present invention will be described in detail with reference to the accompanying drawings.

<Overall Configuration of Object Moving Device>

[0011] An object moving device is a device for moving a carrier plate by transmitting a driving force of a drive section to the carrier plate via a cable. The movement object for the object moving device may be the carrier plate itself or an object that is different from the object moving device and is connected to the object moving device.

[0012] Object moving device 1 of the present embodiment may be used in any device as long as the device moves carrier plate 30, and can be used in a window glass raising and lowering device or other devices. The other devices to which object moving device 1 may be applied include, for example, a device that raises and lowers a window glass, a metal plate or a plate made of a resin. As other opaque plates such as a plate made of a resin, a plate capable of displaying a captured image or the like, such as of a surrounding scenery similar to a surrounding scenery visible through a glass, may be used. Further, the other devices to which object moving device 1 can be applied also include, for example, a walking assisting device that assists a pedestrian in walking by raising and lowering a handle that the pedestrian holds.

[0013] For example, object moving device 1 illustrated in FIG. 1 is fixed between an inner panel and an outer panel of a door of a vehicle, and is applied to a window regulator or the like that raises and lowers a window of the door (for example, a window glass). In the present embodiment, the movement object is window glass W supported by carrier plate 30. In a case where the application example is a window regulator, a moving direction of carrier plate 30 is an up-down direction defined by using as a reference a raising and lowering direction of window glass W, which is the movement object.

[0014] As illustrated in FIG. 1 to FIG. 3, object moving device 1 includes, in addition to carrier plate 30, drive section 20, guide member 40, cable 60, first direction-changing member 100, and second direction-changing member 70. Note that, this configuration is applicable to second direction-changing member 70 and an attachment part of the guide member to which second direction-changing member 70 is attached.

[Drive Section 20]

[0015] Drive section 20 moves carrier plate 30 upward and downward via cable 60.

[0016] Drive section 20 moves carrier plate 30 by winding and unwinding cable 60.

[0017] Drive section 20 is connected to one end of cable 60, that is, one end of raising cable 62 and one end of lowering cable 64 in the present embodiment, respectively.

[0018] In the present embodiment, drive section 20 includes motor 22 that is electrically driven, drum 24, and a power transmission section (not illustrated) that transmits rotational motion of motor 22 to drum 24, such as a worm gear, for example. Drive section 20 rotationally drives motor 22 in a forward direction and in a backward direction, and drum 24 rotates in the forward direction and in the backward direction by the rotational driving.

[0019] In the present embodiment, drive section 20 is held, between one end and another end of guide member 40, by drive section-fixing portion 46 provided in guide member 40. In the rotational driving of motor 22, drum 24 rotates in the forward direction and in the backward direction. The one ends (in this case, the respective one ends) of raising cable 62 and lowering cable 64 are connected to drum 24 in which raising cable 62 and lowering cable 64 are wound in opposite directions to each other.

[0020] Drum 24 winds raising cable 62 by the rotation in the forward direction or in the backward direction to pull raising cable 62, or winds lowering cable 64 thereby to pull lowering cable 64. Drum 24 unwinds lowering cable 64 when drum 24 winds raising cable 62, and unwinds raising cable 62 when drum 24 winds lowering cable 64. In the present embodiment, drive section 20 is provided between one end portion 42 and another end portion 44 of guide member 40, but may be provided in another end portion 44 of guide member 40. Further, in a configuration in which first direction-changing member 100 is provided not in one end portion 42, but in another end portion 44 in guide member 40, drive section 20 can also be provided in one end portion 42 of guide member 40. Furthermore, drive section 20 is provided in guide member 40 in the present embodiment, but may be disposed away from guide member 40.

[Carrier Plate 30]

[0021] Although the movement object is connected to carrier plate 30, carrier plate 30 itself may be the movement object.

[0022] Carrier plate 30 is moved by drive section 20 via cable 60. In a case where the movement object is connected to carrier plate 30, carrier plate 30 moves the movement object.

[0023] In the present embodiment, carrier plate 30 is fitted into guide member 40, and is guided by guide member 40 to move upward and downward. Carrier plate 30 is fitted into rail portion 41 extending between a side of

the one end and a side of the other end of guide member 40, and is freely movable along rail portion 41. Carrier plate 30 is movable upward and downward by being guided by rail portion 41.

[0024] In the present embodiment, carrier plate 30 holds a lower end portion of window glass W, and is guided along guide member 40 (specifically, rail portion 41 of guide member 40) in the raising and lowering direction of window glass W.

[0025] Carrier plate 30 moves between a side of one end portion 42 (the side of the upper end in FIG. 1) and a side of another end portion 44 (the side of the lower end in FIG. 1) of guide member 40, and moves window glass W, which is the movement object.

[Cable 60]

[0026] Cable 60 is a member that moves carrier plate 30 in the up-down direction indicated by an arrow in FIG. 1.

[0027] Cable 60 is moved by a driving force of drive section 20.

[0028] Cable 60 is a long member that connects drive section 20 and carrier plate 30, and transmits the driving force generated by drive section 20 to carrier plate 30.

[0029] Cable 60 moves carrier plate 30 in the up-down direction by converting the driving force of drive section 20 into a tensile force to pull carrier plate 30.

[0030] As cable 60, for example, a wire formed by twisting a plurality of at least one of metal element wires and resin fiber element wires can be used.

[0031] Cable 60 has flexibility enabling the direction of cable 60 to be changed by first direction-changing member 100 and second direction-changing member 70, for example.

[0032] Cable 60 is linearly disposed, in a state in which tension is applied thereto, in a region between drive section 20 and first direction-changing member 100, in a region between first direction-changing member 100 and carrier plate 30, in a region between carrier plate 30 and second direction-changing member 70, and in a region between second direction-changing member 70 and drive section 20, for example. By the movement of cable 60 in the up-down direction, carrier plate 30 moves in the up-down direction in conjunction with the driving of drive section 20.

[0033] Specifically, cable 60 includes raising cable 62 and lowering cable 64.

[0034] Raising cable 62 pulls carrier plate 30 upward. Raising cable 62 is connected to carrier plate 30 at another end of raising cable 62, is wound around direction-changing portion (a pulley in the present embodiment) 110 of first direction-changing member 100 above, and is connected to drum 24 of drive section 20 at one end of raising cable 62.

[0035] Lowering cable 64 pulls carrier plate 30 downward. Lowering cable 64 is connected to carrier plate 30 at another end of lowering cable 64, is wound around

second direction-changing member 70 (for example, a pulley) below, and is connected to drum 24 of drive section 20 at one end of lowering cable 64.

5 [Guide Member 40]

[0036] Guide member 40 guides the movement of carrier plate 30, and movably supports carrier plate 30. In guide member 40, a rotation regulation portion, such as a rib, that restrains carrier plate 30 from rotating in an axial direction of guide member 40, is provided in a longitudinal direction, that is, in an extending direction of guide member 40. Rail portion 41 is formed by the rotation regulation portion.

10 **[0037]** Guide member 40 supports carrier plate 30 such that carrier plate 30 is capable of being raised and lowered along the extending direction of guide member 40 (a direction in which guide member 40 extends).

[0038] In the present embodiment, guide member 40 is formed of a resin material, and the weight of guide member 40 is reduced compared to a conventional guide rail made of a metal.

[0039] Guide member 40 is formed in a curved shape as a whole such that a central portion thereof between one end portion 42 and another end portion 44 protrudes on a side of one surface, in this case, a surface on which carrier plate 30 is disposed.

25 **[0040]** In the present embodiment, guide member 40 includes drive section-fixing portion 46 that fixes drive section 20 at a position deviated in the width direction of rail portion 41 from the position of rail portion 41 extending in the longitudinal direction. Guide member 40 is disposed such that rail portion 41 extends in the up-down direction. The width direction described here is a direction perpendicular to the extending direction of guide member 40, more specifically, the left-right direction of object moving device 1 corresponding to the width direction of the movement object.

30 **[0041]** Further, attachment portion 420 to which first direction-changing member 100 is attached is provided on the side of one end portion 42 (here, the side of the upper end) of guide member 40, and second direction-changing member 70 is attached on the side of another end portion 44 (here, the side of the lower end) of guide member 40. Drive section-fixing portion 46 is disposed between one end portion 42 and another end portion 44.

35 **[0042]** Drive section-fixing portion 46 is disposed between one end portion 42 and another end portion 44 in the extending direction, and away from rail portion 41 in the width direction of rail portion 41.

[0043] In drive section-fixing portion 46, drum 24 is provided to be rotatable by the driving of motor 22.

40 **[0044]** Note that, in the present embodiment, all of the extending direction of guide member 40 and the moving directions of raising cable 62 and lowering cable 64 are up-down directions in accordance with the movement of carrier plate 30 in the up-down direction, but are not limited thereto. When the moving direction of carrier plate

30 is a direction different from the up-down direction, the extending direction of guide member 40 and the moving directions of raising cable 62 and lowering cable 64 may be any directions such as left-right directions, for example. These moving directions can be appropriately set depending on the moving direction of the movement object.

[0045] Second direction-changing member 70 is attached on the side of another end portion 44. Specifically, a pulley shaft freely rotatably supporting the pulley that is second direction-changing member 70 is attached to another end portion 44. By fixing of the pulley shaft to another end portion 44, the pulley of second direction-changing member 70 is freely rotatably attached to guide member 40, and the moving direction of lowering cable 64 wound around the pulley is changed.

[0046] As illustrated in FIG. 4 to FIG. 6, attachment portion 420 attaches first direction-changing member 100 to guide member 40. FIG. 4 is a partial perspective view of first direction-changing member 100 in object moving device 1 illustrated in FIG. 1. FIG. 5 is a partial perspective view of a state in which first direction-changing member 100 is removed from guide member 40 in object moving device 1 illustrated in FIG. 1. FIG. 6 is a cross-sectional view in an arrow direction taken along line A-A of FIG. 1. Note that, illustration of raising cable 62 is omitted in FIG. 4 to FIG. 6 for convenience. Similarly, illustration of raising cable 62 is omitted in FIG. 7 to FIG. 9 as well.

[0047] First direction-changing member 100 is attached to attachment portion 420 by movement of rigid portion 130 of first direction-changing member 100, which is a first direction-changing member, from a position apart in the extending direction of guide member 40 to be fitted into attachment portion 420.

[0048] Attachment portion 420 is provided to allow first direction-changing member 100 to be fitted into attachment portion 420 from above.

[0049] Attachment portion 420 includes first fitting portion 422 and second fitting portion 424, and is fitted into first direction-changing member 100 at first and second fitting portions 422 and 424 described above.

[0050] First fitting portion 422 regulates relative movements of guide member 40 and first direction-changing member 100 in the extending direction of guide member 40.

[0051] When first direction-changing member 100 is moved in one direction and attachment portion 420 is attached thereto, first fitting portion 422 is fitted into a fitted portion (a first fitted portion) that is a part of first direction-changing member 100 to regulate the movement of first direction-changing member 100 in the one direction.

[0052] In the present embodiment, first fitting portion 422 is a groove portion opening upward and provided in an upper end portion that is one end portion 42 of guide member 40. Movement regulation portion 134 of first direction-changing member 100 is inserted and fitted into

the groove portion to regulate the movement of first direction-changing member 100 in the one direction with respect to guide member 40. Note that, end surface portion 1342 of first direction-changing member 100 abuts on end surface 42a in one end portion 42 of guide member 40 between first fitting portion 422 and second fitting portion 424 to regulate movement of end surface portion 1342 in the one direction.

[0053] In the present embodiment, second fitting portion 424 is provided on a surface of a side, to which the movement object is connected, of carrier plate 30, and in a U-shaped peripheral wall portion opening upward. By insertion of rigid portion-main body 132 of rigid portion 130 into the U-shaped peripheral wall portion in the one direction, rigid portion-main body 132 is fitted, upon insertion, into both side wall portions of the peripheral wall portion in the left-right direction, and thus, movement of rigid portion-main body 132 in the left-right direction is regulated. Further, upon the insertion into the U-shaped peripheral wall portion, rigid portion-main body 132 is fitted into a curved wall portion of the peripheral wall portion in the one direction, and thus, movement of rigid portion-main body 132 in the one direction is regulated. In the present embodiment, second fitting portion 424 corresponds to the both side wall portions of the peripheral wall portion. The peripheral wall portion includes a U-shaped groove formed therein. Second fitting portion 424 is fitted into rigid portion 130 by insertion of both side end portions in the width direction of rigid portion 130 into the groove provided in the both side wall portions of the peripheral wall portion. Second fitting portion 424 may include a bottom-shaped portion of the U-shape of the peripheral wall portion.

[0054] In the inside the peripheral wall portion of second fitting portion 424, abutting surface portion 426 is provided.

[0055] Abutting surface portion 426 is provided along at least the inside of the peripheral wall portion in one end portion 42, and functions as a plane supporting rigid portion 130 in a state in which first direction-changing member 100 is attached to attachment portion 420. On the side of one end portion 42, guide member 40 includes a space recessed in the width direction of guide member 40 with respect to second fitting portion 424, and is provided with abutting surface portion 426 as a bottom in the width direction of guide member 40 of the space. In the present embodiment, rigid portion-main body 132 of rigid portion 130 abuts on abutting surface portion 426 to support rigid portion 130. Abutting surface portion 426 is provided with through-hole 426a. Even in a case where support portion 120 such as a pulley shaft protrudes (for example, caulking portion 124) on a side of a rear surface of rigid portion 130 (specifically, a rear surface of rigid portion-main body 132) in first direction-changing member 100 to be attached to attachment portion 420, through-hole 426a makes it possible to attach first direction-changing member 100 to attachment portion 420 without allowing abutting surface portion 426 to interfere

with support portion 120.

[0056] Note that, the plane may be provided anywhere as long as the plane is provided along second fitting portion 424 and supports rigid portion 130 in a state in which first direction-changing member 100 is attached to attachment portion 420. For example, the plane may be a wall surface of at least one of both side walls of the groove constituting first fitting portion 422.

[0057] The above-mentioned case may be configured as in object moving device 1A illustrated in FIG. 7, for example. FIG. 7 is a partial cross-sectional view of a configuration of a main portion of object moving device 1A that is Variation 1 of object moving device 1. In attachment portion 420A provided in one end portion 42A of guide member 40A having a function similar to that of guide member 40, object moving device 1A includes both side wall portions 4222 in which a groove is deepened in first fitting portion 422A as a groove portion and which extend in an extending direction of guide member 40A. First fitting portion 422A described above makes it possible to accommodate auxiliary surface portion 1344A of movement regulation portion 134 in which an area facing rigid portion-main body 132A is widened in first direction-changing member 100A. Thus, when direction-changing member 100A is attached to attachment portion 420A, attachment portion 420A is capable of supporting rigid portion 130A of direction-changing member 100A with a wide area of both side wall portions 4222.

[Direction-Changing Member (First Direction-Changing Member 100, Second Direction-Changing Member 70)]

[0058] Direction-changing members (70, 100) illustrated in FIG. 1 to FIG. 6 change the moving direction of cable 60 on guide member 40. As direction-changing members (70, 100), a resin-made guide having elasticity to guide cable 60 along a changing direction, a pulley or the like is used, for example.

[0059] Direction-changing members (70, 100) are disposed apart in the moving direction of carrier plate 30. In the present embodiment, direction-changing members (70, 100) are provided on upper and lower end portions 42 and 44 of guide member 40, respectively.

[Second Direction-Changing Member 70]

[0060] In the present embodiment, lowering cable 64 extending from drum 24 toward the side of another end (the lower end) portion 44 is wound around second direction-changing member 70, and second direction-changing member 70 changes the moving direction of lowering cable 64. Second direction changing member 70 changes motion of pulling up a side of the one end of lowering cable 64 connected to drum 24 upward to motion of pulling down the side of the other end connected to carrier plate 30 downward.

[0061] In the present embodiment, second direction changing member 70 includes a pulley including a groove

around which lowering cable 64 is wound, and a pulley shaft that freely rotatably supports the pulley on a side of a leading end. By fixing of a side of a base end of the pulley shaft at a predetermined position of another end portion 44 of guide member 40, second direction-changing member 70 is fixed to guide member 40.

[First Direction-Changing Member 100]

[0062] In the present embodiment, raising cable 62 extending from drum 24 toward the side of one end (the upper end) portion 42 is wound around first direction-changing member 100, and first direction-changing member 100 changes the moving direction of raising cable 62.

[0063] First direction-changing member 100 changes motion of pulling down a side of the one end of raising cable 62 connected to drum 24 downward to motion of pulling up the side of the other end connected to carrier plate 30 upward.

[0064] First direction-changing member 100 of the present embodiment is fitted into and attached to guide member 40.

[0065] As illustrated in FIG. 4 to FIG. 6, first direction-changing member 100 is attached to attachment portion 420 provided in one end portion 42 of guide member 40.

[0066] First direction-changing member 100 includes direction-changing portion 110 that changes the direction of cable 60, support portion 120 supporting direction-changing portion 110, and rigid portion 130 provided with support portion 120.

[0067] Direction-changing portion 110 changes the direction of cable 60. In the present embodiment, raising cable 62 is wound around direction-changing portion 110 to change the moving direction of raising cable 62.

[0068] In the present embodiment, direction-changing portion 110 includes the pulley as direction-changing portion 110. The pulley is provided with a wire groove around which cable 60 is wound. Specifically, two flanges having the same shape are provided in disc outer periphery of the pulley that is a disc-shaped member, and a small diameter portion between these two flanges extends as the wire groove in a circumferential direction. The pulley is made of a resin, for example.

[0069] Support portion 120 supports direction-changing portion 110 such that direction-changing portion 110 is capable of changing the direction of cable 60, and freely rotatably fixes direction-changing portion 110 to rigid portion 130.

[0070] Since direction-changing portion 110 is the pulley in the present embodiment, support portion 120 is a pulley shaft rotatably supporting the pulley, freely rotatably supports the pulley with respect to rigid portion 130, and fixes the pulley to rigid portion 130.

[0071] The pulley shaft as support portion 120 includes a rod-shaped, columnar or cylindrical shaft portion, is freely rotatably attached such that the pulley does not come off in one end portion of the shaft portion, and is

fixed to rigid portion 130 by insertion of a side of another end portion of the shaft portion into a through-hole penetrating rigid portion 130. In the present embodiment, support portion 120 is strongly fixed to rigid portion 130 by caulking (corresponding to caulking portion 124) another end portion of support portion 120 (shaft portion) on a rear side of a surface, on which support portion 120 is erected, in rigid portion 130.

[0072] Note that, in a case where direction-changing portion 110 is a resin-made guide having elasticity, support portion 120 is a joint part where the resin-made guide and rigid portion 130 are joined. The joint part may be a recessed and protruding fitting portion in which both are fitted into each other or may be configured with a bonded portion, a welded portion or a fastening portion such as a screw, in which both are joined. In either case, the joint part functions as a fixing portion that fixes the guide to rigid portion 130.

[0073] Rigid portion 130 has a strength capable of receiving tension of cable 60, which is wound around direction-changing portion 110, via support portion 120 and withstanding the tension. Rigid portion 130 is configured with, for example, a metal material or a resin material. In the present embodiment, rigid portion 130 is formed in a shape fittable into attachment portion 420 of guide member 40 by processing a metal sheet. When rigid portion 130 is a metal sheet, the thickness thereof can be reduced as much as possible in a state of ensuring rigidity for receiving the tension of cable 60 that is wound around direction-changing portion 110.

[0074] Rigid portion 130 is attached by being fitted into attachment portion 420 of guide member 40, thereby mounting first direction-changing member 100 on guide member 40.

[0075] The fitted state of rigid portion 130 with attachment portion 420 is a state in which movement in a direction opposite to the one direction is possible, but the movement in the direction opposite to the one direction is regulated by the tension of cable 60 wound around direction-changing portion 110 of first direction-changing member 100 attached to guide member 40.

[0076] The movement of rigid portion 130 in the direction opposite to the one direction is regulated by the tension of cable 60 that is wound around direction-changing portion 110 in a state of being mounted on guide member 40.

[0077] In the present embodiment, rigid portion 130 includes rigid portion-main body 132 in which support portion 120 is erected, and movement regulation portion 134 that regulates the movement of rigid portion-main body 132 in the one direction when performing the mounting.

[0078] In rigid portion-main body 132, support portion 120 is erected perpendicularly. Rigid portion-main body 132 includes planar portion 1321 abutting on abutting surface portion 426, and is disposed facing direction-changing portion 110. Direction-changing portion 110 is freely rotatably fixed to rigid portion-main body 132 via

support portion 120 that is erected.

[0079] In the present embodiment, rigid portion-main body 132 is formed of a metal sheet, and protrusion portion 1322 is formed in a central portion of rigid portion-main body 132 so as to protrude toward a side of a front surface and to be recessed on a side of a rear surface. Protrusion portion 1322 is formed, for example, by processing a metal substrate constituting rigid portion-main body 132. Protrusion portion 1322 includes a through-hole formed in the central portion. The other end portion of support portion 120 is inserted into the through-hole from the side of the front surface onto the side of the rear surface of protrusion portion 1322. The other end portion of support portion 120 is caulked on the side of the rear surface of protrusion portion 1322 to be fixed to rigid portion-main body 132. Caulking portion 124 formed by caulking in support portion 120 is disposed in a recess of the side of the rear surface of protrusion portion 1322. Thus, caulking portion 124 does not protrude on the side of the rear surface with respect to planar portion 1321 of rigid portion-main body 132. On the rear surface of rigid portion-main body 132, the periphery of protrusion portion 1322 functions as planar portion 1321, and the entire surface thereof abuts on abutting surface portion 426. In the width direction of guide member 40, protrusion portion 1322 protrudes such that the position of direction-changing portion 110 is apart from abutting surface portion 426 rather than second fitting portion 424 being apart from abutting surface portion 426.

[0080] In the present embodiment, in a state in which rigid portion-main body 132 is fitted into the U-shaped peripheral wall portion as second fitting portion 424, an end portion on a side of the one direction of rigid portion-main body 132 is inserted and fitted into a cutout portion of the curved wall portion of the U-shaped peripheral wall portion. Further, in a state in which rigid portion-main body 132 is fitted into second fitting portion 424, direction-changing portion 110 is rotatably located at a position on a side of a front surface with respect to the peripheral wall portion of second fitting portion 424.

[0081] In the present embodiment, rigid portion-main body 132 receives the tension of cable 60, which is transmitted via direction-changing portion 110 and support portion 120, with planar portion 1321 perpendicular to support portion 120, and freely rotatably supports direction-changing portion 110.

[0082] Movement regulation portion 134 includes movement regulation portion 134 that regulates the movement of rigid portion-main body 132 in the one direction when first direction-changing member 100 is moved in the one direction to be attached to attachment portion 420.

[0083] In the present embodiment, rigid portion 130 includes rigid portion-main body 132 formed by processing of a metal sheet, and support portion 120 is erected in rigid portion-main body 132. Further, in rigid portion-main body 132, movement regulation portion 134 is formed by being bent from one side portion of rigid por-

tion-main body 132.

[0084] Movement regulation portion 134 is provided by being bent from the one side portion of rigid portion-main body 132, and includes end surface portion 1342 that engages with one end portion 42 of guide member 40, and auxiliary surface portion 1344 provided so as to face rigid portion-main body 132 in end surface portion 1342.

[0085] Auxiliary surface portion 1344 and end surface portion 1342 are formed in a U-shape with rigid portion-main body 132. Auxiliary surface portion 1344 is a first fitted portion that is fitted into first fitting portion 422 of attachment portion 420, and rigid portion-main body 132 functions as a second fitted portion that is fitted into second fitting portion 424 of attachment portion 420.

[0086] Rigid portion 130 is fitted into attachment portion 420 by fitting of rigid portion-main body 132 into second fitting portion 424 of attachment portion 420, fitting of auxiliary surface portion 1344 into first fitting portion 422 of attachment portion 420, and engagement of end surface portion 1342 with the end surface.

[Effect of Object Moving Device 1]

[0087] According to object moving device 1, first direction-changing member 100 includes direction-changing portion 110 that changes the direction of raising cable 62, support portion 120 supporting direction-changing portion 110, and rigid portion 130 provided with support portion 120. Further, the guide rail that is guide member 40 includes attachment portion 420 to which first direction-changing member 100 is attached. Attachment portion 420 includes first fitting portion 422 that regulates the movement of first direction-changing member 100 in the direction in which guide member 40 extends, and second fitting portion 424 that allows the movement of first direction-changing member 100 in the direction in which guide member 40 extends and that regulates movement of first direction-changing member 100 in a direction perpendicular to the direction in which guide member 40 extends.

[0088] Rigid portion 130 of first direction-changing member 100 is fitted to one end portion 42 of guide member 40 from above (see FIG. 5). Specifically, auxiliary surface portion 1344 is inserted into first fitting portion 422 to cause end surface portion 1342 to abut on end surface 42a, thereby causing movement regulation portion 134 including end surface portion 1342 and auxiliary surface portion 1344 to engage with one end (the upper end) 42 of guide member 40. Further, rigid portion-main body 132 of rigid portion 130 enters the peripheral wall portion of second fitting portion 424 to abut on abutting surface portion 426.

[0089] Thus, rigid portion 130 is fitted into attachment portion 420 in a state in which the movement in the extending direction of guide member 40 and in the left-right direction orthogonal to the extending direction is regulated, and first direction-changing member 100 is attached to attachment portion 420. That is, it is possible to attach

first direction-changing member 100 to guide member 40 only by fitting rigid portion 130 having a recessed shape and supporting direction-changing portion 110 into the protrusion portion of attachment portion 420 of guide member 40 without directly providing the direction-changing portion, such as the pulley, to be freely rotatable with respect to guide member 40.

[0090] Further, in a state in which first direction-changing member 100 together with second direction-changing member 70 and drive section 20 are attached to guide member 40, cable 60 (raising cable 62 and lowering cable 64) is wound around first direction-changing member 100 and second direction-changing member 70.

[0091] In particular, winding of raising cable 62 around first direction-changing member 100 and application of tension thereto result in a state in which first direction-changing member 100 is pressed to attachment portion 420 from above, the movement in the direction opposite to the one direction is regulated, and first direction-changing member 100 is fixed to guide member 40.

[0092] Specifically, as illustrated in FIG. 6, first direction-changing member 100 is in a state of being prevented from coming off by reception of the tension of cable 60 by upper end portion M1 of direction-changing portion 110 in contact with at least raising cable 62, portion M2 facing abutting surface portion 426 of the peripheral wall portion, and both side portions M3 and M4 of the groove of first fitting portion 422.

[0093] Thus, when first direction-changing member 100 is fixed to guide member 40, work of fixing guide member 40 in order to regulate the movement of first direction-changing member 100 in the opposite direction is unnecessary and it is possible to improve assemblability of object moving device 1.

[0094] Further, guide member 40 is provided with abutting surface portion 426 that is a plane along second fitting portion 424, and abutting surface portion 426 supports rigid portion 130 in a state in which first direction-changing member 100 is attached to attachment portion 420.

[0095] Abutting surface portion 426 is capable of surely supporting first direction-changing member 100 by receiving the tension of cable 60 (in particular, raising cable 62) wound around direction-changing portion 110, which is transmitted via direction-changing portion 110 and support portion 120, with an entire surface portion of abutting surface portion 426, on which rigid portion-main body 132 of rigid portion 130 abuts.

[0096] Thus, first direction-changing member 100 is fixed to guide member 40 only by attaching first direction-changing member 100 to attachment portion 420 of guide member 40 by fitting, and winding cable 60 around first direction-changing member 100. Since first direction-changing member 100 is attached to one end portion 42 that is the upper end portion and receives the tension of cable 60 most in the present embodiment, first direction-changing member 100 is strongly fixed to guide member 40 by receiving the tension of cable 60. Thus, it is possible

to achieve an object moving device including a direction-changing portion for which strength is ensured with a simple structure.

[0097] Accordingly, in the object moving device such as a window regulator, unlike a conventional configuration in which a guide rail that is a guide member is made of a resin instead of a metal in order to reduce weight, it is not necessary to make a fastening portion where a pulley is screwed in the guide rail larger than when the guide rail is made of a metal in order to ensure the rigidity for receiving the tension of the cable wound around the pulley.

[0098] In the present embodiment, first direction-changing member 100 is a direction-changing member provided in one end portion 42 as the upper end portion of guide member 40, but may be applied to second direction-changing member 70. In this case, another end portion 44 of guide member 40 may be configured to include an attachment portion in a similar manner to the configuration of one end portion 42, and a direction changing member having a configuration similar to that of first direction-changing member 100 may be attached to the attachment portion.

[0099] Further, in the present embodiment, the one direction that is the direction in which first direction-changing member 100 is attached to, that is, fitted into attachment portion 420 provided in one end portion 42 of guide member 40 is the direction from above along the extending direction of guide member 40 toward one end portion 42 as the upper end portion. However, the one direction is not limited thereto as long as the one direction is a direction in which the movement in the opposite direction is regulated by the tension of the cable.

[0100] For example, the attachment portion of guide member 40 may be configured such that first direction-changing member 100 can be attached to end portion 42 from a direction other than an upward direction. Guide member 40 is a guide rail having a curved shape, and the cable that is routed therein is routed obliquely from drive section 20 to second direction-changing member 70 and first direction-changing member 100, and is disposed so as to be located on different planes in the thickness direction of the guide rail. Accordingly, in the case of a direction other than a direction along the routing direction of the cable that is routed between second direction-changing member 70, first direction-changing member 100, and drum 24 of drive section 20 in the guide rail, it is possible to fit first direction-changing member 100 into one end portion 42 such that first direction-changing member 100 is prevented from coming off by the tension of the cable.

[0101] Further, although rigid portion 130 fixes support portion 120 by caulking on the side of the rear surface of protrusion portion 1322 formed in the central portion of the metal sheet in the present embodiment, the configuration thereof is not limited thereto. The configuration may be any as long as support portion 120 can be fixed thereby. Rigid portion-main body 132 may be formed of

a flat metal sheet as illustrated in FIG. 8 and FIG. 9.

[0102] FIG. 8 is a cross-sectional view of Variation 2 of the object moving device including the rigid portion-main body formed of the flat metal sheet. FIG. 9 is a partial perspective view of Variation 2 of the same object moving device.

[0103] Object moving device 1B illustrated in FIG. 8 and FIG. 9 has the same configuration as that of object moving device 1 except the configurations of attachment portion 420B and first direction-changing member 100B. Accordingly, only parts in object moving device 1B illustrated in FIG. 8 and FIG. 9, which differ from the components of object moving device 1, will be described, and descriptions of the same components will be omitted by giving the same reference signs to the same names.

[0104] In first direction-changing member 100B, rigid portion 130B, unlike rigid portion 130, includes rigid portion-main body 132B that is a flat sheet.

[0105] Rigid portion-main body 132B includes a through-hole formed in a central portion. Another end portion of support portion 120B is inserted into the through-hole from a side of a front surface onto a side of a rear surface of rigid portion-main body 132B.

[0106] The other end of support portion 120B includes caulking portion 124 by being caulked on the side of the rear surface of rigid portion-main body 132B, and support portion 120B is fixed to rigid portion-main body 132B via caulking portion 124 described above. Caulking portion 124 protrudes on the side of the rear surface of rigid portion-main body 132B. The rear surface of rigid portion-main body 132B functions as planar portion 1321B abutting on abutting surface portion 426B.

[0107] In attachment portion 420B in guide member 40B (specifically, one end portion 42B) to which direction-changing member 100B is attached, on the other hand, slit 426b opening on a side of the one direction is formed in abutting surface portion 426B within a peripheral wall portion that is second fitting portion 424.

[0108] Within slit 426b, caulking portion 124 protruding on the side of the rear surface of rigid portion-main body 132B is disposed.

[0109] The above configuration enables rigid portion-main body 132B to be disposed in a state of abutting on abutting surface portion 426B by disposition of caulking portion 124 within slit 426b when direction-changing member 100B is attached to attachment portion 420B, even in a configuration of rigid portion-main body 132B of direction-changing member 100B in which support portion 120B supporting direction-changing portion 110 is fixed to rigid portion-main body 132B via caulking portion 124 on a surface on a side opposite to a side on which support portion 120B is erected.

[0110] Thus, even when rigid portion 130B of direction-changing member 100B is a simple flat metal sheet, it is possible to achieve an object moving device including a direction-changing portion for which strength is ensured.

[0111] The embodiment of the present invention has been described thus far. Note that, the above description

is only illustration of a preferred embodiment of the present invention, and the scope of the present invention is not limited thereto. That is, the descriptions of the configuration of the above-mentioned device and the shape of each portion are only exemplary, and it is obvious that various changes and additions to these examples are possible within the scope of the present invention.

Industrial Applicability

[0112] Although the window regulator is exemplified as the object moving device according to the present invention, the object moving device can be also applied to a device such as a walking assisting device as long as the device has a structure in which a drive section moves a movement object via a cable whose moving direction is changed by a direction-changing member.

Reference Signs List

[0113]

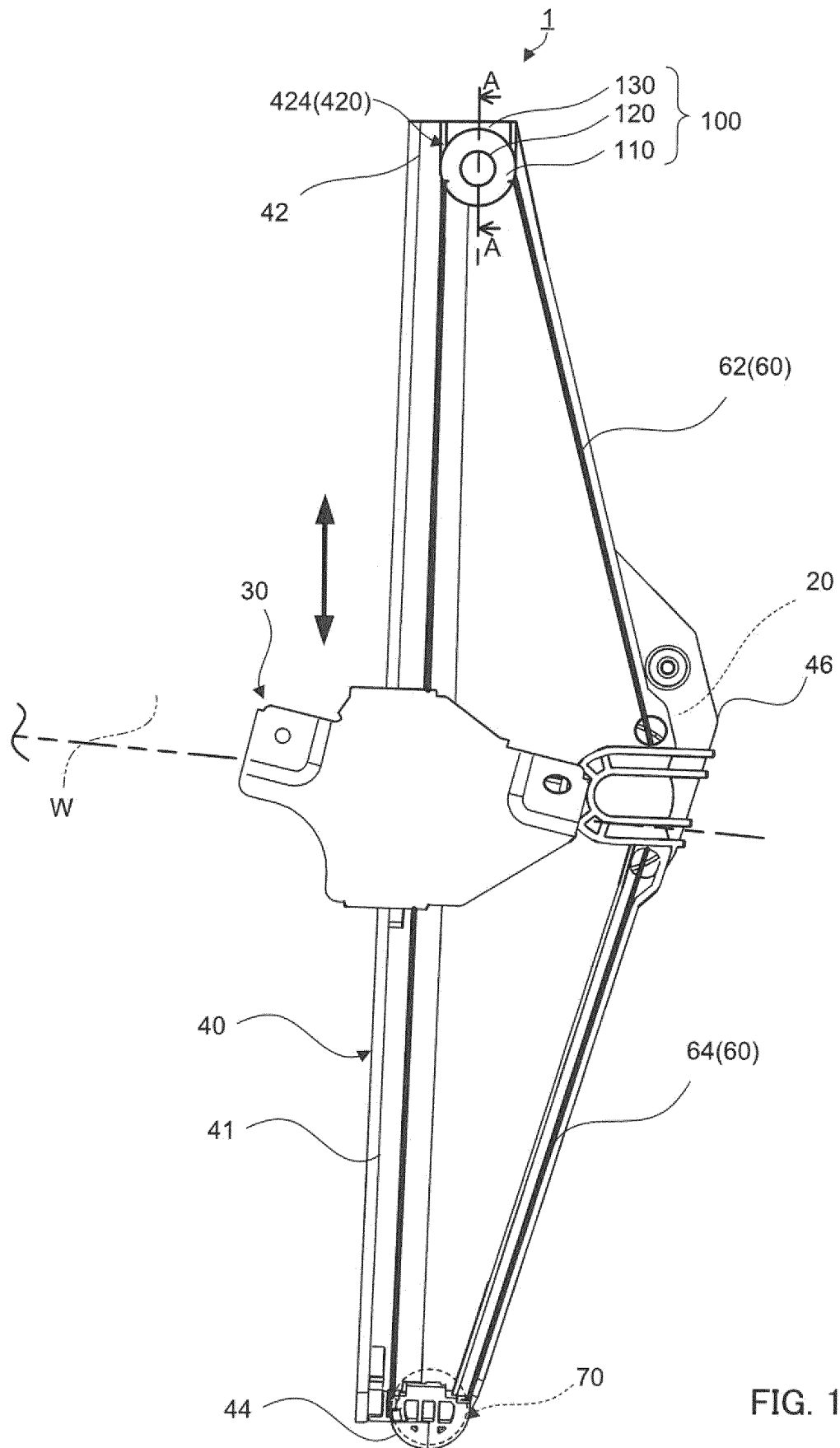
1 Object moving device	
20 Drive section	
22 Motor	
24 Drum	
30 Carrier plate	
40 Guide member	
41 Rail portion	
42, 42B One end portion	
44 Another end portion	
46 Drive section-fixing portion	
60 Cable	
62 Raising cable	
64 Lowering cable	
70 Second direction-changing member	
100 First direction-changing member (direction-changing member)	
110 Direction-changing portion	
120 Support portion	
130 Rigid portion	
132 Rigid portion-main body	
134 Movement regulation portion	
420, 420B Attachment portion	
422, 422A First fitting portion	
424 Second fitting portion	
426 Abutting surface portion (plane)	
1342 End surface portion	
1344 Auxiliary surface portion	
4222 Both side wall portions	

connected;
 a guide member that guides the carrier plate;
 a cable that is connected to the carrier plate and transmits a driving force of the drive section to the carrier plate; and
 a direction-changing member attached to the guide member, wherein
 the direction-changing member includes a direction-changing portion that changes a direction of the cable, a support portion supporting the direction-changing portion, and a rigid portion provided with the support portion,
 the guide member includes an attachment portion to which the direction-changing member is attached,
 the attachment portion includes a first fitting portion that regulates movement of the direction-changing member in a direction in which the guide member extends, and a second fitting portion that allows the movement of the direction-changing member in the direction in which the guide member extends and that regulates movement of the direction-changing member in a direction perpendicular to the direction in which the guide member extends, and
 the direction-changing member is fixed to the attachment portion by winding of the cable around the direction-changing member and application of tension in a state in which the direction-changing member is attached to the attachment portion.

2. The object moving device according to claim 1, wherein the guide member is made of a resin.
3. The object moving device according to claim 1 or 2, wherein the guide member is provided with a plane along the second fitting portion, and the plane supports the rigid portion in a state in which the direction-changing member is attached to the attachment portion.
4. The object moving device according to any one of claims 1 to 3, wherein the rigid portion is a metal sheet.

Claims

1. An object moving device, comprising:
 - a drive section;
 - a carrier plate to which a movement object is



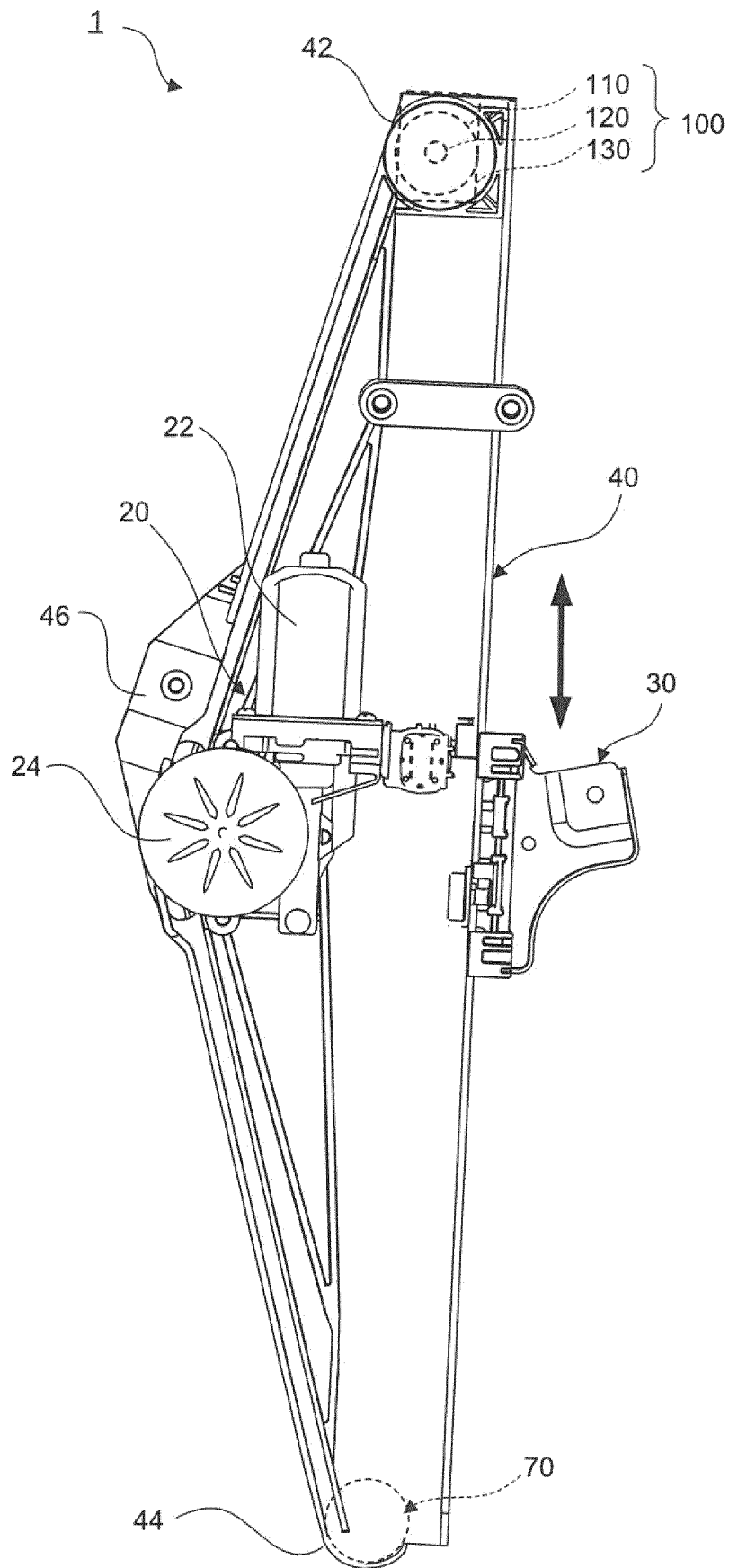


FIG. 2

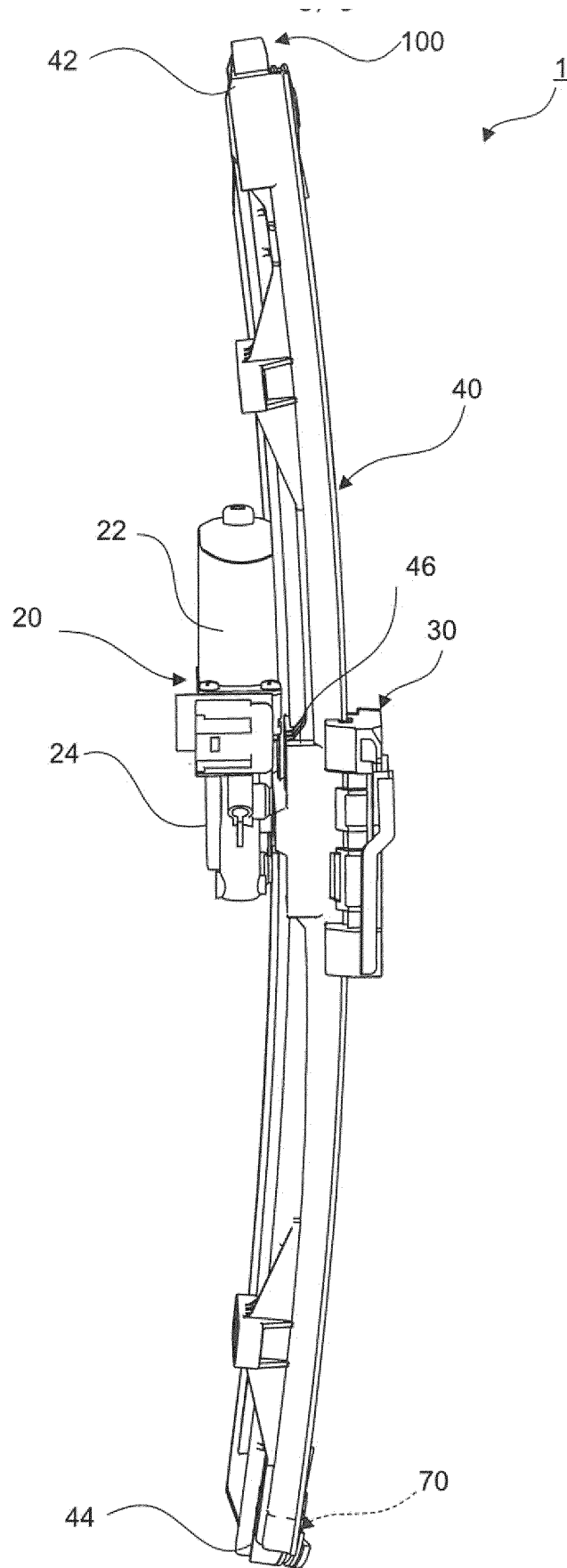


FIG. 3

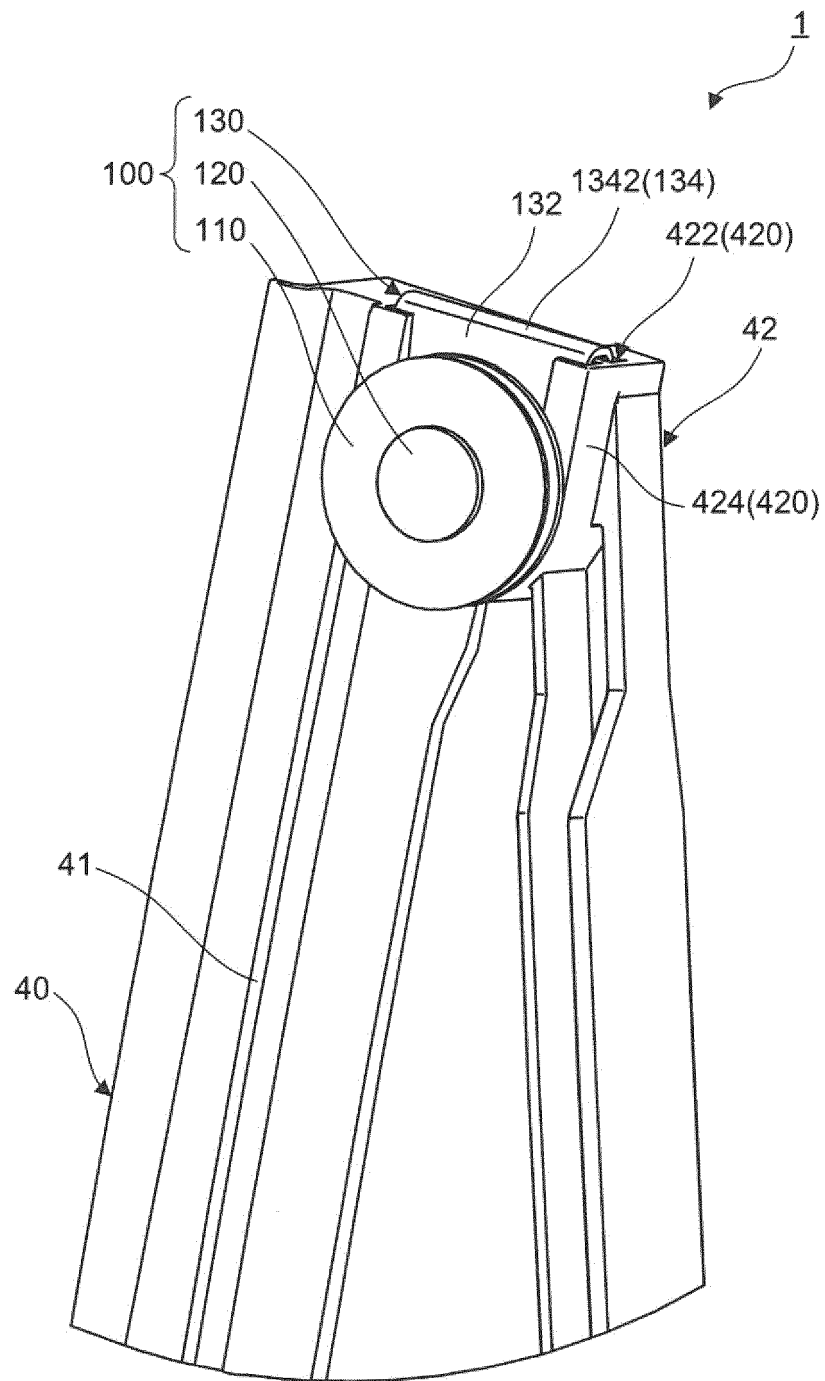


FIG. 4

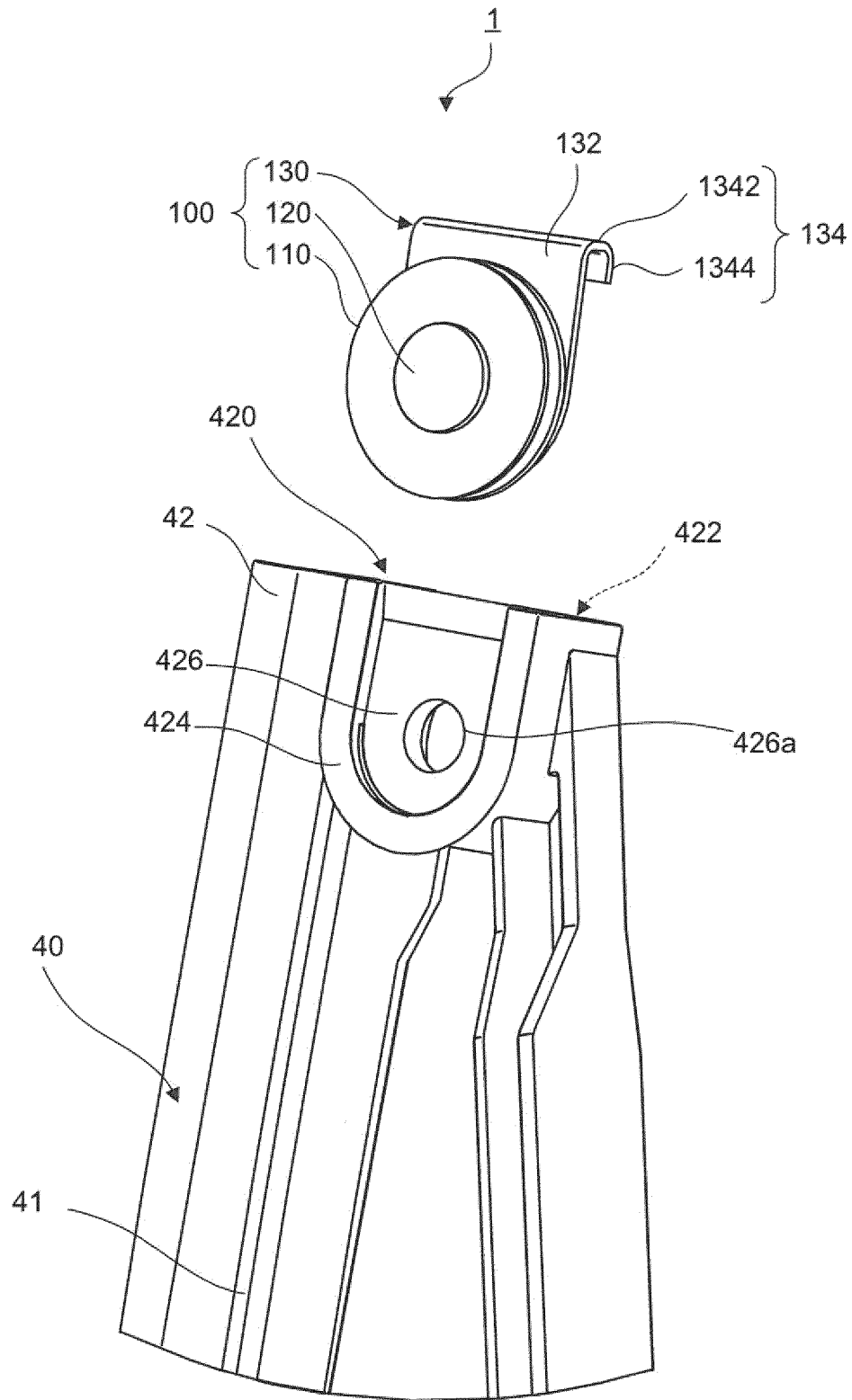


FIG. 5

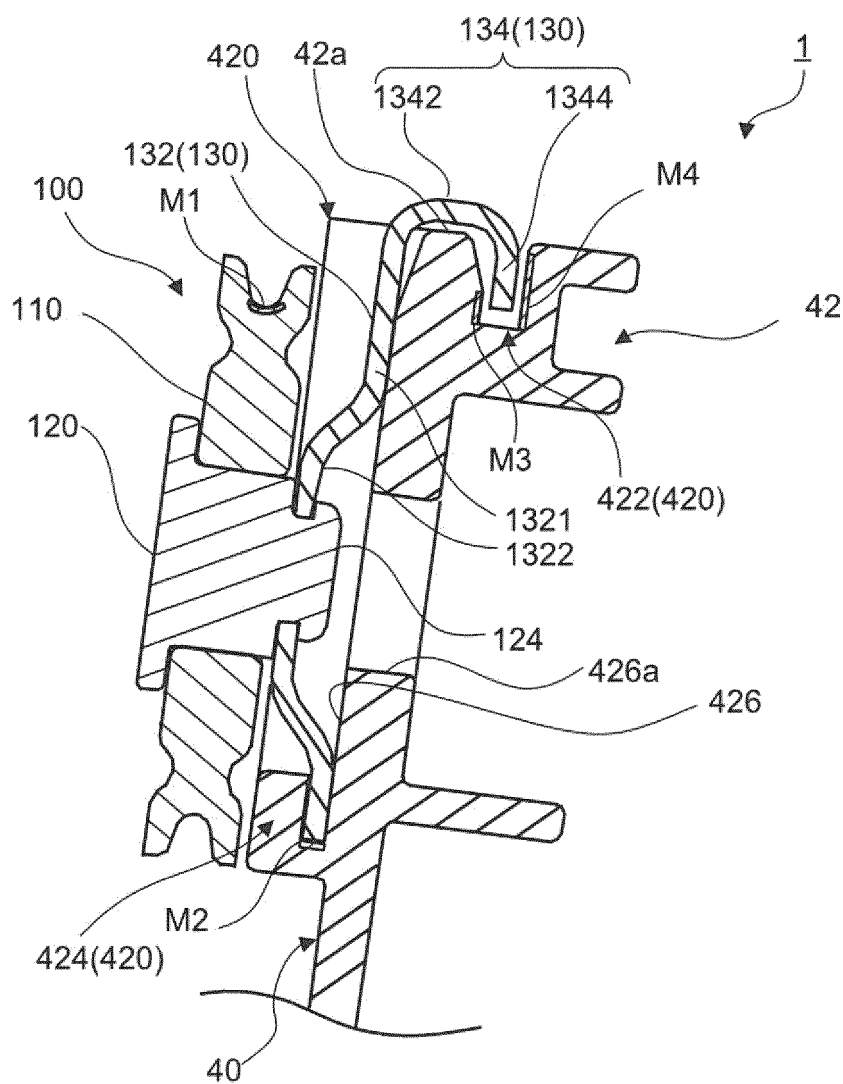


FIG. 6

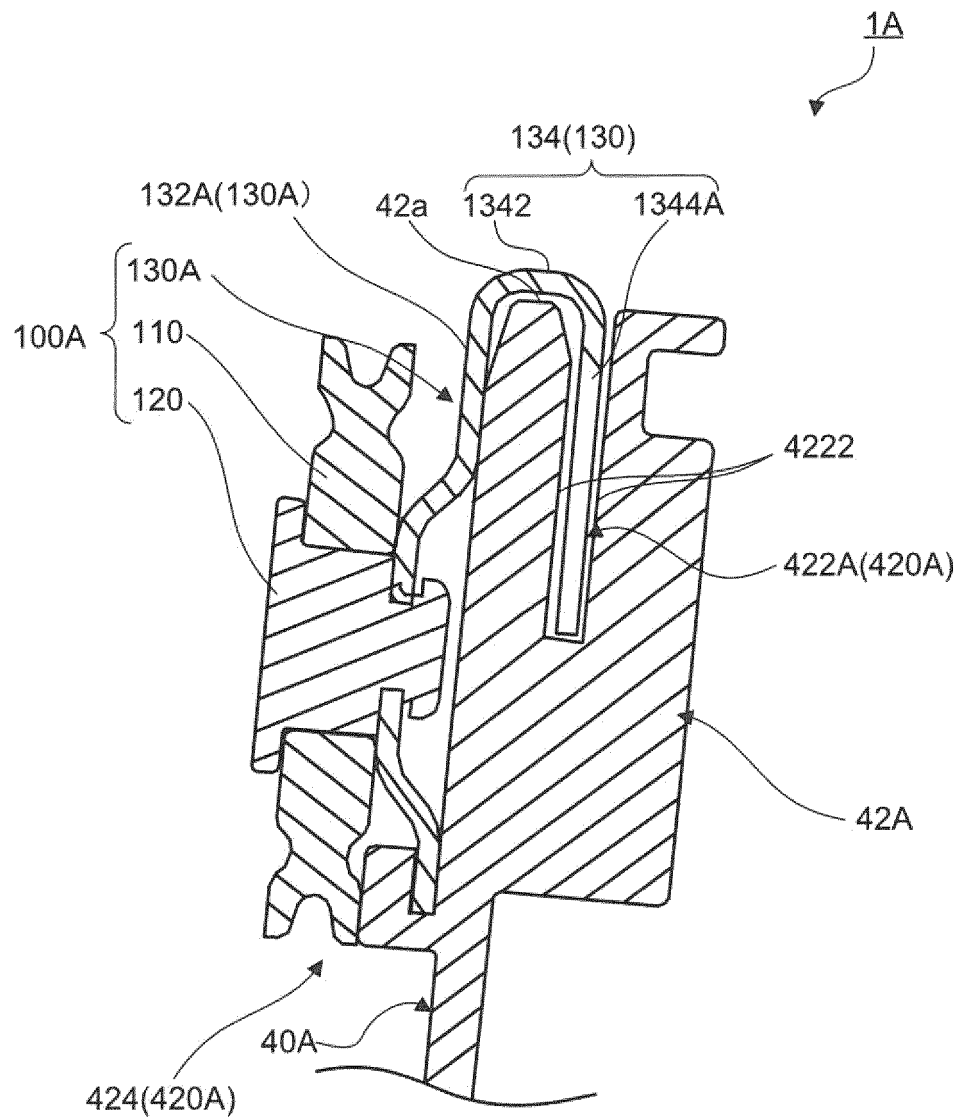


FIG. 7

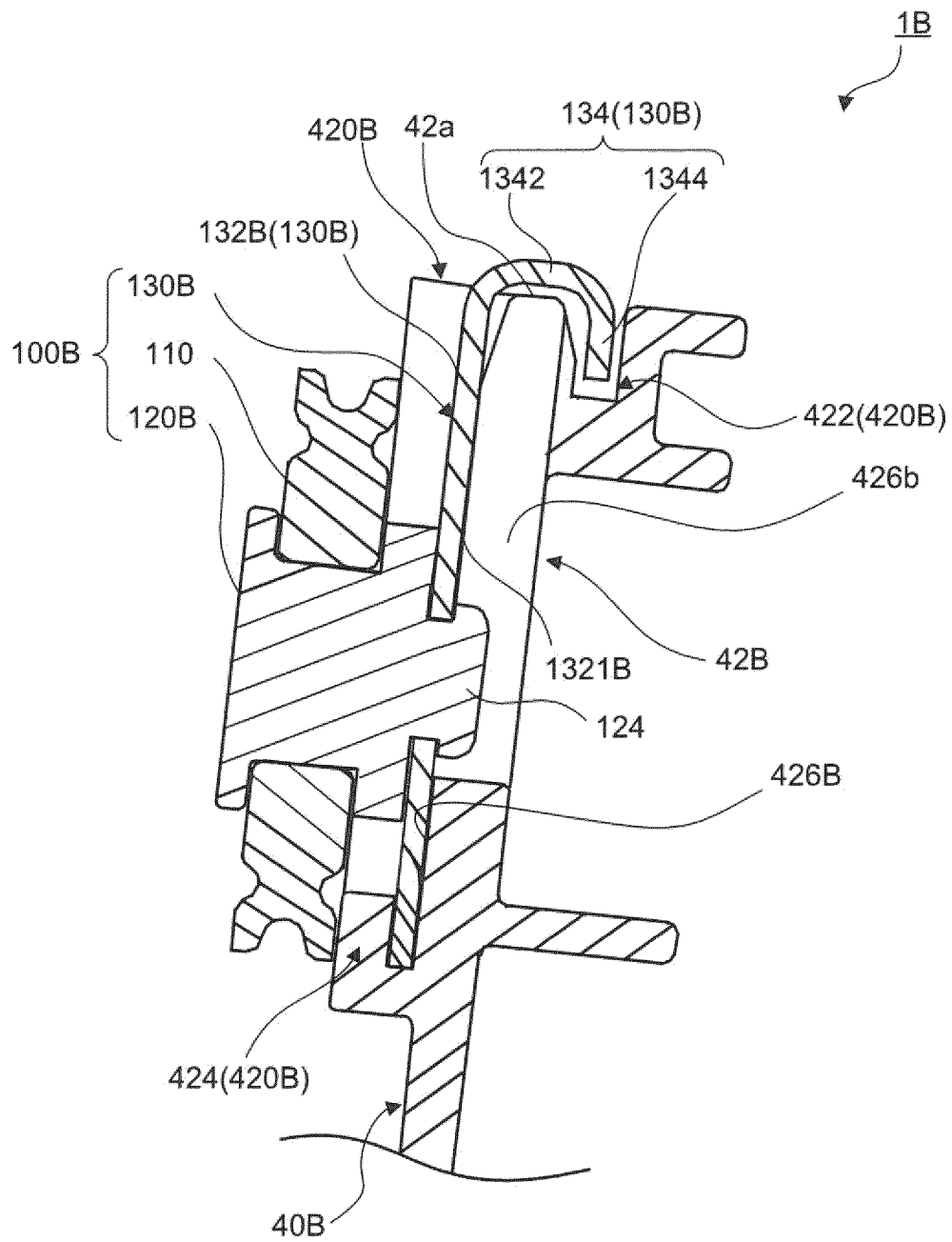


FIG. 8

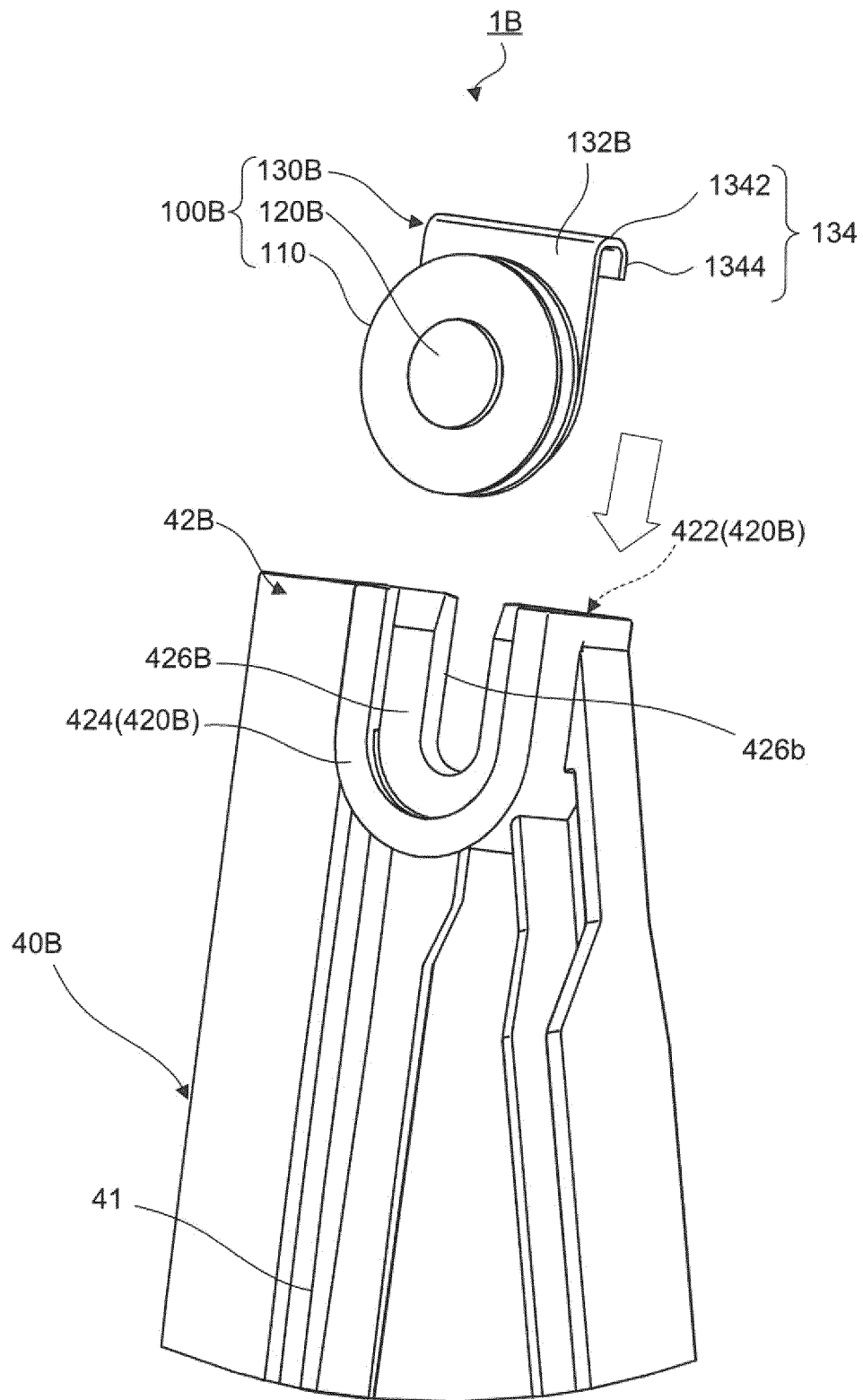


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2019/018224

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. E05F11/48 (2006.01) i, B60J1/17 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl. E05F11/38, E05F11/48, A61H3/04, B60J1/17

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996

Published unexamined utility model applications of Japan 1971-2019

Registered utility model specifications of Japan 1996-2019

Published registered utility model applications of Japan 1994-2019

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 9580953 B1 (HI-LEX CONTROLS, INC.) 28 February	1, 3
Y	2017, column 2, line 19 to column 4, line 2, fig.	2-3
A	1-7B (Family: none)	4
Y	JP 2014-43696 A (ASAHI KASEI CHEMICALS CORPORATION) 13 March 2014, claim 1 (Family: none)	2-3
A	JP 2004-150060 A (NIPPON CABLE SYSTEM INC.) 27 May 2004, entire text, all drawings (Family: none)	1-4



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
13.06.2019Date of mailing of the international search report
25.06.2019Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2019/018224

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 26320/1988 (Laid-open No. 131785/1989) (NIPPON CABLE SYSTEM INC.) 07 September 1989, entire text, all drawings (Family: none)	1-4
A	JP 2015-117487 A (SHIROKI CORPORATION) 25 June 2015, entire text, all drawings & US 2017/0030130 A1, entire text, all drawings & WO 2015/093285 A1	1-4
A	US 6227993 B1 (KUSTER & CO. GMBH) 08 May 2001, entire text, all drawings (Family: none)	1-4
A	JP 2018-29918 A (HI-LEX CORPORATION) 01 March 2018, entire text, all drawings (Family: none)	1-4

Form PCT/ISA/210 (continuation of second sheet) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2014043696 A [0004]