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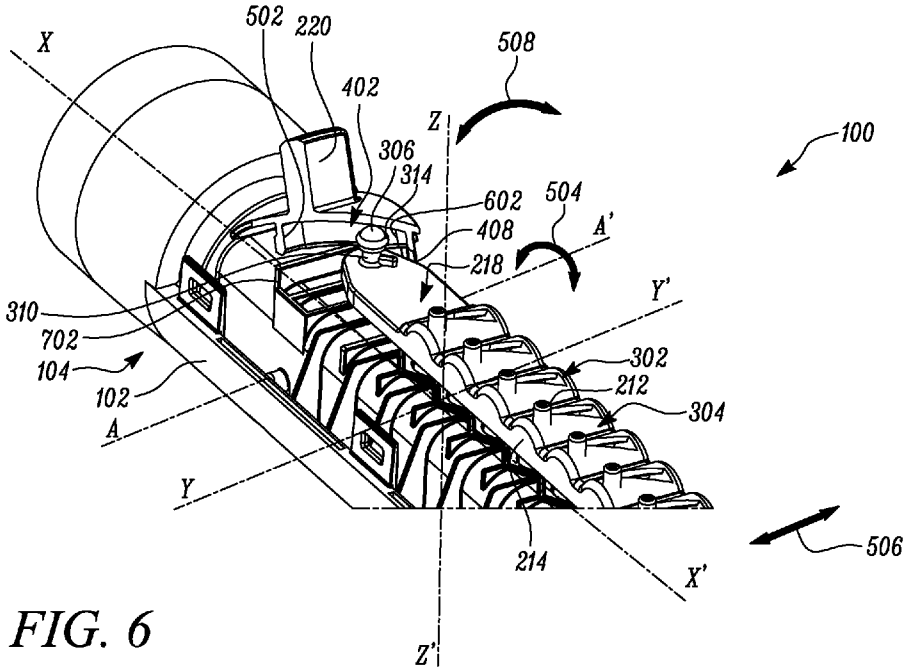

FIG. 6

(57) Abstract: A sprinkler device (100) includes a base member (102), a plurality of nozzles (212), a guide member (214), and at least one control member (220, 222). The sprinkler device (100) also includes at least one engagement member (306, 308) disposed on one of the guide member (214) and the at least one control member (220, 222). The sprinkler device (100) further includes a grooved portion (402, 404) provided on other of the guide member (214) and the at least one control member (220, 222). The at least one engagement member (306, 308) is adapted to engage with the grooved portion (402, 404) such that the at least one control member (220, 222) is adapted to selectively move the guide member (214) along a first lateral axis (Y-Y') to selectively tilt at least one of the plurality of nozzles (212) with respect to a second lateral axis (Z-Z'). The at least one control member (220, 222) is adapted to selectively pivot about an axis (A-A', B- B'), such that the axis (A-A', B-B') is substantially parallel with respect to the first lateral axis (Y-Y').

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SPRINKLER DEVICE

TECHNICAL FIELD

The present disclosure relates to a sprinkler device, and more particularly to an operational aspect of the sprinkler device.

BACKGROUND

Generally, a sprinkler device is used to spray multiple jets of a fluid in a predefined spraying pattern in spaces, such as lawns, gardens, and so on. In many situations, the sprinkler device may include an oscillating mechanism in order to oscillate the sprinkler device about a predefined axis. As such, a spraying range of the spraying pattern may be increased, in relation to a fixed type of a sprinkler device, in order to cover a larger area with the spraying pattern. However, an oscillation range of the sprinkler may be operationally limited, in turn, limiting the spraying range of the spraying pattern.

In many situations, the sprinkler device may include an array of flexible nozzles. Each of the nozzles may be tilted with respect to a predefined axis of the sprinkler device. In such a situation, a guide bar may be used to tilt each of the nozzles in order to increase a width and, thus, an overall spraying range of the spraying pattern in conjunction with the oscillatory movement of the sprinkler device. However, a mechanism to operate the guide bar and tilt each of the nozzle, as required, may be complicated, inefficient, difficult to operate, non-intuitive for a user, and may have a limited adjustment range. More often, it may be difficult to identify an actual spraying pattern with the mechanism and may be user dependent to identify and set a desired spraying pattern and the spraying range.

WO 2018/118485 A1 describes a sprinkler with a row of flexible nozzles that allows to alter the irrigation pattern. For this the nozzles are linked to two sliders each of which can be moved along the longitudinal axis of the sprinkler via the associated controllers. These two controllers are pivotably mounted to the sprinkler and cause the one of the sliders to move linearly when its associated

controller is pivoted. As the tilt of the nozzles are related to the tilt of the pivotable slider a user intuitively gets informed about the resultant spray pattern even when there is no water exiting the sprinkler.

A somewhat comparable sprinkler is described with EP 0 970 752 B1. Here instead of the use of two independent sliders only one single slider is being controlled on both end. As there is just a single slider the controls move the slider transverse the longitudinal axis of the sprinkler. This not to interfere between the two slider but to leave one slider in its selected position while the other slider is moved. Also the drawings show controls that are linearly moved along the longitudinal axis of the sprinkler the specification also describes alternatives to this. For example a pivot-linear-coupling that transforms a pivotable movement of a control to a linear movement of a slider. Hereby the on skilled in the art is informed of several types of suitable couplings.

SUMMARY

In view of the above, it is an objective of the present invention to find reliable working coupling. The objective is at least partially achieved by a sprinkler device, according to an embodiment of the present invention. The sprinkler device includes a base member defining a longitudinal axis, a first lateral axis, and a second lateral axis. Each of the longitudinal axis, the first lateral axis, and the second lateral axis is substantially perpendicular with respect to one another. The sprinkler device includes a plurality of nozzles disposed on the base member. Each of the plurality of nozzles is adapted to selectively tilt with respect to the second lateral axis. The sprinkler device includes a guide member disposed on or above the base member. The guide member is adapted to selectively move along the first lateral axis. The guide member includes a plurality of slots provided in the guide member. Each of the plurality of slots is disposed spaced apart with respect to one another. Each of the plurality of slots is adapted to receive each of the plurality of nozzles respectively. The sprinkler device includes at least one control member disposed movably in association with the guide member. The sprinkler device also includes at least one engagement member disposed on one of the guide member and the at least one control

member. The sprinkler device further includes a grooved portion provided on other of the guide member and the at least one control member. The at least one engagement member is adapted to engage with the grooved portion such that the at least one control member is adapted to selectively move the guide member along the first lateral axis to selectively tilt at least one of the plurality of nozzles with respect to the second lateral axis within the plurality of slots respectively. Also, the at least one control member is adapted to selectively pivot about an axis, such that the axis is substantially parallel with respect to the first lateral axis. As such, the fluid spray from the nozzle adjacent to the at least one control member moves parallel with respect to the at least one engagement member, in turn, providing an intuitive operation of the sprinkler device to the user. Also, the at least one control member provides a simple and effective method of controlling a position of the guide member via the at least one engagement member and, thus, controlling a spraying pattern of the sprinkler device.

According to an embodiment of the present invention, the plane comprising the at least one engagement member (**306**, **308**) is disposed substantially equal to the plane comprising second lateral axis. Thus the nozzles are bend by the guiding member substantially along the longitudinal axis of the base member. As such, a fluid spray from an outermost nozzle moves parallel with respect to the at least one engagement member, in turn, providing the intuitive operation of the sprinkler device to a user.

According to an embodiment of the present invention, the at least one engagement member is connected to one of the guide member and the at least one control member using a stem member. As such, the stem member provides a rugged and durable connection between the guide member and the at least one control member.

According to an embodiment of the present invention, the at least one engagement member includes a friction member disposed on the at least one engagement member. As such, the friction member provides a sturdy and non-slip connection between the at least one engagement member and at least one

control member, in turn, providing a solid operation of the sprinkler device to the user. In addition, the friction member also provides a positioning stability, so that the tilt angle of any of the control members are kept relatively stable against any tendency to unintentionally move out of their position.

According to an embodiment of the present invention, the friction member is disposed obliquely on the at least one engagement member. As such, the friction member provides maximum surface contact with respect to the at least one control member, in turn, improving usability.

According to an embodiment of the present invention, the guide member includes a first engagement member or grooved portion and a second engagement member or grooved portion. Each of the first engagement member or grooved portion and the second engagement member or grooved portion is disposed distally with respect to one another along the longitudinal axis on the guide member. As such, the guide member may be adjusted from distal ends of the sprinkler device, in turn, improving usability and an overall spraying range of the sprinkler device.

According to an embodiment of the present invention, the at least one control member includes a first control member and a second control member. Each of the first control member and the second control member is disposed in association with each of the first engagement member and the second engagement member respectively. As such, the guide member may be adjusted from distal ends of the sprinkler device, in turn, improving usability and the overall spraying range of the sprinkler device.

According to an embodiment of the present invention, the at least one engagement member or grooved portion is disposed on or in a first end of the guide member. A second end of the guide member is pivotally coupled to the base member. The second end being distal with respect to the first end. As such, the sprinkler device may be easily adjusted from the first end of the guide member, in turn, reducing complexity and improving usability.

According to an embodiment of the present invention, the grooved portion has a substantially elevated configuration. As such, the grooved portion may provide an optimized interaction with the associated engagement member.

According to an embodiment of the present invention, each of the plurality of slots is disposed angularly with respect to the first lateral axis. As such, each of the plurality of slots may provide an improved tilting range to each of the plurality of nozzles, in turn, improving the overall spraying range of the sprinkler device.

According to an embodiment of the present invention, the at least one control member is pivotally coupled to the base member. As such, the pivotal movement of the at least one control member provides an intuitive control of the sprinkler device to the user.

According to an embodiment of the present invention, the at least one engagement member is disposed along the pivoting axis associated with the at least one control member. In case the engagement member is fixed to the guide member and the grooved portion is on the control member it is of advantage that the groove with the grooved portion exhibits a radiant that is proximate similar to its distance to the engagement member when the control member is tilted. As such, a height of the grooved portion may be constant throughout a length of the grooved portion.

According to an embodiment of the present invention, the sprinkler device includes a fluid inlet. The fluid inlet is disposed on the base member. The fluid inlet is provided in fluid communication with each of the plurality of nozzles. As such, the fluid inlet provides a simple, plug and play type connection of the sprinkler device to an external fluid source.

According to an embodiment of the present invention, the sprinkler device includes a fluid drive. The fluid drive is coupled to the base member. The fluid drive is provided in fluid communication with the fluid inlet. The fluid drive is adapted to oscillate the base member about the longitudinal axis. The oscillatory

movement of the base member provides the improved spraying range of the sprinkler device.

According to an embodiment of the present invention, the sprinkler device includes a cover member. The cover member is disposed on the base member. The cover member is adapted to, at least partially, enclose the guide member and the at least one control member within the cover member. Accordingly, the cover member provides a simple, efficient, and aesthetic packaging of the components of the sprinkler device.

Other features and aspects of this invention will be apparent from the following description and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in more detail with reference to the enclosed drawings, wherein:

FIG. 1 shows a perspective view of a portion of a sprinkler device, in accordance with an embodiment of the present invention;

FIG. 2 shows a partial exploded perspective view of the sprinkler device of **FIG. 1**, in accordance with an embodiment of the present invention;

FIG. 3 shows a perspective view of a guide member of the sprinkler device of **FIG. 1**, in accordance with an embodiment of the present invention;

FIG. 4A shows an inverted perspective view of a first control member of the sprinkler device of **FIG. 1**, in accordance with an embodiment of the present invention;

FIG. 4B shows an inverted perspective view of a second control member of the sprinkler device of **FIG. 1**, in accordance with an embodiment of the present invention;

FIG. 5 shows a partial cutaway perspective view of the sprinkler device of **FIG. 1**, in accordance with an embodiment of the present invention;

FIG. 6 shows another partial cutaway perspective view of the sprinkler device of **FIG. 1**, in accordance with an embodiment of the present invention;

FIG. 7A shows a partial cutaway side view of a portion of the sprinkler device of **FIG. 1**, in accordance with an embodiment of the present invention;

FIG. 7B shows a partial cutaway top view of the portion of the sprinkler device of **FIG. 7A**, in accordance with an embodiment of the present invention;

FIG. 8A shows another partial cutaway side view of the portion of the sprinkler device of **FIG. 1**, in accordance with an embodiment of the present invention;

FIG. 8B shows a partial cutaway top view of the portion of the sprinkler device of **FIG. 8A**, in accordance with an embodiment of the present invention;

FIG. 9A shows another partial cutaway side view of the portion of the sprinkler device of **FIG. 1**, in accordance with an embodiment of the present invention; and

FIG. 9B shows a partial cutaway top view of the portion of the sprinkler device of **FIG. 9A**, in accordance with an embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

The present invention will be described more fully hereinafter with reference to the accompanying drawings, in which example embodiments of the invention incorporating one or more aspects of the present invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. For example, one or more aspects of the present invention can be utilized in other embodiments and even other types of structures and/or methods. In the drawings, like numbers refer to like elements.

Certain terminology is used herein for convenience only and is not to be taken as a limitation on the invention. For example, "upper", "lower", "front", "rear", "side", "longitudinal", "lateral", "transverse", "upwards", "downwards", "forward", "backward", "sideward", "left," "right," "horizontal," "vertical," "upward", "inner", "outer", "inward", "outward", "top", "bottom", "higher", "above", "below", "central", "middle", "intermediate", "between", "end", "adjacent", "parallel", "inclined", "proximate", "near", "distal", "remote", "radial", "circumferential", or the like, merely describe the configuration shown in the Figures. Indeed, the components may be oriented in any direction and the terminology, therefore, should be understood as encompassing such variations unless specified otherwise.

Referring to **FIG. 1**, a perspective view of a portion of a sprinkler device **100** is illustrated. The sprinkler device **100** will be hereinafter interchangeably referred to as the "sprinkler **100**". The sprinkler **100** is adapted to distribute fluid, such as water, in a controlled spraying configuration in space surrounding the sprinkler **100**. The sprinkler **100** may be used to spray the fluid in spaces, such as fields, lawns, parks, gardens, playgrounds, fountains, and the like. The sprinkler **100** may be employed for various activities, such as gardening, agriculture, decorative water display, and the like.

The sprinkler **100** has a substantially elongated configuration. The sprinkler **100** includes a base member **102**. The base member **102** has a substantially elongated configuration. The base member **102** includes a first side **104** and a second side **106**. The second side **106** is spaced apart and opposite to the first side **104**. The base member **102** defines a longitudinal axis **X-X'**, a first lateral axis **Y-Y'**, and a second lateral axis **Z-Z'**. The longitudinal axis **X-X'** extends between the first side **104** and the second side **106**. Each of the longitudinal axis **X-X'**, the first lateral axis **Y-Y'**, and the second lateral axis **Z-Z'** is substantially perpendicular with respect to one another.

The sprinkler **100** includes a cover member **108**. The cover member **108** has a substantially elongated configuration. The cover member **108** is mounted

on the base member **102**. The cover member **108** is adapted to enclose one or more components (discussed later) of the sprinkler **100** mounted on or above the base member **102**. The cover member **108** includes multiple openings, such as a first opening **110**, a second opening **112**, and a third opening **114**. In other embodiments, the cover member **108** may include single or multiple openings, based on application requirements. Each of the first opening **110**, the second opening **112**, and the third opening **114** is adapted to provide access to the one or more components (discussed later) of the sprinkler **100** mounted on the base member **102**.

Referring to **FIG. 2**, a partial exploded view of the sprinkler **100** is illustrated. The sprinkler **100** includes a fluid inlet **202**. The fluid inlet **202** is disposed on the base member **102**. In the illustrated embodiment, the fluid inlet **202** is disposed on the first side **104** of the base member **102**. In other embodiments, the fluid inlet **202** may be disposed on the second side **106** of the base member **102**. Also, in the illustrated embodiment, the fluid inlet **202** is disposed axially aligned with respect to the longitudinal axis **X-X'**. In other embodiments, the fluid inlet **202** may be disposed in any orientation, such as inclined with respect to the longitudinal axis **X-X'**, axially parallel with respect to any of the first lateral axis **Y-Y'** and the second lateral axis **Z-Z'**, and the like. The fluid inlet **202** is adapted to receive a flow of fluid, such as water, from an external fluid source (not shown).

The sprinkler **100** includes a fluid drive **204**. The fluid drive **204** is coupled to the base member **102**. In the illustrated embodiment, the fluid drive **204** is disposed on the first side **104** of the base member **102** and adjacent to the fluid inlet **202**. In other embodiments, the fluid drive **204** may be disposed on the second side **106** of the base member **102**. The fluid drive **204** is provided in fluid communication with the fluid inlet **202**. The fluid drive **204** is adapted to receive the flow of fluid from the fluid inlet **202** and oscillate the base member **102** about the longitudinal axis **X-X'** based on the flow of fluid. The fluid drive **204** may be any fluid drive employed in oscillating type sprinklers.

The sprinkler **100** includes one or more support members, such as a first support member **206** and a second support member **208**. The first support member **206** is coupled to the base member **102** on the first side **104**. The second support member **208** is coupled to the base member **102** on the second side **106**. As such, each of the first support member **206** and the second support member **208** is disposed distally with respect to one another along the longitudinal axis **X-X'**. Each of the first support member **206** and the second support member **208** is adapted to support the sprinkler **100** on a ground surface. In other embodiments, the sprinkler **100** may include single or multiple support members, based on application requirements.

The sprinkler **100** includes a control valve **210**. The control valve **210** is provided in fluid communication with each of the fluid inlet **202** and the fluid drive **204**. In the illustrated embodiment, the control valve **210** is disposed on the first support member **206**. In other embodiments, the control valve **210** may be disposed on any other location on the sprinkler **100**, such as on the base member **102**. The control valve **210** is adapted to control the flow of fluid received through the fluid inlet **202**. The control valve **210** may be any fluid control valve, such as a gate valve, a ball valve, and the like.

The sprinkler **100** includes a number of nozzles **212**. Each of the nozzles **212** is disposed on the base member **102** along the longitudinal axis **X-X'**. Each of the nozzles **212** is disposed spaced apart and adjacent with respect to one another. Each of the nozzles **212** is disposed extending substantially parallel with respect to the second lateral axis **Z-Z'**. Each of the nozzles **212** is adapted to selectively tilt with respect to the second lateral axis **Z-Z'**. Each of the nozzles **212** is provided in fluid communication with the fluid inlet **202** via the fluid drive **204**. Accordingly, each of the nozzles **212** is adapted to distribute the flow of fluid in the space surrounding the sprinkler **100**. More specifically, each of the nozzles **212** is adapted to distribute the flow of fluid via the third opening **114** provided on the cover member **108**.

Referring to **FIGS. 2** and **3**, the sprinkler **100** includes a guide member **214**. The guide member **214** has a substantially elongated configuration. The

guide member **214** includes a first end **216** and a second end **218**. The second end **218** is spaced apart and opposite to the first end **216**. The guide member **214** is movably disposed on the base member **102** along the longitudinal axis **X-X'**. More specifically, the first end **216** is disposed adjacent to the first side **104** of the base member **102**, and the second end **218** is disposed adjacent to the second side **106** of the base member **102**. In an assembled position of the sprinkler **100**, the guide member **214** is partially enclosed by the cover member **108**. The guide member **214** is adapted to selectively move along the first lateral axis **Y-Y'** and will be explained in more detail later.

The guide member **214** includes a number of slots **302**. Each of the slots **302** is disposed between the first end **216** and the second end **218**. Each of the slots **302** is disposed spaced apart and adjacent with respect to one another. More specifically, in the illustrated embodiment, each of the slots **302** is disposed on a substantially raised and curved portions **304** of the guide member **214**. Also, each of the slots **302** is disposed at an angle "**A**" with respect to the first lateral axis **Y-Y'**. In the illustrated embodiment, the angle "**A**" measures approximately 45 degrees (°). In other embodiments, an actual value of the angle "**A**" may vary based on application requirements. Each of the slots **302** is adapted to movably receive each of the nozzles **212** respectively.

It is understood, that it is also possible that the guide member **214** can be of different shape (for example having a flat surface) and/or the slots **302** might be disposed of the guide member **214** differently to the depicted example.

The guide member **214** also includes one or more engagement members, such as a first engagement member **306** and a second engagement member **308**. The first engagement member **306** is disposed on the first end **216** of the guide member **214**. The second engagement member **308** is disposed on the second end **218** of the guide member **214**. As such, each of the first engagement member **306** and the second engagement member **308** is disposed distally with respect to one another along the longitudinal axis **X-X'**. In the illustrated embodiment, each of the first engagement member **306** and the second engagement member

308 has a substantially spherical configuration. In other embodiments, one or more of the first engagement member **306** and the second engagement member **308** may have any other configuration, such as elliptical.

Each of the first engagement member **306** and the second engagement member **308** is fixedly coupled to the guide member **214** using a first stem member **310** and a second stem member **312** respectively. Each of the first stem member **310** and the second stem member **312** extends away and substantially perpendicular with respect to the longitudinal axis **X-X'**. Accordingly, each of the first engagement member **306** and the second engagement member **308** is disposed substantially parallel with respect to the second lateral axis **Z-Z'**. It should be noted that each of the first stem member **310** and the second stem member **312** described herein is merely exemplary and optional and may vary based on application requirements. For example, in other embodiments, one or more of the first engagement member **306** and the second engagement member **308** may be directly disposed on the guide member **214**. In such a situation, one or more of the first stem member **310** and the second stem member **312** may be omitted.

Each of the first engagement member **306** and the second engagement member **308** includes a first friction member **314** and a second friction member **316**. In the illustrated embodiment, each of the first friction member **314** and the second friction member **316** is disposed obliquely on each of the first engagement member **306** and the second engagement member **308** respectively. More specifically, each of the first friction member **314** and the second friction member **316** is inclined at an angle "**B**" with respect to the longitudinal axis **X-X'**. In the illustrated embodiment, the angle "**B**" measures approximately 45°. In other embodiments, an actual value of the angle "**B**" may vary based on application requirements. In other embodiments, one or more of the first friction member **314** and the second friction member **316** may be disposed parallel with respect to the longitudinal axis **X-X'**, such that the angle "**B**" may measure 0°.

Each of the first friction member **314** and the second friction member **316** may be any friction inducing material, such as a rubber strip, an O-ring, a sealing material, and the like. It should be noted that each of the first friction member **314** and the second friction member **316** described herein is merely exemplary and optional and may vary based on application requirements. For example, in some embodiments, the friction member may be provided on any one of the first engagement member **306** and the second engagement member **308**. In yet some embodiment, each of the first friction member **314** and the second friction member **316** may be omitted.

Referring to **FIGS. 2**, **4A** and **4B**, the guide member **214** includes a number of control members, such as a first control member **220** and a second control member **222**, disposed movably in association with the guide member **214**. The first control member **220** has a configuration similar to the second control member **222**. In the assembled position of the sprinkler **100**, each of the first control member **220** and the second control member **222** is partially enclosed by the cover member **108**. More specifically, the first control member **220** partially extends from the first opening **110** of the cover member **108**, and the second control member **222** extends from the second opening **112** of the cover member **108**.

The first control member **220** is disposed adjacent to the first end **216** of the guide member **214**. Also, the first control member **220** is pivotally coupled to the first side **104** of the base member **102** via a pair of first arms **406, 408** (also shown in **FIG. 2**). The second control member **222** is disposed adjacent to the second end **218** of the guide member **214**. Also, the second control member **220** is pivotally coupled to the second side **106** of the base member **102** via a pair of second arms **410, 412** (also shown in **FIG. 2**). Accordingly, each of the first control member **220** and the second control member **222** is adapted to selectively pivot about an axis **A-A'** and an axis **B-B'** respectively. Each of the axis **A-A'** and axis **B-B'** is substantially parallel with respect to the first lateral axis **Y-Y'**.

Each of the first control member **220** and the second control member **222** includes a first grooved portion **402** and a second grooved portion **404**. Each of the first grooved portion **402** and the second grooved portion **404** has a substantially curved configuration. Each of the first grooved portion **402** and the second grooved portion **404** is disposed at an angle "**C**" with respect to each of the axis **A-A'** and the axis **B-B'** respectively. In the illustrated embodiment, the angle "**C**" measures approximately 45°. In other embodiments, an actual value of the angle "**C**" may vary based on application requirements.

Each of the first control member **220** and the second control member **222** is disposed in association with each of the first engagement member **306** and the second engagement member **308** respectively. More specifically, the first grooved portion **402** of the first control member **220** is disposed in operational engagement with respect to the first engagement member **306** of the guide member **214**. Also, the second grooved portion **404** of the second control member **222** is disposed in operational engagement with respect to the second engagement member **308** of the guide member **214**.

Referring to **FIGS. 5** and **6**, different partial perspective views of the sprinkler **100** in a partially assembled position are illustrated. For the purpose of clarity and explanation, the cover member **108** is omitted in the accompanying figures. An operation of the sprinkler **100** will now be explained with reference to the first engagement member **306** and the first control member **220**. It should be noted that the sprinkler **100** may also be operated using the second engagement member **308** and the second control member **222** in a manner similar to that described below.

Referring to **FIG. 5**, a first position of the first control member **220** is illustrated. In the first position, the first engagement member **306** is positioned adjacent to a first edge **502** of the first grooved portion **402**. During operation, the first control member **220** is adapted to selectively pivot about the axis **A-A'**, as shown by an arrow **504**. Also, based on the movement of the first control member **220** about the axis **A-A'**, the guide member **214** is adapted to move

along the first lateral axis **Y-Y'**, as shown by an arrow **506**. Accordingly, based on the movement of the guide member **214** along the first lateral axis **Y-Y'**, each of the nozzles **212** is adapted to selectively tilt with respect to the second lateral axis **Z-Z'** within each of the slots **302** respectively, as shown by an arrow **508**.

Referring to **FIG. 6**, a second position of the first control member **220** is illustrated. In the second position, the first engagement member **306** is positioned adjacent to a second edge **602** of the first grooved portion **402**. As the first control member **220** is selectively pivoted about the axis **A-A'** from the first position to the second position, as shown by the arrow **504**, the guide member **214** moves along the first lateral axis **Y-Y'**, as shown by the arrow **506**. Accordingly, each of the nozzles **212** selectively tilt with respect to the second lateral axis **Z-Z'** within each of the slots **302** respectively, as shown by the arrow **508**.

Referring to **FIGS. 7A** and **7B**, different cutaway views of the first control member **220** and the first engagement member **306** in the assembled position are illustrated. In the accompanying figures, the first control member **220** is disposed substantially parallel with respect to the second lateral axis **Z-Z'**, such that the first engagement member **306** is disposed adjacent to the first edge **502** of the first grooved portion **402**. Also, the first engagement member **306** is disposed along the axis **A-A'**. In such a situation, a height "**H**" of the first grooved portion **402** may be substantially constant along a length "**L**" of the first grooved portion **402** for all tilting angles of the first control member **220**. Additionally, the base member **102** includes a stop member **702, 703** (also shown in **FIGS. 2, 5, 6**). The stop member **702** is disposed adjacent to and abutting the first end **216** of the guide member **214**. The stop member **703** is disposed adjacent to and abutting the second end **218** of the guide member **214**. The stop member **702, 703** limits movement of the guide member **214** along the longitudinal axis **X-X'** as shown by an arrow **704** and allows movement along the longitudinal axis **X-X'** as shown by an arrow **706**.

Referring to **FIGS. 8A** and **8B**, different cutaway views of another position of each of the first control member **220** and the first engagement member **306** are illustrated. As the first control member **220** is moved in a direction as shown by an arrow **708**, the first control member **220** pivots about the axis **A-A'** via the pair of first arms **406, 408**. In the accompanying figures, the first control member **220** is pivoted about the axis **A-A'**, such that an angle "**D**" measures approximately 10°. Accordingly, the first engagement member **306** moves along the first lateral axis **Y-Y'** as shown by an arrow **710**, such that the first engagement member **306** is disposed approximately at a center of the first grooved portion **402** between the first edge **502** and the second edge **602**.

Referring to **FIGS. 9A** and **9B**, different cutaway views of another position of each of the first control member **220** and the first engagement member **306** are illustrated. As the first control member **220** is moved further in the direction as shown by the arrow **708**, the first control member **220** further pivots about the axis **A-A'** via the pair of first arms **406, 408**. In the accompanying figures, the first control member **220** is pivoted about the axis **A-A'**, such that the angle "**D**" measures approximately 20°. Accordingly, the first engagement member **306** moves along the first lateral axis **Y-Y'** as shown by the arrow **710**, such that the first engagement member **306** is disposed adjacent to the second edge **602** of the first grooved portion **402**.

During operation, each of the first control member **220** and the second control member **222** may be independently adjusted with respect to one another. Accordingly, each of the nozzles **212** may be selectively tilted with respect to the second lateral axis **Z-Z'** in a manner such that each of the nozzles **212** may have a unique tilting configuration different from that of one another. As such, each of the first control member **220** and the second control member **222** may be adjusted at varying positions, between and including the respective first positions and the respective second positions, to form a variety of spraying patterns by angularly orienting the guide member **214** in a plane (not shown) along the longitudinal axis **X-X'**.

It should be noted that a configuration of the sprinkler **100** described herein is merely exemplary and may vary based on application requirements. For example, in some embodiments, the guide member **214** may include a single engagement member, such as the first engagement member **306**. In such a situation, each of the second engagement member **308** and the second control member **222** may be omitted. Accordingly, the second end **218** of the guide member **214** may be pivotally coupled to the second side **106** of the base member **102** using a suitable pivotal connection (not shown). In other embodiments, the guide member **214** may include only the second engagement member **308**. In such a situation, the first engagement member **306** and the first control member **220** may be omitted. Accordingly, the first end **216** of the guide member **214** may be pivotally coupled to the first side **104** of the base member **102** using a suitable pivotal connection (not shown).

Also, in the accompanying figures, although the engagement members and the grooved portions are shown on the guide member **214** and the control members respectively, in some embodiments, location of the engagement members and the grooved portions may be interchanged. For example, in some embodiments, the first engagement member **306** may be provided on the first control member **220**. In such a situation, the first grooved portion **402** may be provided on the first end **216** of the guide member **214**. Additionally, or alternatively, the second engagement member **308** may be provided on the second control member **222**. In such a situation, the second grooved portion **404** may be provided on the second end **218** of the guide member **214**. Irrespective of the location of the engagement members and the grooved portions being interchanged, an overall functioning and operation of the sprinkler **100** may be similar to that described with reference to the accompanying figures, arrangements, and/or configuration of various components of the sprinkler **100**.

In the drawings and specification, there have been disclosed preferred embodiments and examples of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for the

purpose of limitation of the scope of the invention being set forth in the following claims.

LIST OF ELEMENTS

100 Sprinkler Device / Sprinkler

102 Base Member

104 First Side

106 Second Side

108 Cover Member

110 First Opening

112 Second Opening

114 Third Opening

202 Fluid Inlet

204 Fluid Drive

206 First Support Member

208 Second Support Member

210 Control Valve

212 Nozzle

214 Guide Member

216 First End

218 Second End

220 First Control Member

222 Second Control Member

302 Slot

304 Portion

306 First Engagement Member

308 Second Engagement Member

310 First Stem Member

312 Second Stem Member

314 First Friction Member

316 Second Friction Member

402 First Grooved Portion

404 Second Grooved Portion

406 First Arm

408 First Arm

410 Second Arm

412 Second Arm

502 First Edge

504 Arrow

506 Arrow

508 Arrow

602 Second Edge

702 Stop Member

703 Stop Member

704 Arrow

706 Arrow

708 Arrow

710 Arrow

A Angle

B Angle

C Angle

D Angle

H Height

L Length

A-A' Axis

B-B' Axis

X-X' Longitudinal Axis

Y-Y' First Lateral Axis

Z-Z' Second Lateral Axis

CLAIMS

1. A sprinkler device (**100**) comprising:

a base member (**102**) defining a longitudinal axis (**X-X'**), a first lateral axis (**Y-Y'**), and a second lateral axis (**Z-Z'**), each of the longitudinal axis (**X-X'**), the first lateral axis (**Y-Y'**), and the second lateral axis (**Z-Z'**) being substantially perpendicular with respect to one another;

a plurality of nozzles (**212**) disposed on the base member (**102**), each of the plurality of nozzles (**212**) adapted to selectively tilt with respect to the second lateral axis (**Z-Z'**);

a guide member (**214**) disposed on or above the base member (**102**), the guide member (**214**) adapted to selectively move along the first lateral axis (**Y-Y'**), the guide member (**214**) including a plurality of slots (**302**) provided in the guide member (**214**), each of the plurality of slots (**302**) disposed spaced apart with respect to one another, each of the plurality of slots (**302**) adapted to receive each of the plurality of nozzles (**212**) respectively; and

at least one control member (**220**, **222**) disposed movably in association with the guide member (**214**);

characterized in that:

at least one engagement member (**306**, **308**) disposed on one of the guide member (**214**) and the at least one control member (**220**, **222**); and

a grooved portion (**402**, **404**) provided on other of the guide member (**214**) and the at least one control member (**220**, **222**),

wherein the at least one engagement member (**306**, **308**) is adapted to engage with the grooved portion (**402**, **404**) such that the at least one control member (**220**, **222**) is adapted to selectively move the guide member (**214**) along the first lateral axis (**Y-Y'**) to selectively tilt at least

one of the plurality of nozzles (**212**) with respect to the second lateral axis (**Z-Z'**) within the plurality of slots (**302**) respectively, and

wherein the at least one control member (**220**, **222**) is adapted to selectively pivot about an axis (**A-A'**, **B-B'**), the axis (**A-A'**, **B-B'**) being substantially parallel with respect to the first lateral axis (**Y-Y'**).

2. The sprinkler device (**100**) of claim 1, wherein the plane comprising the at least one engagement member (**306**, **308**) is disposed substantially equal to the plane comprising second lateral axis (**Z-Z'**).

3. The sprinkler device (**100**) of claims 1-2, wherein the at least one engagement member (**306**, **308**) is connected to one of the guide member (**214**) and the at least one control member (**220**, **222**) using a stem member (**310**, **312**).

4. The sprinkler device (**100**) of claims 1-3, wherein the at least one engagement member (**306**, **308**) includes a friction member (**314**, **316**) disposed on the at least one engagement member (**306**, **308**).

5. The sprinkler device (**100**) of claim 4, wherein the friction member (**314**, **316**) is disposed obliquely on the at least one engagement member (**306**, **308**).

6. The sprinkler device (**100**) of claims 1-5, wherein the guide member (**214**) includes a first engagement member (**306**) or grooved portion and a second engagement member (**308**) or grooved portion, each of the first engagement member (**306**) or grooved portion and the second engagement member (**308**) or grooved portion disposed distally with respect to one another along the longitudinal axis of the guide member (**214**).

7. The sprinkler device (**100**) of claim 6, wherein the at least one control member (**220**, **222**) includes a first control member (**220**) and a second control member (**222**), each of the first control member (**220**) and the second control member (**222**) disposed in association with each of the first engagement member (**306**) and the second engagement member (**308**) respectively.

8. The sprinkler device (**100**) of claims 1-5, wherein the at least one engagement member (**306**, **308**) or grooved portion is disposed on a first end (**216**) of the guide member (**214**), and wherein a second end (**218**) of the guide member (**214**) is pivotally coupled to the base member (**102**), the second end (**218**) being distal with respect to the first end (**216**).

9. The sprinkler device (**100**) of claims 1-8, wherein the grooved portion (**402**, **404**) has a substantially curved configuration.

10. The sprinkler device (**100**) of claims 1-9, wherein each of the plurality of slots (**302**) is disposed angularly with respect to the first lateral axis (**Y-Y'**).

11. The sprinkler device (**100**) of claims 1-10, wherein the at least one control member (**220**, **222**) is pivotally coupled to the base member (**102**).

12. The sprinkler device (**100**) of claim 1-11, wherein the at least one engagement member (**306**, **308**) is disposed along the axis (**A-A'**, **B-B'**) associated with the at least one control member (**220**, **222**).

13. The sprinkler device (**100**) of claims 1-12 further includes a fluid inlet (**202**) disposed on the base member (**102**), the fluid inlet (**202**) provided in fluid communication with each of the plurality of nozzles (**212**).

14. The sprinkler device (**100**) of claims 1-13 further includes a fluid drive (**204**) coupled to the base member (**102**), the fluid drive (**204**) provided in fluid communication with the fluid inlet (**202**), the fluid drive (**204**) adapted to oscillate the base member (**102**) about the longitudinal axis (**X-X'**).

15. The sprinkler device (**100**) of claims 1-14 further includes a cover member (**108**) disposed on the base member (**102**), the cover member (**108**) adapted to, at least partially, enclose the guide member (**214**) and the at least one control member (**220**, **222**) within the cover member (**108**).

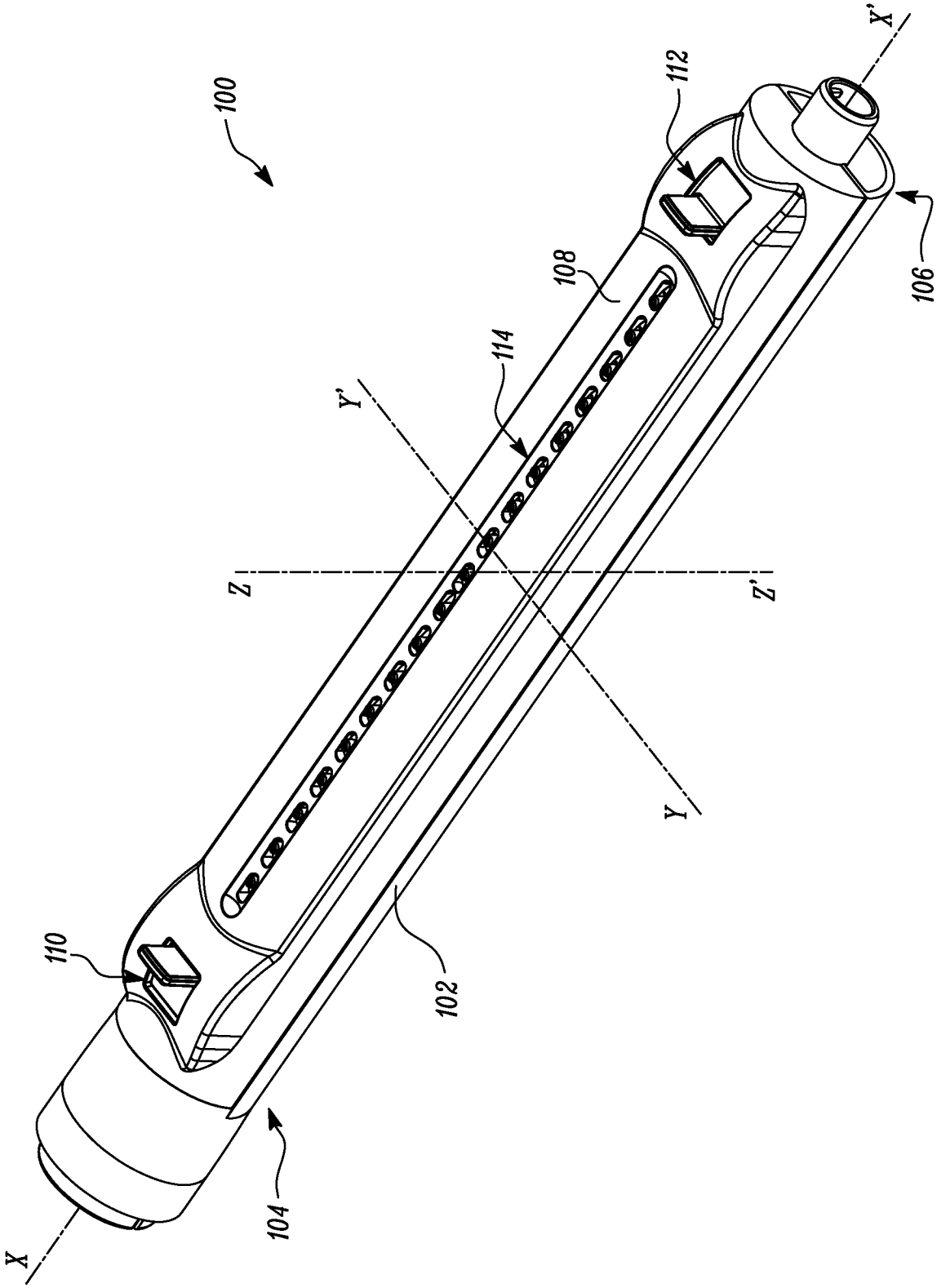
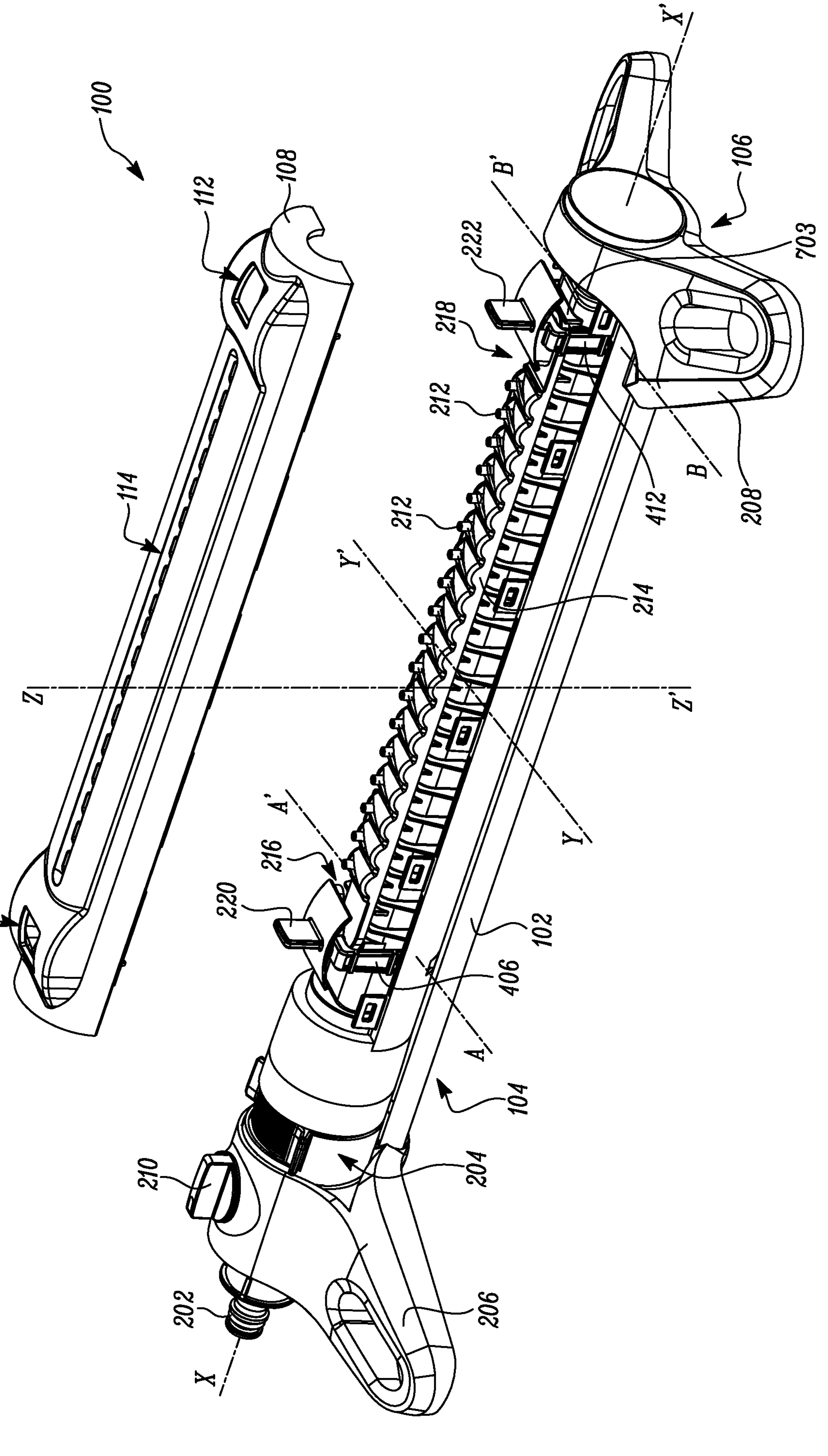


FIG. 1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220
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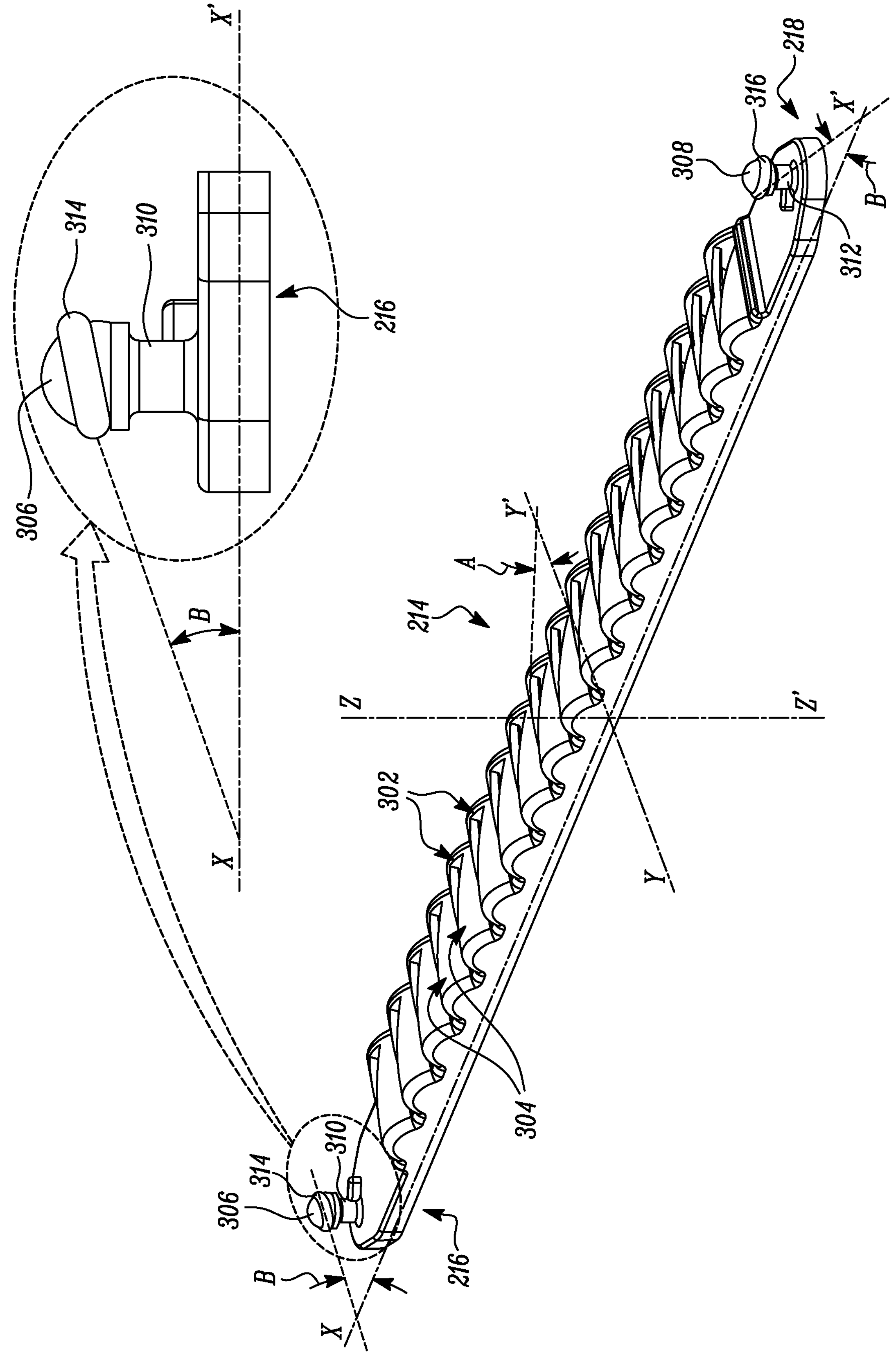
202
206
X

FIG. 2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X'
B
312

FIG. 3

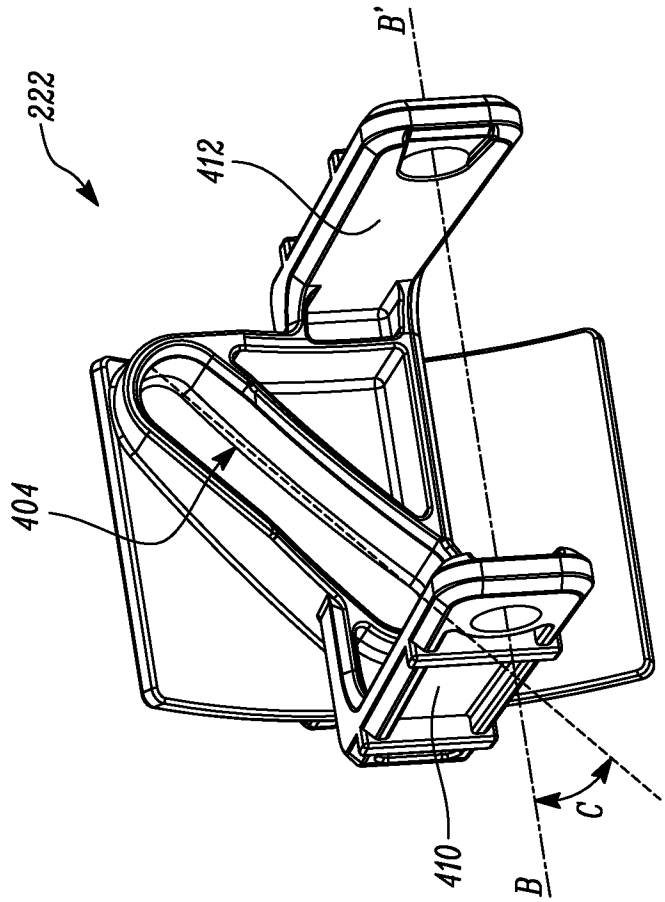


FIG. 4B

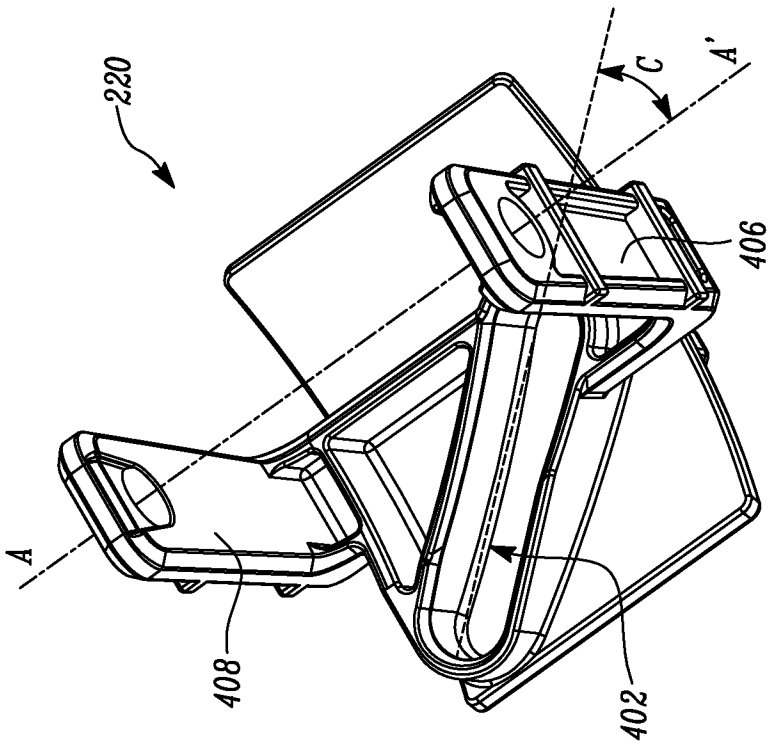
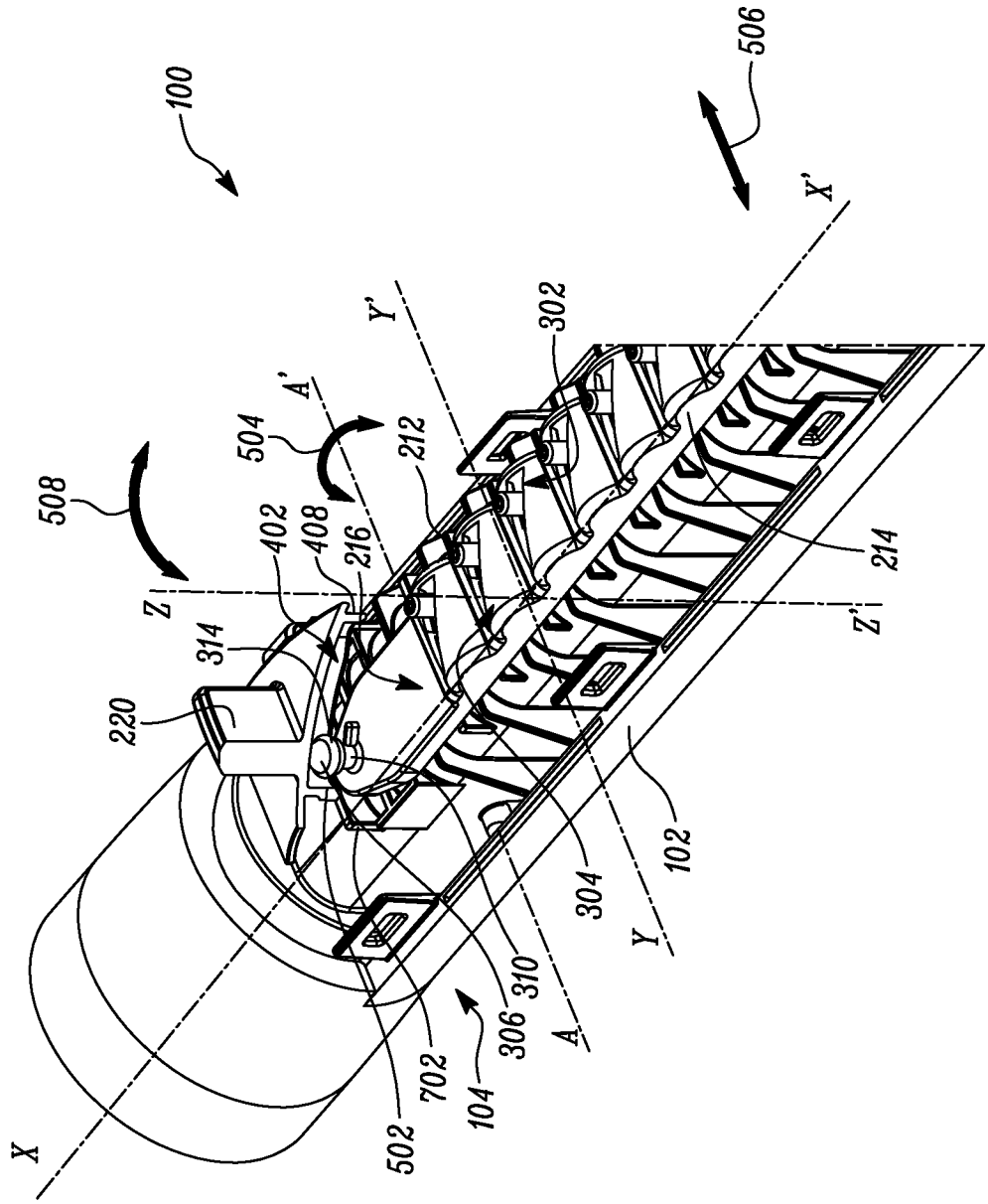


FIG. 4A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506
X'
Y'
302
A'
504
212
508
402
408
216
214
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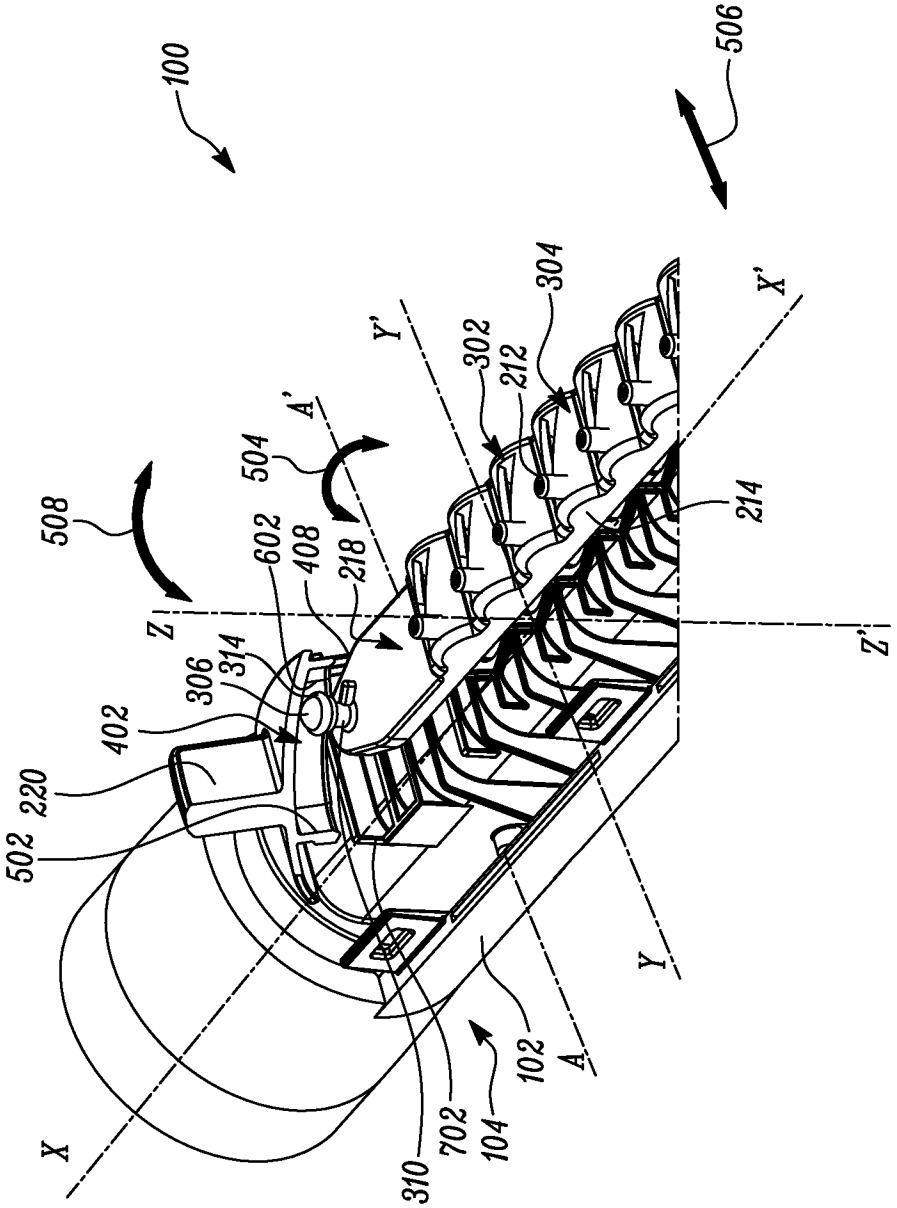
Z'
314
220
102
304
Y
310
306
A
702
104
502
X

FIG. 5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314
402
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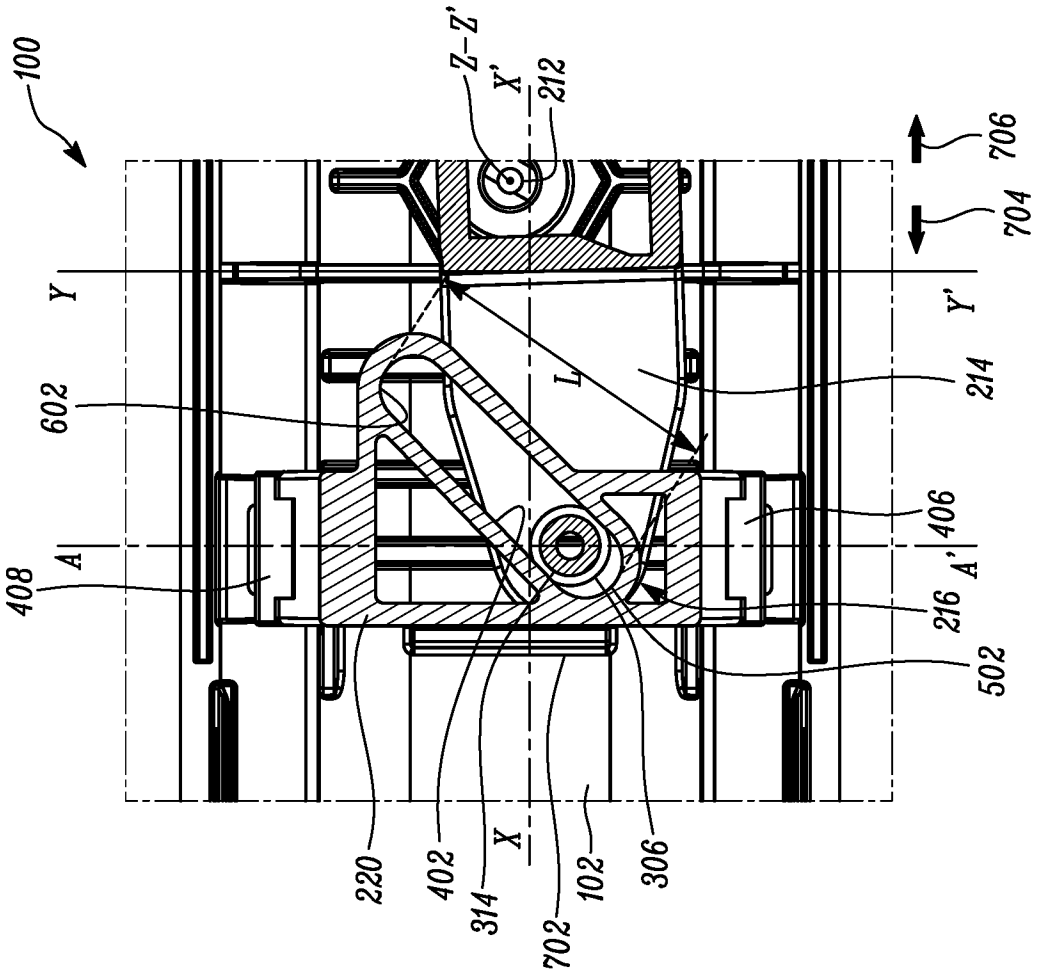
502
Y
A
102
X
310
702
104

FIG. 6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X'
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704
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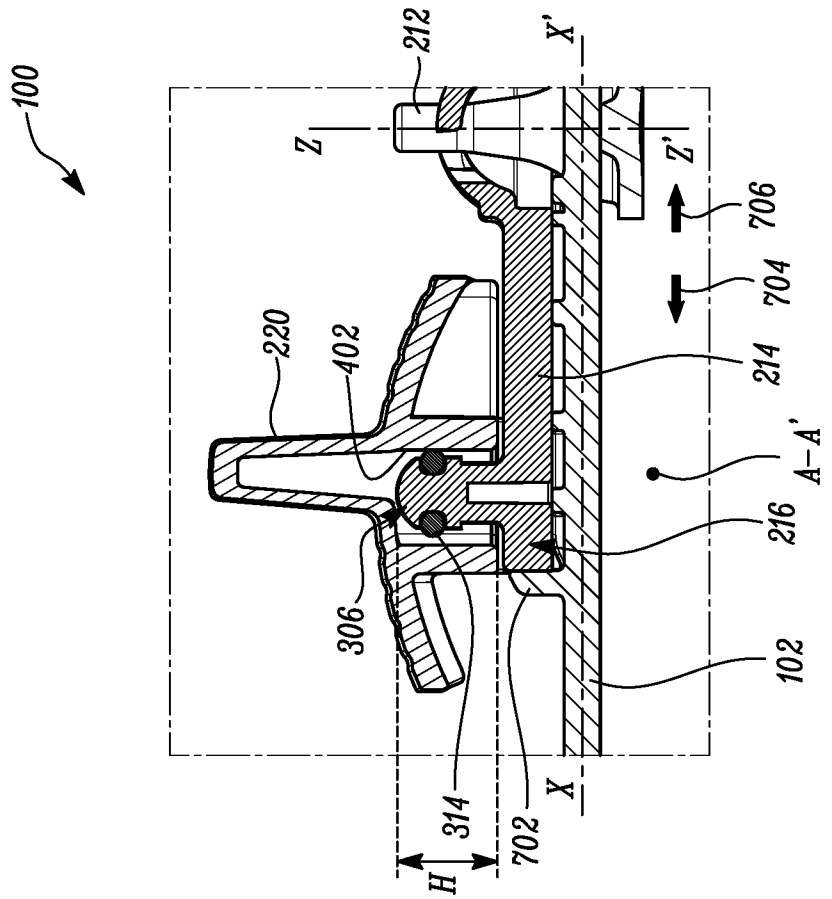
A
A'
216
502
220
402
314
X
102
306
702

FIG. 7B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402
214
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216
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102
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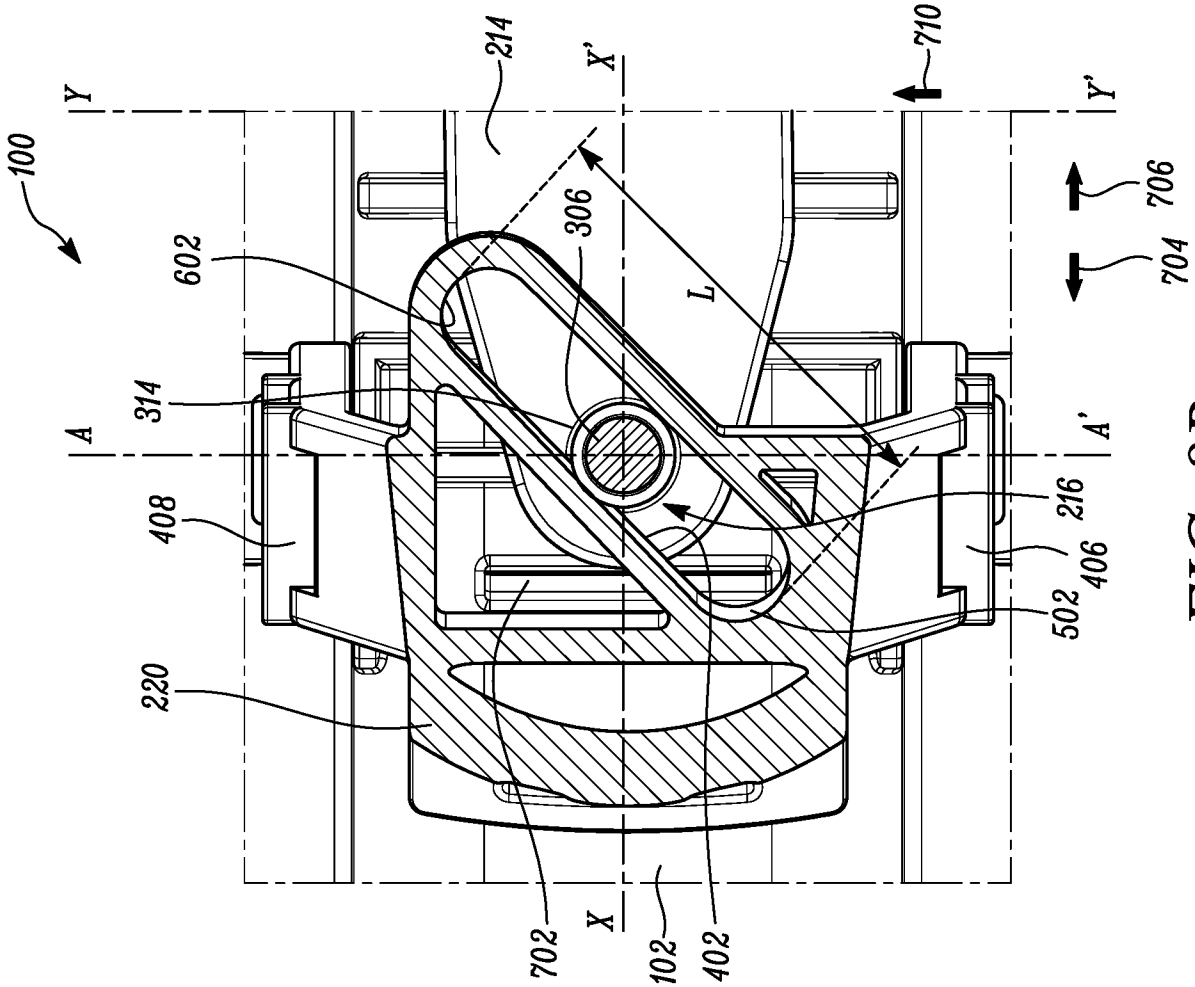
X
H
702

FIG. 7A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X'
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Y
Y'
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A'
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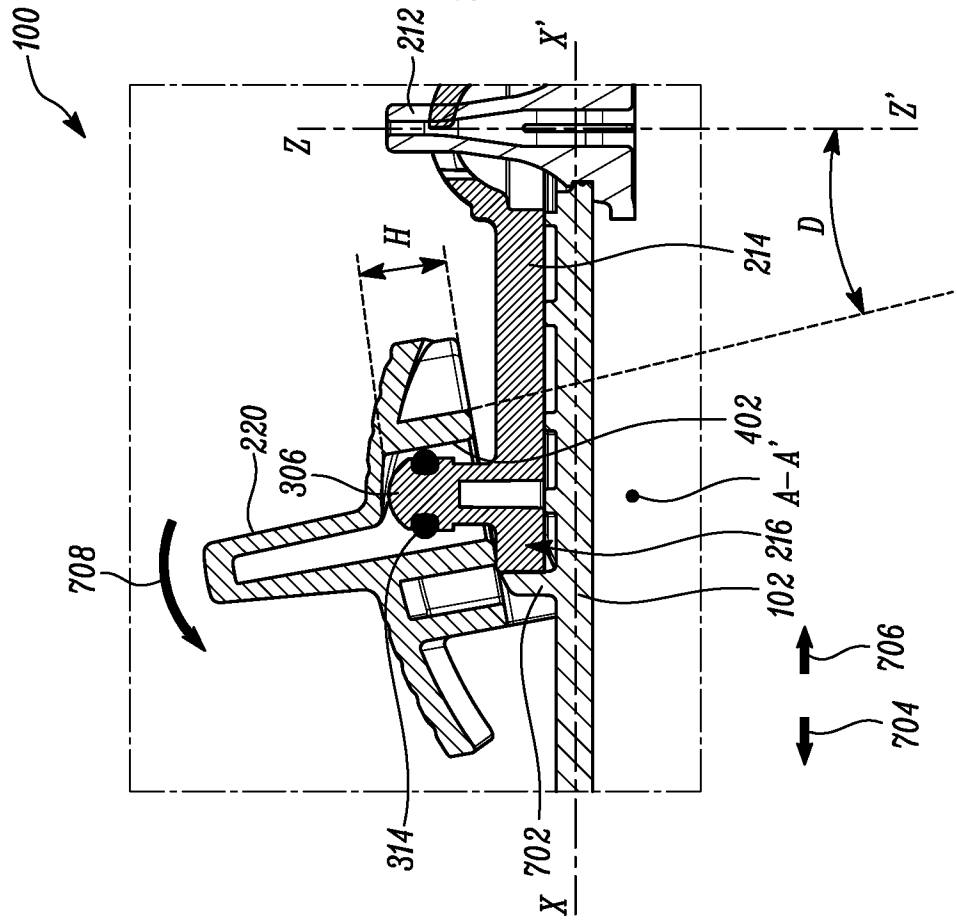
702
X
102
402

FIG. 8B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H
214
D
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306
402
A-A'
708
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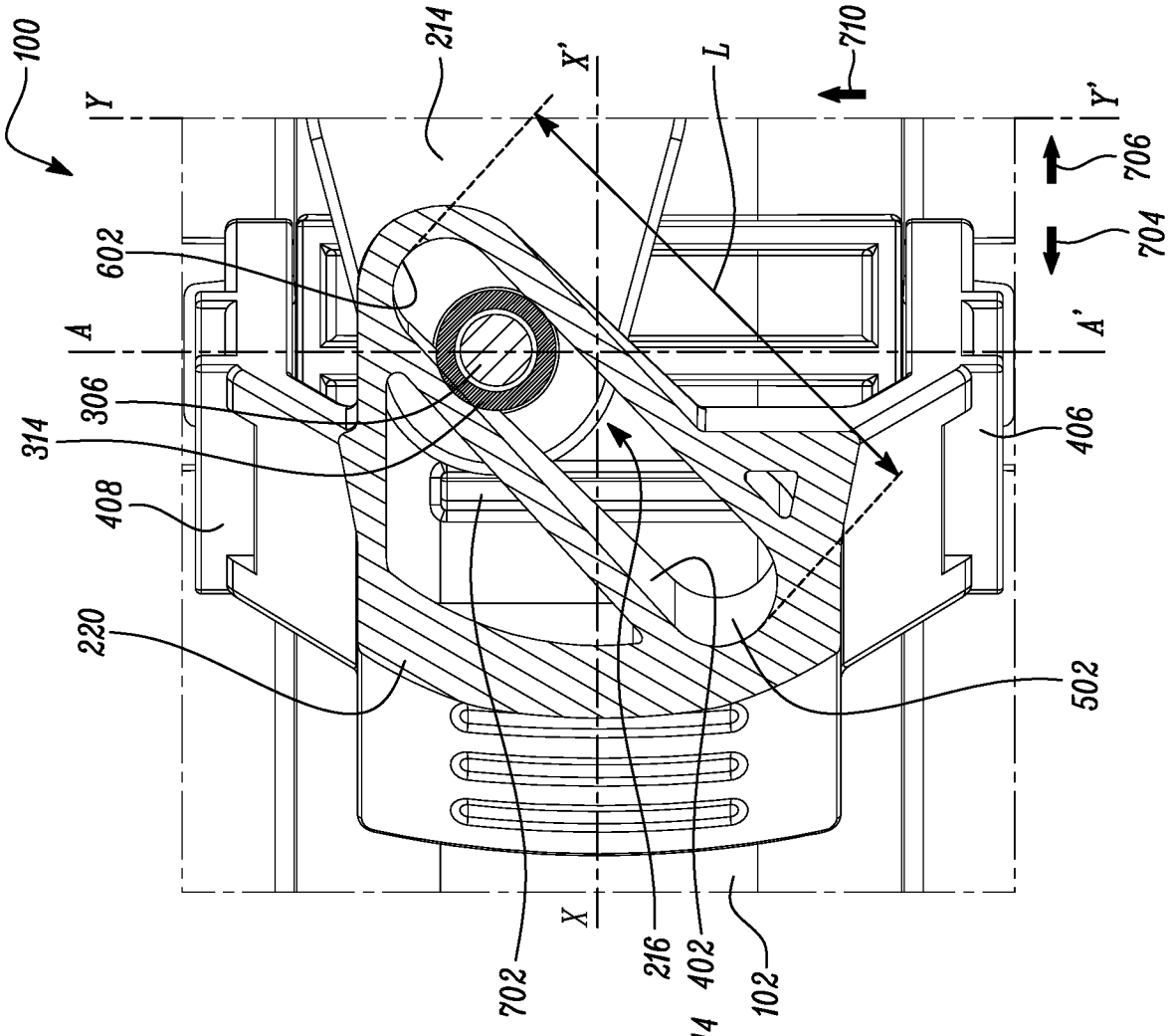
702
X

FIG. 8A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X'
L
710
Y
Y'
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A'
306
314
406
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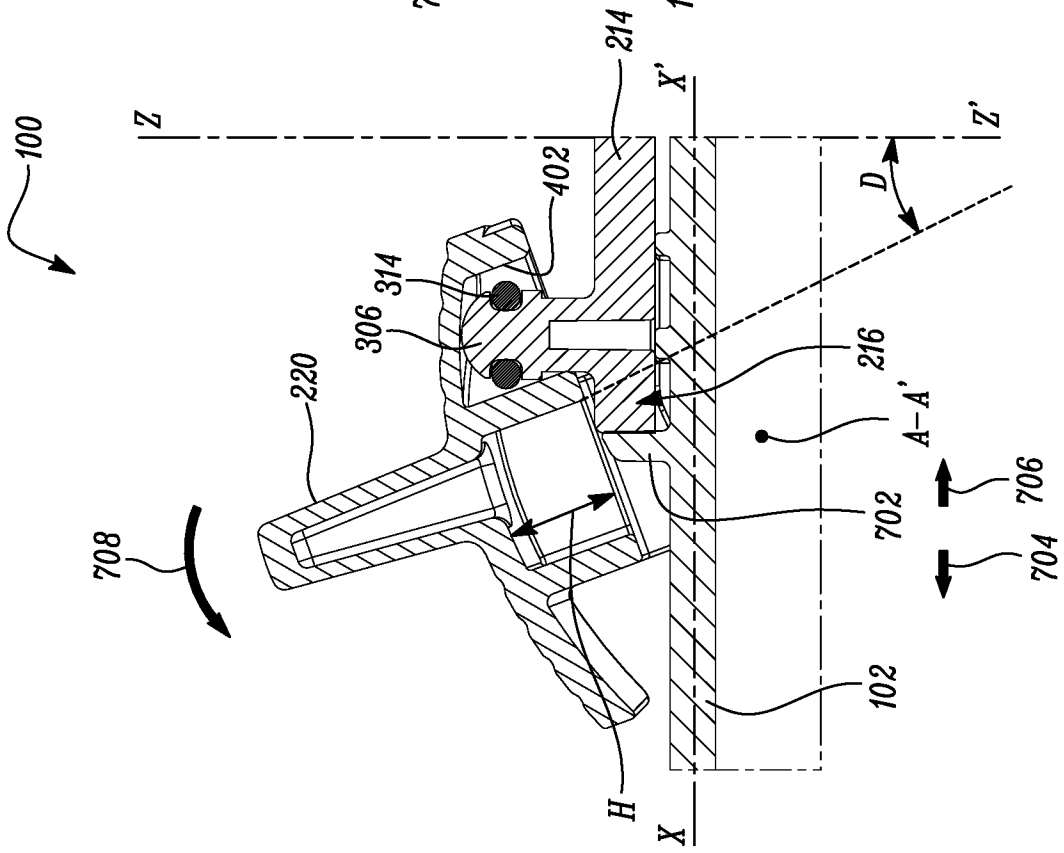
220
502
X
702
216
402
102

FIG. 9B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214
X'
Z
Z'
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216
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A-A'
706
708
702
704
102
H
X

FIG. 9A

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/084281

A. CLASSIFICATION OF SUBJECT MATTER
INV. B05B3/04 B05B15/652
ADD. B05B3/02

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)
B05B

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 970 752 B1 (GARDENA KRESS & KASTNER GMBH [DE]) 9 April 2003 (2003-04-09) cited in the application paragraph [0027] - paragraph [0034]; figures 1-10; examples 24,25,15,26,27,28,29	1-15
A	WO 2018/118485 A1 (FISKARS OYJ ABP [FI]; FARRA STEVEN HOWARD [US] ET AL.) 28 June 2018 (2018-06-28) cited in the application figures 2,4,5; examples 170a,170b,180a,180b	1
A	US 2011/095101 A1 (WANG PO-HSIUNG [TW] ET AL) 28 April 2011 (2011-04-28) figures 2,3,6,7-11; examples 2,42,41,50	1-15

-/--

[X] Further documents are listed in the continuation of Box C.

[X] 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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 March 2020	20/03/2020

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Deligiannidis, N

1

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/084281

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2 417 699 A (WANG KING YUAN [TW]) 8 March 2006 (2006-03-08) figure 1; example 32 -----	1-15
A	US 2018/339302 A1 (CHENG CHI-HAN [TW]) 29 November 2018 (2018-11-29) figures 1-6; examples 321,322 -----	1-15

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2019/084281

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		EP 0970752 A2	12-01-2000
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		CN 110121390 A	13-08-2019
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		TW M269972 U	11-07-2005
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