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- (71) Applicant: **ILLINOIS TOOL WORKS INC.** [US/US];
155 Harlem Avenue, Glenview, Illinois 60025 (US).
- (72) Inventors: **CHEN, Bin**; c/o Illinois Tool Works Inc., 155
Harlem Avenue, Glenview, Illinois 60025 (US). **SHA,
Wenquan**; c/o Illinois Tool Works Inc., 155 Harlem Av-
enue, Glenview, Illinois 60025 (US).
- (74) Agent: **SCHMIDBAUER, Nicholas P.** et al.; QUARLES
& BRADY LLP (CHI), Attn: IP Docket, 411 E. WIS-
CONSIN AVE., SUITE 2350, MILWAUKEE, Wisconsin
53202-4426 (US).
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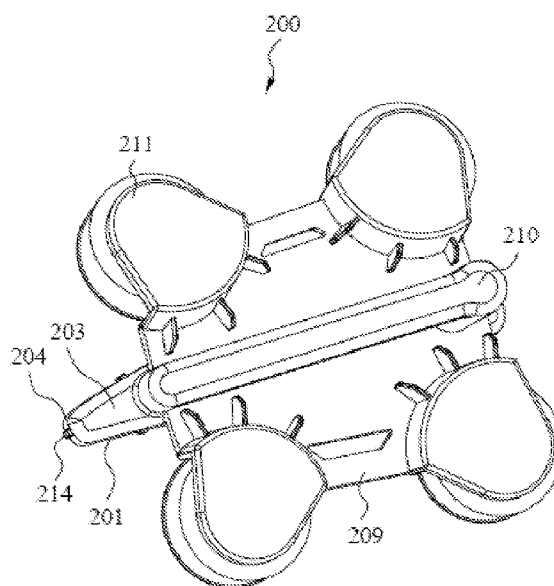


Figure 2A

(57) Abstract: A mounting jig for a concealed door handle assembly comprises a simulation housing, a positioning device, and a retaining device. The simulation housing has an outer contour configured to match a handle hole defined in an outer sheet-metal of a door, such that the simulation housing is embedded in the handle hole of the door outer sheet-metal. The positioning device is disposed inside the simulation housing to position a concealed door handle subassembly when the concealed door handle subassembly is mounted on a reinforcing plate. The retaining device is configured to retain the simulation housing in the handle hole and to release the simulation housing from the handle hole.



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MOUNTING JIG FOR CONCEALED DOOR HANDLE ASSEMBLY

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application is based on, claims priority to, and incorporates by reference in its entirety Chinese patent application number 201711421438.7 filed on December 25, 2017.

FIELD OF THE INVENTION

[0002] The present invention relates to a mounting jig for mounting a concealed door handle assembly to a vehicle door.

BACKGROUND

[0003] A concealed door handle assembly comprises a handle cover plate, a handle hole for accommodating the handle cover plate is arranged on the door outer sheet-metal, and the hole contour of the handle hole has a shape the same as that of the outer contour of the handle cover plate, but has a size larger than that of the outer contour of the handle cover plate. When the concealed door handle assembly is mounted on the door, as seen from outside of the door, the handle cover is flush with the outer door sheet-metal, and the cover plate of the door handle seems concealed. When the door handle needs to be used, the handle cover plate can be rotated relative to the door outer sheet-metal to expose a portion for manual operation. Since the cover plate of the door handle needs to frequently enter and exit the handle hole of the outer sheet-metal, a gap is required between the outer contour of the handle cover plate and the hole contour of the handle hole of the outer sheet-metal. In order to ensure an aesthetically pleasing door, it is desirable that when the concealed door handle is mounted in position on the door, the gap between the outer contour of the handle cover plate and the hole contour of the handle hole of the outer sheet-metal be uniform. However, the applicant has found that with a conventional method for installing a concealed door handle, it is difficult to maintain a uniform gap between the outer

contour of the handle cover plate and the hole contour of the handle hole of the outer sheet-metal.

SUMMARY OF THE INVENTION

[0004] In order to solve the above problems, it is an objective of the present invention to provide a mounting jig for a concealed door handle assembly that can be used to mount a concealed door handle assembly to a vehicle door, ensuring a uniform gap after installation.

[0005] In order to achieve the above objective, a first aspect of the present invention provides a mounting jig for a concealed door handle assembly, comprising: a simulation housing, the outer contour of the simulation housing being capable of matching a handle hole of a door outer sheet-metal, so that the simulation housing can be embedded in the handle hole of the door outer sheet-metal; a positioning device, the positioning device being disposed inside the simulation housing and for, when a concealed door handle subassembly is mounted on a reinforcing plate, positioning the concealed door subassembly; and a retaining device, the retaining device being capable of retaining the simulation housing in the handle hole and of releasing the simulation housing from the handle hole.

[0006] According to the first aspect described above, the door is provided with an outer sheet-metal and a reinforcing plate, the outer sheet-metal being located outside the reinforcing plate; the concealed door handle assembly comprises a handle cover plate and a handle subassembly, the handle subassembly being provided with a fitting portion; the handle subassembly is mounted inside the reinforcing plate so that the fitting portion is aligned with the handle hole on the outer sheet-metal, the handle cover plate being capable of being embedded in the handle hole of the outer sheet-metal and mounted on the fitting portion.

[0007] According to the first aspect described above, the simulation housing is provided with a bottom plate and an outer edge extending toward an inner side of the bottom plate along an edge of the bottom plate, wherein the shape of the bottom plate

matches that of the handle hole, and the outer edge can be inserted into the handle hole of the outer sheet-metal.

[0008] According to the first aspect described above, the outer edge is provided with a retaining rib on the surface of contact with the edge of the handle hole, the retaining rib being sized such that when the simulation housing is in the handle hole, the retaining rib can fit the handle hole.

[0009] According to the first aspect described above, the retaining device is an adsorption device that is fixed to the door outer sheet-metal by an adsorptive or magnetic force to retain the simulation housing in the handle hole.

[0010] According to the first aspect described above, the retaining device is a locking device that retains the simulation housing in the handle hole by locking the simulation housing on the handle subassembly.

[0011] According to the first aspect described above, the simulation housing is provided with a locking portion that cooperates with the locking device, the locking portion comprising a bolt, wherein the locking portion is provided with an opening, and the bolt is connected in the opening.

[0012] According to the first aspect described above, the locking device comprises: a connecting rod, the connecting rod being disposed inside the simulation housing; a slider, the slider being coupled to the middle of the connecting rod and extending through the simulation housing to the outside of the simulation housing; a buckle, the buckle being disposed on at least one end of the connecting rod, wherein by sliding the slider, the locking device can be placed in an unlocked position or a locked position.

[0013] According to the first aspect described above, the buckle is provided with two chutes having openings opposite each other, wherein one chute is for engaging with a lug on the fitting portion of the handle subassembly and the other chute is for engaging with the bolt.

[0014] A second aspect of the present invention provides another mounting jig for a concealed door handle assembly, comprising: a simulation housing, the outer contour of the simulation housing being capable of matching a handle hole of a door outer sheet-metal, so that the simulation housing can be inserted in the handle hole of the

outer sheet-metal, wherein the outer contour of the simulation housing is sized to enable the outer contour of the simulation housing to fit the handle hole, thereby retaining the simulation housing in the handle hole so that a concealed door handle subassembly can be mounted on the inside of the simulation housing.

[0015] According to the second aspect described above, the fit between the outer contour of the simulation housing and the handle hole is a tight fit.

[0016] According to the second aspect described above, a positioning device is further provided, the positioning device being disposed inside the simulation housing and for, when a concealed door handle subassembly is mounted on a reinforcing plate, positioning the concealed door subassembly.

[0017] A third aspect of the present invention provides a method for mounting a concealed door handle on a vehicle door by using a mounting jig, the mounting jig comprising a simulation housing, the method comprising: embedding the simulation housing in the handle hole of the door outer sheet-metal; retaining the simulation housing in the handle hole and positioning the handle subassembly of the concealed door handle by the simulation housing; mounting the handle subassembly on the reinforcing plate of the door; releasing the simulation housing from the handle hole and taking out the simulation housing; and attaching a cover plate of the concealed door handle to the handle subassembly.

[0018] According to the third aspect described above, the step of retaining the simulation housing in the handle hole comprises: fixing a mounting jig to the door outer sheet-metal to retain the simulation housing in the handle hole.

[0019] According to the third aspect described above, the step of retaining the simulation housing in the handle hole comprises: locking the simulation housing to the handle subassembly to retain the simulation housing in the handle hole.

[0020] The present invention utilizes a mounting jig to position a handle subassembly relative to a door outer sheet-metal, thereby ensuring a uniform gap and face difference between the outer contour of the cover plate mounted on the handle subassembly and the hole contour of the handle hole of the outer sheet-metal.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] Figure 1A is a schematic view of an embodiment of a concealed door handle assembly according to the present invention;

[0022] Figure 1B is a schematic view of a vehicle door using the concealed door handle assembly shown in Figure 1A;

[0023] Figure 2A is a front perspective view showing an embodiment of a mounting jig according to the present invention;

[0024] Figure 2B is a reverse schematic perspective view showing the structure of the mounting jig shown in Figure 2A;

[0025] Figures 3A to 3D are schematic views showing a process of mounting the concealed door handle shown in Figure 1A on the door shown in Figure 1B using the mounting jig shown in Figures 2A and 2B;

[0026] Figure 4A is a schematic view of another embodiment of a concealed door handle assembly according to the present invention;

[0027] Figure 4B is a schematic view of a vehicle door using the concealed door handle assembly shown in Figure 4A;

[0028] Figure 5A is a front perspective view showing another embodiment of a mounting jig according to the present invention;

[0029] Figure 5B is a reverse schematic perspective view showing the structure of the mounting jig shown in Figure 5A;

[0030] Figures 6A to 6D are schematic views showing a process of mounting the concealed door handle shown in Figure 4A on the door shown in Figure 4B using the mounting jig shown in Figures 5A and 5B;

[0031] Figure 7A is a schematic view showing the mounting jig shown in Figure 5A locking the handle assembly shown in Figure 4A during the positioning and connection shown in Figure 6B;

[0032] Figure 7B is a cross-sectional view taken along line A-A shown in Figure 7A.

SPECIFIC EMBODIMENTS

[0033] Various specific embodiments according to the present invention will be described below with reference to the drawings which form a part of this specification. It should be understood that although terms referring to directions, such as "front", "back", "upper", "lower", "left", "right", "top", "bottom" etc. are used to describe or illustrate the various example structural components and elements according to the present invention, these terms are used herein for purposes of illustration only, and are based on the example orientation shown in the figures. Since the embodiments disclosed herein may be arranged in different orientations, these terms are merely illustrative and are not to be considered as limiting.

[0034] Figure 1A shows an embodiment of a concealed door handle assembly according to the present invention. As shown in Figure 1A, the handle assembly 100 comprises a handle cover plate 118 and a handle subassembly 113, the handle cover plate 118 being for being mounted on the handle subassembly 113. The handle subassembly 113 is provided with a support portion 120 and a fitting portion 117 disposed on the support portion 120. The outer contour of the fitting portion 117 has an annular shape similar to that of the handle cover plate 118. The handle cover plate 118 can cover and be mounted on the fitting portion 117 of the handle subassembly 113.

[0035] Further, a plurality of mounting holes outside the annular outer contour of the fitting portion 117 are provided on the support portion 120 of the handle subassembly 113, and the handle subassembly 113 can be mounted to the door reinforcing plate 305 (see Figure 3B) through the mounting holes. In the example shown in Figure 1A, the mounting holes comprise a mounting hole 116.1, a mounting hole 116.2, and a mounting hole 116.3 that are evenly disposed on the outer edge of the handle subassembly 113 and are arranged in a triangular shape such that the handle subassembly 113 is fixed more securely when connected to the reinforcing plate. In other examples, there may be more mounting holes or mounting holes may be disposed unevenly.

[0036] Still as shown in Figure 1A, a plurality of lugs 119 are provided at the inner edge of the outer contour of the fitting portion 117, and the inside of the handle cover

plate 118 is provided with a corresponding recess. When the handle cover plate 118 covers the fitting portion 117 of the handle subassembly 113, the handle cover plate 118 can be buckled onto the handle subassembly 113 by the lugs 119. In other examples, the handle cover plate 118 can also be fixedly coupled to the handle subassembly 113 by other fitting structures. A plurality of reinforcing ribs are further disposed inside the outer contour of the fitting portion 117, and accommodating portions 124.1 and 124.2 are formed between the reinforcing ribs.

[0037] Figure 1B shows a vehicle door using the concealed door handle assembly shown in Figure 1A. As shown in Figure 1B, the door comprises an outer sheet-metal 102, the outer sheet-metal 102 is provided with a handle hole 107, and the shape of the handle hole 107 matches the shape of the handle cover plate 118; however, the size of the hole contour of the handle hole 107 is slightly larger than the size of the outer contour of the handle cover plate 118. A reinforcing plate 305 is mounted to the inner side of the outer sheet-metal 102 (see Figure 3B). When the concealed door handle assembly 100 shown in Figure 1A is mounted on the vehicle door, the handle subassembly 113 is mounted on the reinforcing plate 305, and the handle cover plate 118 is located within the handle hole 107 of the outer sheet-metal 102. In order to enable the handle cover plate 118 to be embedded in the handle hole 107 on the door outer sheet-metal 102, the height of the fitting portion 117 is set such that when the handle subassembly 113 is mounted on the door reinforcing plate 305, the fitting portion 117 can pass through the reinforcing plate 305 and extend into the handle hole 107 of the door outer sheet-metal 102.

[0038] The applicant has found that since the handle subassembly 113 is mounted on the reinforcing plate 305 of the door, the position of the outer contour of the handle cover plate 118 relative to the hole contour of the handle hole 107 actually depends on the mounting accuracy of the handle subassembly 113 on the reinforcing plate 305 and the mounting accuracy of the reinforcing plate 305 with respect to the door outer sheet-metal 102. However, it is difficult to ensure the mounting accuracy of the reinforcing plate 305 with respect to the door sheet-metal 102. Therefore, if the handle subassembly 113 is directly mounted on the reinforcing plate 305 of the door without

the help of certain precision calibration, it is difficult to ensure that the gap between the outer contour of the handle cover plate 118 and the hole contour of the handle hole 107 of the outer sheet-metal 102 is even.

[0039] To solve the above-mentioned problem, the present invention provides a mounting jig for mounting a concealed door handle. Mounting a concealed door handle assembly with the mounting jig can effectively ensure an even gap between the outer contour of the handle cover and the hole contour of the handle hole of the outer sheet-metal.

[0040] Figures 2A and 2B are respectively schematic perspective views of two different viewing angles of an embodiment of the mounting jig according to the present invention.

[0041] As shown in Figures 2A and 2B, the mounting jig 200 comprises a simulation housing 201, a positioning device 212, and a retaining device 211. The simulation housing 201 is used to simulate the handle cover plate 118. Like the handle cover plate 118, the simulation housing 201 has an outer contour shape that cooperates with the hole contour of the handle hole 107 of the outer sheet-metal such that the simulation housing 201 can be inserted or embedded in the handle hole 107 of the outer sheet-metal. However, unlike the handle cover plate 118, the outer contour of the simulation housing 201 is larger than the handle cover plate 118. Specifically, the outer contour of the simulation housing 201 is sized to enable the outer contour of the simulation housing 201 to fit the handle hole 107, so that the simulation housing 201 can be embedded in the handle hole 107, allowing a concealed door handle assembly 100 to be mounted on the inside of the simulation housing 201.

[0042] The simulation housing 201 comprises a bottom plate 203 and an outer edge 204 that projects toward the inside of the bottom plate 203 along the edge of the bottom plate 203. The bottom plate 203 has a shape matching the hole contour of the handle hole 107 of the outer sheet-metal, and the outer contour of the outer edge 204 extending along the edge of the bottom plate 203 also matches the hole contour of the handle hole 107 of the outer sheet-metal. According to an example of the present invention, the edge of the bottom plate 203 and the outer wall of the outer edge 204 form an outer

contour of the simulation housing 201. When the simulation housing 201 is inserted into the handle hole 107 of the outer sheet-metal, the outer wall of the outer edge 204 can come into contact with the handle hole 107, so that the simulation housing 201 can be embedded in the handle hole 107. According to another example of the present invention, the outer wall of the outer edge 204 is provided with a plurality of raised retaining ribs 214 that jointly form the outer contour of the simulation housing 201. When the simulation housing 201 is inserted into the handle hole 107 of the outer sheet-metal, the retaining ribs 214 can come into contact with the handle hole 107, so that the simulation housing 201 can be embedded in the handle hole 107. The bottom plate 203, the outer edge 204, and the retaining ribs 214 of the simulation housing 201 may be integrally formed. The simulation housing 201 is embedded in the handle hole 107 by providing the retaining ribs 214 so that the simulation housing 201 can be more easily machined to obtain the outer contour of the simulation housing 201 that matches the hole contour of the handle hole 107 of the outer sheet-metal.

[0043] Still as shown in Figure 2B, the inner side of the simulation housing 201 is coupled with a positioning device 212; the positioning device 212, as an example, comprises positioning pins 212.1 and 212.2. The positioning pins 212.1 and 212.2 can cooperate with the accommodating portions 124.1 and 124.2 in the fitting portion 117 of the handle subassembly 113 as shown in Figure 1A such that the handle subassembly 113, when installed, can be positioned relative to the simulation housing 201. In the example shown in Figure 2B, the positioning pin 212.1 is -shaped and located on the left side in the simulation housing 201. The positioning pin 212.2 is in the shape of a cross and is located on the right side in the simulation housing 201. In fact, the positioning pin can also be of another shape or in another portion located in the simulation housing 201, as long as it fits the accommodating portion in the fitting portion 117 on the handle subassembly 113. The positioning device and the accommodating portion on the handle subassembly that cooperates with the positioning device are not limited to the examples mentioned above, as long as the handle subassembly 113 can be positioned relative to the simulation housing 201 by the cooperation of the two.

[0044] The mounting jig 200 further comprises a retaining device 211; the retaining device 211 is capable of retaining the simulation housing 201 embedded in the handle hole 107 of the door outer sheet-metal in the handle hole 107. As an example, the retaining device 211 can comprise a variety of detachable devices, such as adsorption devices or buckling devices. In the example shown in Figure 1A, the retaining device 211 comprises a plurality of adsorption devices, such as magnets or suction cups. With a suction force or magnetic force of the adsorption device, the adsorption device can be connected outside the door outer sheet-metal 102, so that the simulation housing 201 can be held in the handle hole 107. The position of the retaining device 211 is set such that when the retaining device 211 is connected outside the door outer sheet-metal 102, the simulation housing 201 is located exactly in the handle hole 107, and the outer surface of the bottom plate 203 of the simulation housing 201 is flush with the outer surface of the outer sheet-metal 102. As an example, the retaining device 211 comprises suction cups, and the outer side of the bottom plate 203 of the simulation housing 201 is connected with a connecting plate 209; the connecting plate 209 is for carrying the suction cups.

[0045] In the example shown in Figures 2A and 2B, the mounting jig 200 may further comprise an operating portion 210, the operating portion 210 being disposed outside the simulation housing 201; an installer may move the simulation housing 201 into the handle hole 107 through the operating portion 210 or remove it from the handle hole 107. The operating portion 210 may be a hand-held component that protrudes from the outside of the simulation housing 201, or may be a component that is recessed from the outside of the simulation housing 201.

[0046] Figures 3A to 3D show a process for mounting the concealed door handle assembly 100 shown in Figure 1A on the vehicle door shown in Figure 1B using the mounting jig 200 shown in Figures 2A and 2B. Figures 3A and 3D are views seen from the outside of the outer sheet-metal 102 on the outer side of the door, and Figures 3B and 3C are views seen from the inside of the reinforcing plate 305 on the inner side of the door. In order to clearly explain the process of mounting the concealed handle assembly, the direction of the door plane is set to the x and z directions in Figures 3A

to 3D, and the inner and outer directions perpendicular to the door plane are set to the y direction.

[0047] As shown in Figure 3A, first, the installer inserts the simulation housing 201 from the outside of the door outer sheet-metal 102 into the handle hole 107 of the outer sheet-metal 102 through the operating portion 210 until the suction cup 211 is pressed against the outer sheet-metal 102. Then, the operator tightens the suction cup 211 so that the suction cup 211 is firmly attracted to the outside of the door outer sheet-metal 102. Since the simulation housing 201 comes into contact with the hole contour of the handle hole 107 by the retaining ribs 214, the movement of the simulation housing 201 in the x and z directions is limited. In this case, since the suction cup 211 is fixed to the outer sheet-metal 102, the movement of the mounting jig 200 in the y direction can be restricted. Thus, the mounting jig 200 cannot move relative to the outer sheet-metal 102 in all three directions x, y, and z, so that the mounting jig 200 is stationary with respect to the door outer sheet-metal 102.

[0048] When the simulation housing 201 is held in the handle hole 107 of the door outer sheet-metal 102 and the mounting jig 200 is fixed relative to the door outer sheet-metal 102, as shown in Figure 3B, by the positioning pins 212.1 and 212.2 on the simulation housing 201, the handle subassembly 113 is positioned relative to the door outer sheet-metal 102. Specifically, the installer moves the handle subassembly 113 toward the reinforcing plate 305 on the inside of the door, aligning the accommodating portions 124.1 and 124.2 on the handle subassembly 113 with the positioning pins 212.1 and 212.2 on the simulation housing 201, and then inserts the positioning pins 212.1 and 212.2 into the accommodating portions 124.1 and 124.2, respectively. Thus, the simulation housing 201 limits movement of the handle subassembly 113 in the x and z directions. Since the mounting jig 200 is stationary relative to the door outer sheet-metal 102, the handle subassembly 113 is also positioned relative to the door outer sheet-metal 102.

[0049] Figure 3C shows the state in which the handle subassembly 113 is positioned relative to the door outer sheet-metal 102, after which the handle subassembly 113 can be secured to the reinforcing plate 305. As shown in Figure 3C, when the handle

subassembly 113 is positioned relative to the door outer sheet-metal 102, the mounting holes 116.1, 116.2, and 116.3 on the handle subassembly 113 are aligned with the corresponding mounting holes 315.1, 315.2, and 315.3 on the reinforcing plate 305, respectively. The handle subassembly 113 can be fixedly attached to the door reinforcing plate 305 by inserting fasteners in the respective aligned holes.

[0050] It should be noted that, in order to position the handle subassembly 113 through the positioning pins 212.1 and 212.2, it can still be ensured that fasteners can be inserted in the positioning holes 116.1, 116.2 and 116.3 on the handle subassembly 113 and the mounting holes 315.1, 315.2 and 315.3 on the reinforcing plate 305; the mounting holes in the reinforcing plate 305 are typically set to be slightly larger than the mounting holes in the handle subassembly 113.

[0051] Figure 3D shows the process of mounting the cover plate 118 to the handle subassembly 113 after the handle subassembly 113 is secured to the door reinforcing plate 305. After the completion of the step shown in Figure 3C, the suction cup 211 of the mounting jig 200 is released from the door outer sheet-metal 102, and the mounting jig 200 is detached from the door outer sheet-metal 102. Then, as shown in Figure 3D, it can then be seen that the fitting portion 117 of the handle subassembly 113 extends through the reinforcing plate 305 into the handle hole 107 of the outer sheet-metal 102. Next, the handle cover plate 118 is inserted into the handle hole 107 of the outer sheet-metal 102 from the outside of the outer sheet-metal 102, so that the handle cover plate 118 covers the fitting portion 117. The handle cover plate 118 is then slightly pressed so that the handle cover plate 118 and the handle subassembly 113 are coupled together by the lugs 119 to form the handle assembly 100.

[0052] In the above-described process of mounting the handle assembly 100 on the vehicle door, since the handle subassembly 113 is positioned relative to the door outer sheet-metal 102 by the mounting jig 200, it is ensured that there is a uniform gap and face difference between the outer contour of the handle cover plate 118 mounted on the handle subassembly 113 and the hole contour of the handle hole 107 of the outer sheet-metal.

[0053] Moreover, since the above-described mounting jig 200 can be held stationary not only in the x and z directions with respect to the outer sheet-metal 102 but also in the y direction with respect to the outer sheet-metal 102, one installer can complete the mounting of the handle assembly independently by the mounting jig 200, thereby improving the installation efficiency.

[0054] It is worth noting, however, that if a plurality of persons cooperate to install the concealed door handle assembly 100, the mounting jig may comprise only the simulation housing and positioning devices described above but not the retaining device described above. When installing the handle assembly with such a mounting jig, an operator needs to press against the simulation housing embedded in the handle hole 107 of the outer sheet-metal 102 from the outer side of the door outer sheet-metal, so that the simulation housing cannot move in the y direction relative to the door outer sheet-metal 102. Such a mounting jig positions the handle subassembly 113 relative to the door outer sheet-metal 102 by the simulation housing and the positioning device, thereby ensuring a uniform gap and face difference between the outer contour of the cover plate 118 mounted on the handle subassembly 113 and the hole contour of the handle hole 107 of the outer sheet-metal. Therefore, regardless of whether it is a jig that requires a plurality of persons to cooperate to complete installation or a jig that allows independent installation by one person, it is within the scope of protection of the present invention.

[0055] Figure 4A illustrates another embodiment of a concealed door handle assembly according to the present invention. As shown in Figure 4A, similar to the handle assembly 100 shown in Figure 1A, the handle assembly 400 also comprises a handle cover 418 and a handle subassembly 413, the handle subassembly 413 being provided with a support portion 420 and a fitting portion 417 disposed on the support portion 420. An accommodating portion 424 is provided inside the fitting portion 417. A mounting hole 416.1, a mounting hole 416.2, and a mounting hole 416.3 are also provided on the support portion 420. In other examples, a plurality of mounting holes may be provided or mounting holes may be unevenly arranged. A plurality of lugs 419 are provided on the inner edge of the fitting portion 417, and the handle cover plate 418

can be buckled onto the handle subassembly 413 by the lugs 419. In other examples, the handle cover plate 418 can also be fixedly coupled to the handle subassembly 413 by other fitting structures.

[0056] Figure 4B shows a vehicle door using the concealed door handle assembly shown in Figure 4A. As shown in Figure 4B, the door comprises an outer sheet-metal 402, and the outer sheet-metal 402 is provided with a handle hole 407.

[0057] Figures 5A and 5B are respectively schematic perspective views of two different perspectives of the front and back of another embodiment of a mounting jig according to the present invention.

[0058] As shown in Figures 5A and 5B, the mounting jig 500 comprises a simulation housing 501, a positioning device 512, and a retaining device 511. The simulation housing 501 is used to simulate the handle cover plate 418, and the outer contour of the simulation housing 501 is sized to enable the outer contour of the simulation housing 501 to fit the handle hole 407, allowing the simulation housing 501 to be embedded in the handle hole 407, so that the concealed door handle assembly 400 can be mounted on the inside of the simulation housing 501.

[0059] The simulation housing 501 comprises a bottom plate 503 and an outer edge 504. The outer wall of the outer edge 504 is provided with a plurality of raised retaining ribs 514 that jointly form the outer contour of the simulation housing 501. When the simulation housing 501 is inserted into the handle hole 507 of the outer sheet-metal, the retaining ribs 514 can come into contact with the handle hole 407, so that the simulation housing 501 can be embedded in the handle hole 407.

[0060] Still as shown in Figure 5B, the inner side of the simulation housing 501 is coupled with a positioning device 512, the positioning device 512 comprising cross-shaped positioning pins 512.1 and 512.2, wherein the positioning pins 512.1 and 512.2 can fit the accommodating portion 424 in the handle subassembly 413 shown in Figure 4A, so that the handle subassembly 413 can be positioned relative to the simulation housing 501 during installation. The same as the embodiment shown in Figures 3A and 3B, the positioning device and the accommodating portion on the handle subassembly 413 that cooperates with the positioning device are not limited to

the examples mentioned above, as long as the handle subassembly 413 can be positioned relative to the simulation housing 501 by the cooperation of the two.

[0061] In the example shown in Figures 5A and 5B, the mounting jig 500 may further comprise an operating portion 510, and the operating portion 510 is a hole formed by recessing the outside of the simulation housing 501. An installer can move the simulation housing 501 into or out of the handle hole 407 through the operating portion 510.

[0062] As shown in Figure 5B, a plurality of reinforcing ribs 532 are connected to the inner side of the simulation housing 501. In order to enable the simulation housing 501 to be better supported in the handle hole of the outer sheet-metal 407, the reinforcing ribs 532 may be located on both the left and right sides of the simulation housing 401.

[0063] As shown in Figures 5A and 5B, the retaining device 511 is a locking device 511, the locking device 511 is coupled to the middle of the simulation housing 501, and the locking device 511 can be in an unlocked position or a locked position. When the locking device 511 is in the locked position, the locking device 511 locks the handle subassembly 413 to securely connect the handle subassembly 413 to the simulation housing 501. When the locking device 511 is in the unlocked position, the locking device 511 releases the handle assembly 413.

[0064] In the example shown in Figures 5A and 5B, the locking device 511 comprises a slider 529, a connecting rod 523, and a buckle 525. Correspondingly, a corresponding locking portion 530 is provided on the simulation housing 501 for fitting with the locking device 511.

[0065] As shown in Figure 5B, the connecting rod 523 is located inside the simulation housing 501, and a slider 529 is connected to the middle of the connecting rod 523, the slider 529 extending through the bottom plate 503 of the simulation housing to the outside of the simulation housing 501. By sliding the position of the slider 529 left and right, the locking device 511 can be placed in the unlocked position or the locked position. The middle portion of the simulation housing 501 is provided with a waist hole 528 for accommodating the slider 529 passing through the bottom plate 503, and

the slider 529 can slide left and right in the waist hole 428, so that the locking device 511 can be in the unlocked position or the locked position. At least one of the ends of the connecting rod 523 is provided with a buckle 525; the buckle 525 has two chutes 526.1 and 526.2 with openings that are opposite each other, wherein the chute 526.1 is for accommodating the lugs 419 on the handle subassembly 413 and the chute 526.2 is for fitting with the locking portion 530 on the simulation housing 501. In the example shown in Figure 4B, a buckle 525 is provided at each end of the connecting rod 523 to make the sliding more balanced and stable.

[0066] Still as shown in Figure 5B, the locking portion 530 on the simulation housing 501 has an opening in which a bolt 521 is attached, wherein the bolt 521 is for fitting with the buckle 525 and the bolt 521 can be accommodated in the chute 526.2 of the buckle 525. The bolt 521 fits with the chute 526.2 so that the slider 529 can slide along the bolt 521 during sliding left and right.

[0067] The working process of the locking device 511 will be described below by taking as an example the fitting relationship between the buckle 525 at one end of the connecting rod 523 and the bolt 521. When the handle subassembly 413 is aligned with the simulation housing 501, and when the slider 529 is slid such that the chute 526.1 accommodates the lugs 419 and the chute 526.2 accommodates the bolt 521, the locking device 511 is in the locked position and the locking device 511 securely connects the handle subassembly 413 to the simulation housing 501. When the slider 529 is slid so that the lugs 419 are not accommodated in the chute 526.1, the locking device 511 is in the unlocked position, and the locking device 511 releases the handle assembly 413. The buckle at the other end of the connecting rod 523 has a structure similar to that of the buckle 525. When the chute 526.1 accommodates the lugs 419, the chute of the other buckle also accommodates the lugs on the handle subassembly. It should be noted that, in other examples, other buckle structures with similar functions may also be employed.

[0068] Corresponding to the buckle 525 at both ends of the connecting rod 523, in the example described herein, the locking portion also comprises locking portions 530.1 and 530.2 corresponding to the buckle, wherein the locking portions 530.1 and 530.2

are not completely aligned, such that the connecting rod 523 is bent by an angle to increase the area of the locking portion.

[0069] Figures 6A to 6D show a process for mounting the concealed door handle assembly 400 shown in Figure 4A on the vehicle door shown in Figure 4B using the mounting jig 500 shown in Figures 5A and 5B. Figures 6A and 6D are views seen from the outside of the outer sheet-metal 402 on the outer side of the door, and Figures 6B and 6C are views seen from the inside of the reinforcing plate 605 on the inner side of the door. In order to clearly explain the process of mounting the concealed handle assembly, the x, y, and z directions that are the same as those in the embodiment shown in Figures 3A to 3D are used in Figures 6A to 6D.

[0070] As shown in Figure 6A, first, the installer inserts the simulation housing 501 into the handle hole 407 of the outer sheet-metal from the outside of the door outer sheet-metal 402 through the hand-held operating portion 510. Since the simulation housing 501 comes into contact with the hole contour of the handle hole 407 through the retaining ribs 514, the movement of the simulation housing 501 relative to the door outer sheet-metal 402 in the x and z directions is limited.

[0071] After the simulation housing 501 is embedded in the handle hole 407 of the door outer sheet-metal 402, as shown in Figure 6B, the handle subassembly 413 can be positioned relative to the simulation housing 501 and the door outer sheet-metal 402 by the positioning pins 512.1 and 512.2 on simulation housing 501.

[0072] Figure 6C shows the state in which the handle subassembly 413 has been positioned relative to the simulation housing 501 and the outer door sheet-metal 402. Thus, the simulation housing 501 limits movement of the handle subassembly 413 in the x and z directions. Since the movement of the simulation housing 501 relative to the door outer sheet-metal 402 in the x and z directions is limited, the movement of the handle subassembly 413 relative to the door outer sheet-metal 402 in the x and z directions is also limited.

[0073] It should be noted that in this case, the movement of the simulation housing 501 and the handle subassembly 413 in the y direction is not limited. In order to prevent the simulation housing 501 from coming out from the side of the door outer sheet-metal

402 when the handle subassembly 413 is connected with the reinforcing plate 605, which affects the positioning of the handle subassembly 413, the locking device 511 needs to be moved from the unlocked position to the locked position such that the handle subassembly 413 is fixedly coupled to the simulation housing 501. Thus, the installer can hold the handle subassembly 413 from the inside of the door reinforcing plate 605 to ensure that the simulation housing 501 can also be held in the handle hole 407.

[0074] After the handle subassembly 413 is positioned relative to the door outer sheet-metal 402, the handle subassembly 413 is fixed to the reinforcing plate 605. As shown in Figure 6C, when the handle subassembly 413 is positioned relative to the door outer sheet-metal 402, the mounting holes 416.1, 416.2, and 416.3 on the handle subassembly 413 are aligned with the corresponding mounting holes 615.1, 615.2, and 615.3 on the reinforcing plate 605, respectively. The handle subassembly 413 can be fixedly attached to the door reinforcing plate 605 by inserting fasteners in the respective aligned holes. Similarly, the mounting holes in the reinforcing plate 605 are slightly larger than the mounting holes in the handle subassembly 413, so that the position of the handle assembly 413 can be fine-tuned when the mounting holes on the reinforcing plate 605 and the mounting holes on the handle subassembly 413 are connected.

[0075] Figure 6D shows a state in which the handle cover plate 418 is mounted to the handle subassembly 413 after the handle subassembly 413 is fixed to the door reinforcing plate 605. After the handle subassembly 413 is fixed on the reinforcing plate 605, the locking device 511 of the mounting jig 500 is moved from the locked position to the unlocked position, and the mounting jig 500 is detached from the door outer sheet-metal 402. Then, as shown in Figure 6D, it can then be seen that the fitting portion 417 of the handle subassembly 413 passes through the reinforcing plate 605 and extends out of the handle hole 407 of the outer sheet-metal 402. Next, the handle cover plate 418 is moved from the outer side of the outer sheet-metal 402 to the handle hole 407 of the sheet-metal 402, so that the handle cover plate 418 covers the fitting portion 417. The handle cover plate 418 is then slightly pressed so that the cover plate 418 is

coupled to the handle subassembly 413 through the lugs 419 to form the handle assembly 400.

[0076] In the above-mentioned process of mounting the handle assembly 400 on the vehicle door, since the handle subassembly 413 is positioned relative to the door outer sheet-metal 402 by the mounting jig 500, a uniform gap and face difference is ensured between the outer contour of the cover plate 418 mounted on the handle subassembly 413 and the hole contour of the handle hole 407 of the outer sheet-metal.

[0077] Moreover, since the simulation housing 501 only needs to ensure the position in the x and z directions after being inserted into the handle hole 407, there is no requirement on the contour shape of the outer sheet-metal 402; in addition, since the suction cup 211 in the first embodiment whose position needs to fit with the outer sheet-metal 402 is omitted, the requirement on the machining accuracy of the mounting jig 500 is also lower.

[0078] It is worth noting, however, that if a plurality of persons cooperate to install the concealed door handle assembly 500, the mounting jig may comprise only the simulation housing and positioning devices described above, but not the locking device described above. When installing the handle assembly with such a mounting jig, an operator needs to press against the simulation housing embedded in the handle hole of the outer sheet-metal from the outer side of the door outer sheet-metal, so that the simulation housing cannot move in the y direction relative to the door outer sheet-metal. Since the mounting jig also positions the handle subassembly by the simulation housing and the positioning device with respect to the door outer sheet-metal, a uniform gap and face difference is ensured between the outer contour of the cover plate mounted on the handle subassembly and the hole contour of the handle hole of the outer sheet-metal. Therefore, regardless of whether it is a jig that requires a plurality of persons to cooperate to complete installation or a jig that allows independent installation by one person, it is within the scope of protection of the present invention.

[0079] In order to more clearly show the specific structure in which the locking device 511 locks and connects the handle subassembly 413 and the simulation housing 501,

Figures 7A and 7B show a schematic view of a partial structure of the handle subassembly 413 and the simulation housing 501 when the locking device 511 is in the locked position in the state shown in Figure 6C, wherein Figure 7A is a view seen from the outside of the door outer sheet-metal 402 and Figure 7B is a cross-sectional view taken along line A - A shown in Figure 7A. As shown in Figures 7A and 7B, the locking device 511 is in the locked position, the chute 526.1 accommodates the lugs 419, and the chute 526.2 accommodates the bolt 521.

[0080] While the present invention has been particularly disclosed and described above with reference to preferred embodiments, it should be understood that the description is not intended to limit the present invention. Various modifications and alterations may be made by those of ordinary skill in the present art without departing from the spirit and scope of the present invention as defined by the Claims attached hereafter.

CLAIMS

1. A mounting jig for a concealed door handle assembly, comprising:

a simulation housing having an outer contour configured to match a handle hole defined in an outer sheet-metal of a door, such that the simulation housing is embedded in the handle hole of the outer sheet-metal;

a positioning device, the positioning device being disposed inside the simulation housing to position a concealed door handle subassembly when the concealed door handle subassembly is mounted on a reinforcing plate; and

a retaining device configured to retain the simulation housing in the handle hole and to release the simulation housing from the handle hole.

2. The mounting jig of claim 1, wherein:

the door is provided with the reinforcing plate, the outer sheet-metal being located outside the reinforcing plate;

the concealed door handle subassembly comprises a handle cover plate and a handle subassembly, the handle subassembly having a fitting portion; and

the handle subassembly is mounted inside the reinforcing plate such that the fitting portion is aligned with the handle hole on the outer sheet-metal, the handle cover plate being configured to embed in the handle hole of the outer sheet-metal and mount to the fitting portion.

3. The mounting jig of claim 1, wherein:

the simulation housing comprises a bottom plate and an outer edge extending from an inner side of the bottom plate, wherein the bottom plate matches the handle hole, and the outer edge is configured to be inserted into the handle hole.

4. The mounting jig of claim 3, wherein:

the outer edge comprises a retaining rib to contact an edge of the outer sheet-metal defining the handle hole.

5. The mounting jig of claim 1, wherein:

the retaining device is an adsorption device configured to attach to the outer sheet-metal by an adsorptive or magnetic force to retain the simulation housing in the handle hole.

6. The mounting jig of claim 1, wherein:

the retaining device is a locking device that retains the simulation housing in the handle hole by locking the simulation housing on the handle subassembly.

7. The mounting jig of claim 6, wherein:

the simulation housing comprises a locking portion configured to cooperate with the locking device, the locking portion comprises a bolt and defines a bolt opening, and the bolt is disposed in the bolt opening.

8. The mounting jig of claim 7, wherein:

the locking device comprises:

a connecting rod, the connecting rod being disposed inside the simulation housing,

a slider, the slider being coupled to the middle of the connecting rod and extending through the simulation housing, and

a buckle, the buckle being disposed on at least one end of the connecting rod; and

by sliding the slider, the locking device selectively moves from an unlocked position to a locked position and from the locked position to the unlocked position.

9. The mounting jig of claim 8, wherein:

the buckle comprises first and second chutes respectively defining opposing first and second chute openings, the first chute is configured to engage with a lug on the fitting portion of the handle subassembly, and the second chute is configured to engage with the bolt.

10. A mounting jig for a concealed door handle, comprising:

a simulation housing comprising an outer contour configured to match a handle hole defined in an outer sheet-metal of a door, such that the simulation housing is insertable into the handle hole,

wherein the outer contour of the simulation housing fits the handle hole to retain the simulation housing in the handle hole such that a concealed door handle subassembly is mountable on the inside of the simulation housing.

11. The mounting jig of claim 10, wherein:

the outer contour of the simulation housing is configured to fit the handle hole tightly.

12. The mounting jig of claim 10, further comprising:

a positioning device, the positioning device being disposed inside the simulation housing to position a concealed door subassembly when the concealed door handle subassembly is mounted on a reinforcing plate.

13. A method for mounting a concealed door handle on a vehicle door using a mounting jig, the mounting jig comprising a simulation housing, the method comprising:

embedding the simulation housing in a handle hole of an outer sheet-metal of a door;

retaining the simulation housing in the handle hole and positioning a handle subassembly of a concealed door handle via the simulation housing;

mounting the handle subassembly on a reinforcing plate of the door;

releasing the simulation housing from the handle hole and removing the simulation housing from the door; and

attaching a cover plate of the concealed door handle to the handle subassembly.

14. The method of claim 13, wherein retaining the simulation housing in the handle hole comprises:

fixing a mounting jig to the outer sheet-metal to retain the simulation housing in the handle hole.

15. The method of claim 13, wherein retaining the simulation housing in the handle hole comprises:

locking the simulation housing to the handle subassembly to retain the simulation housing in the handle hole.

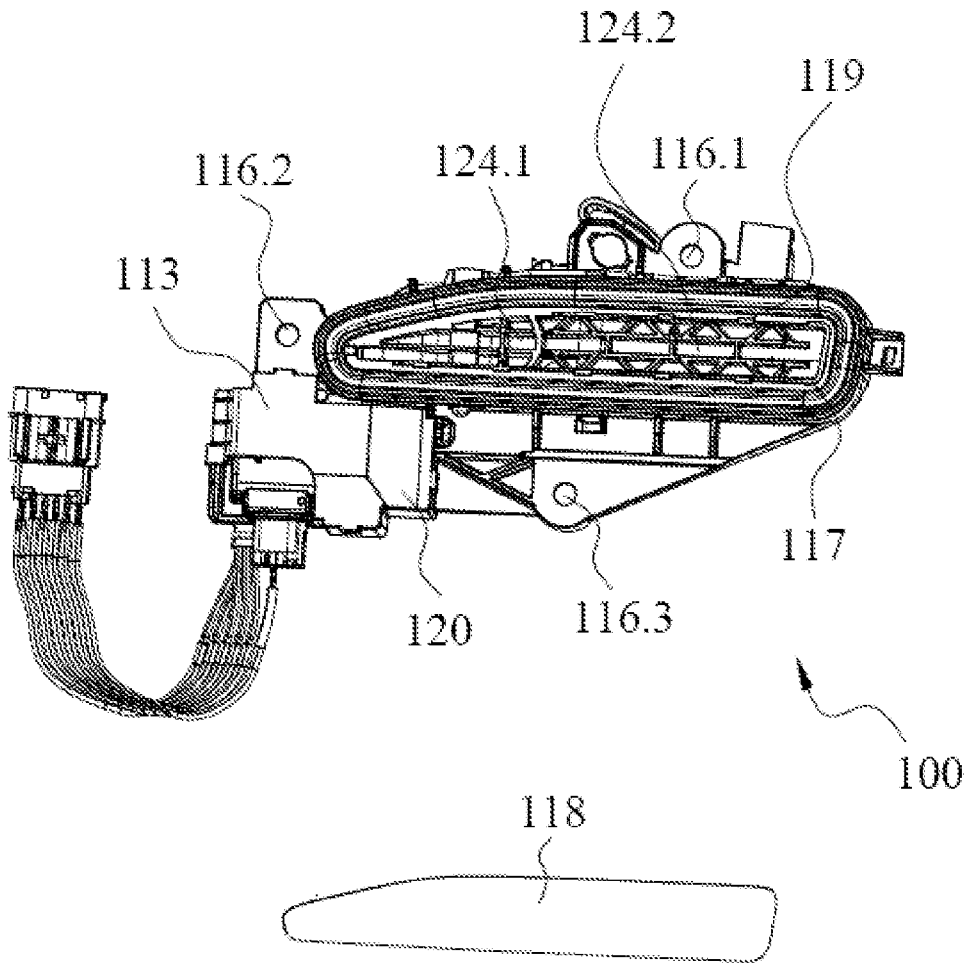


Figure 1A

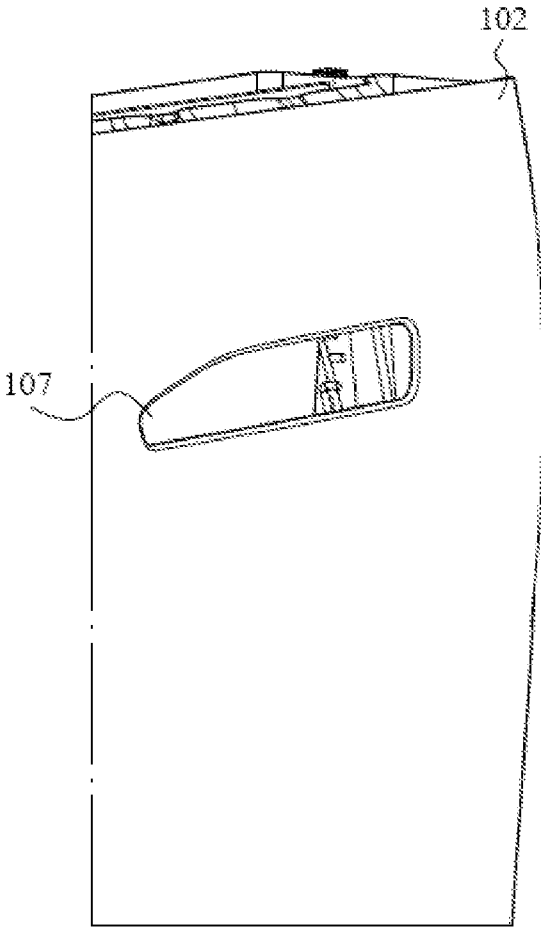


Figure 1B

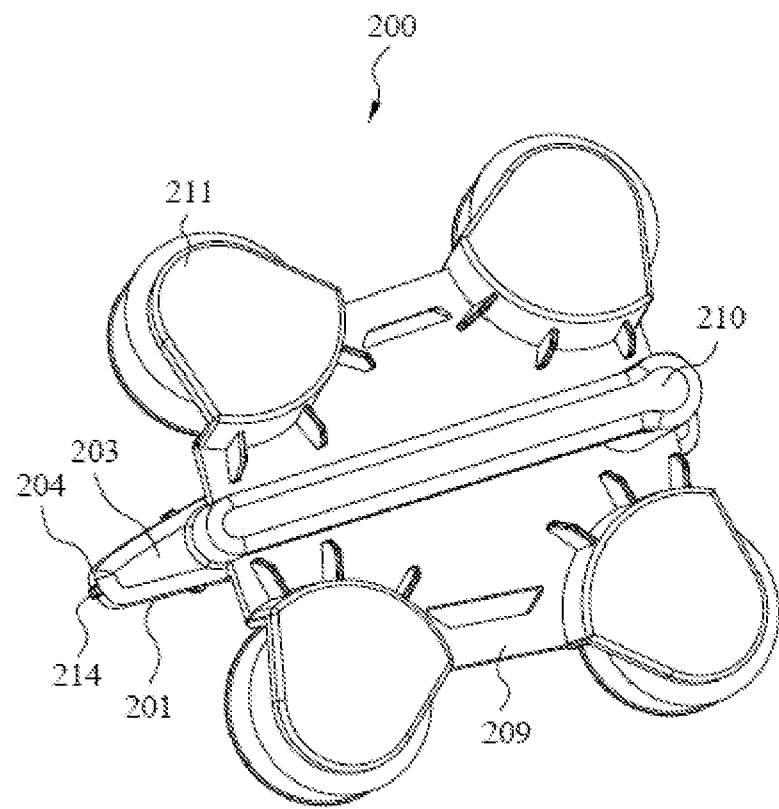


Figure 2A

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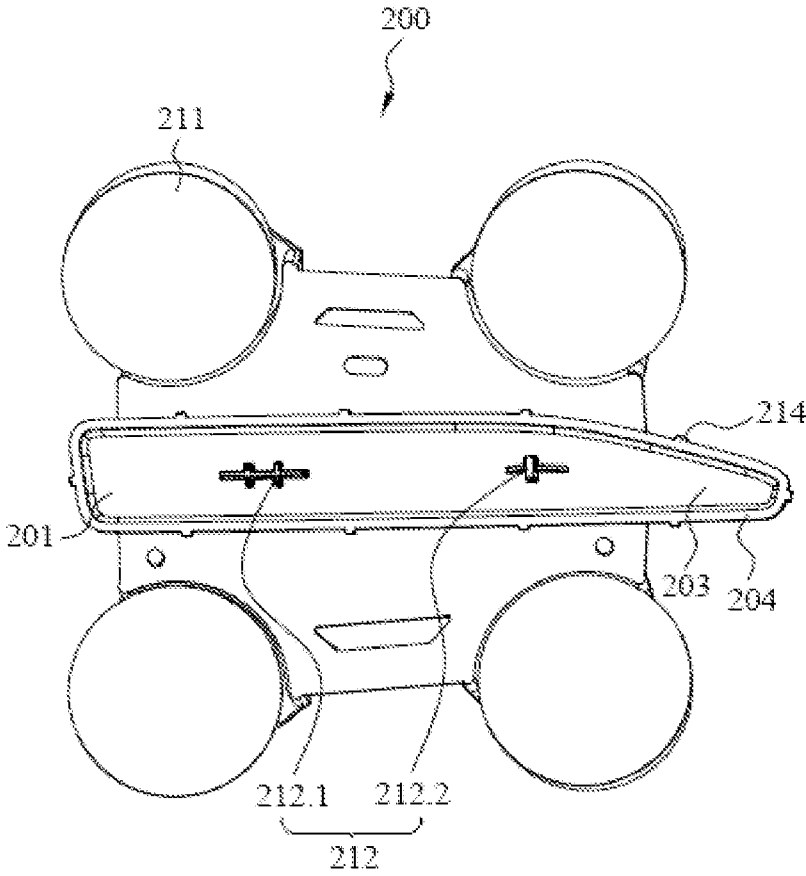


Figure 2B

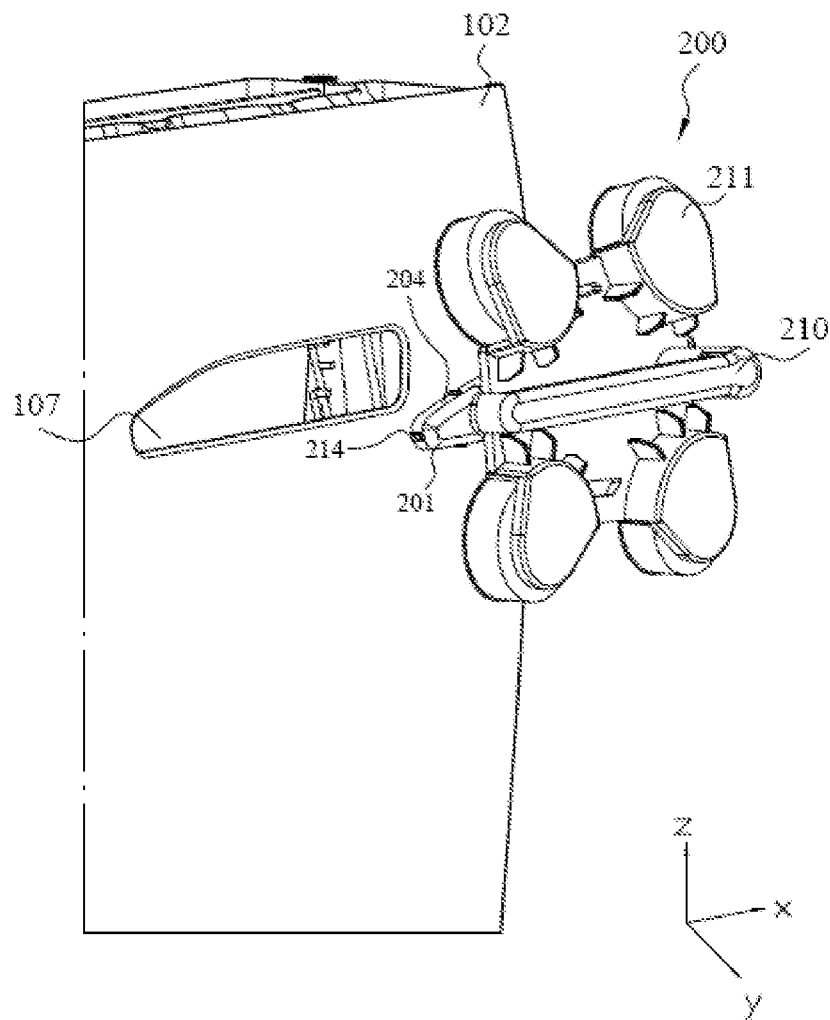


Figure 3A

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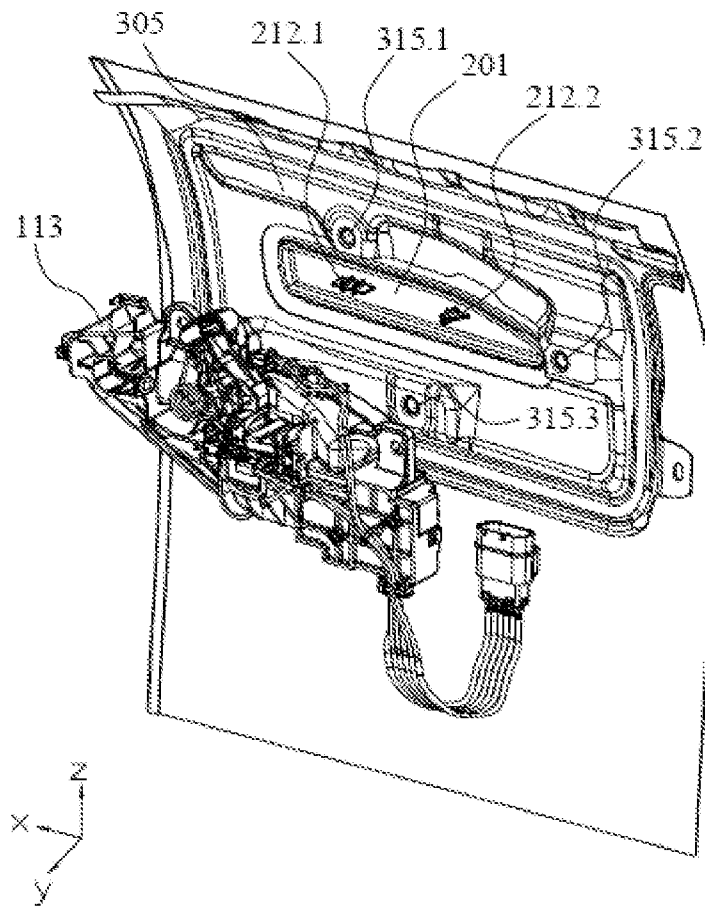


Figure 3B

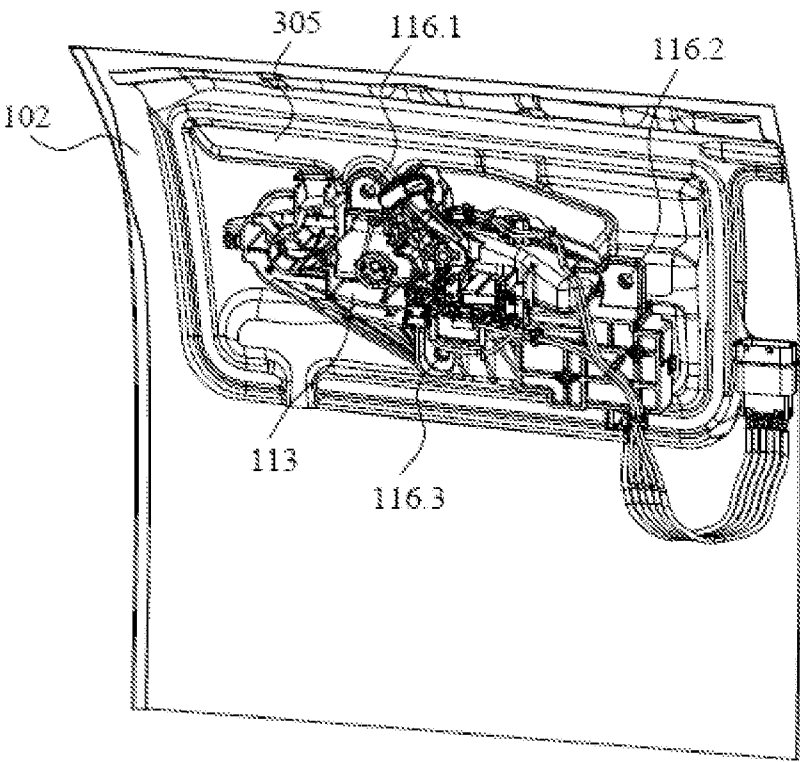


Figure 3C

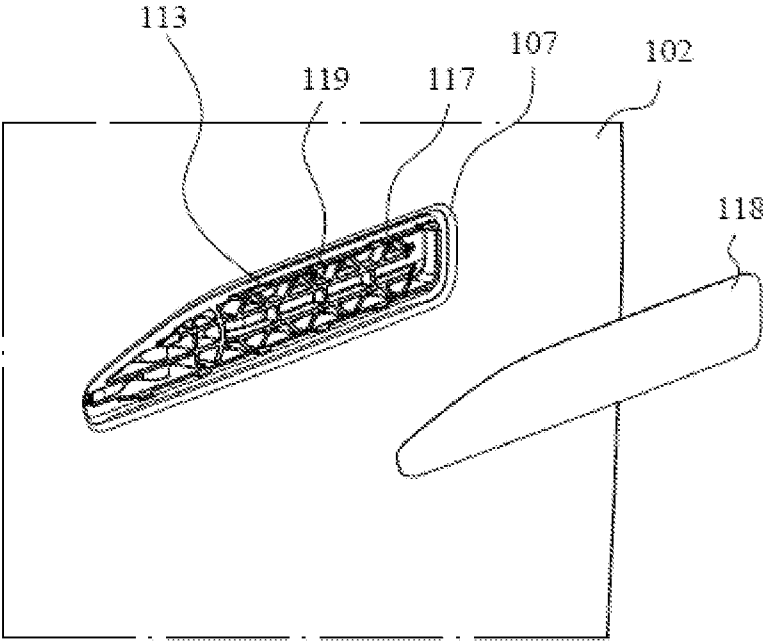


Figure 3D

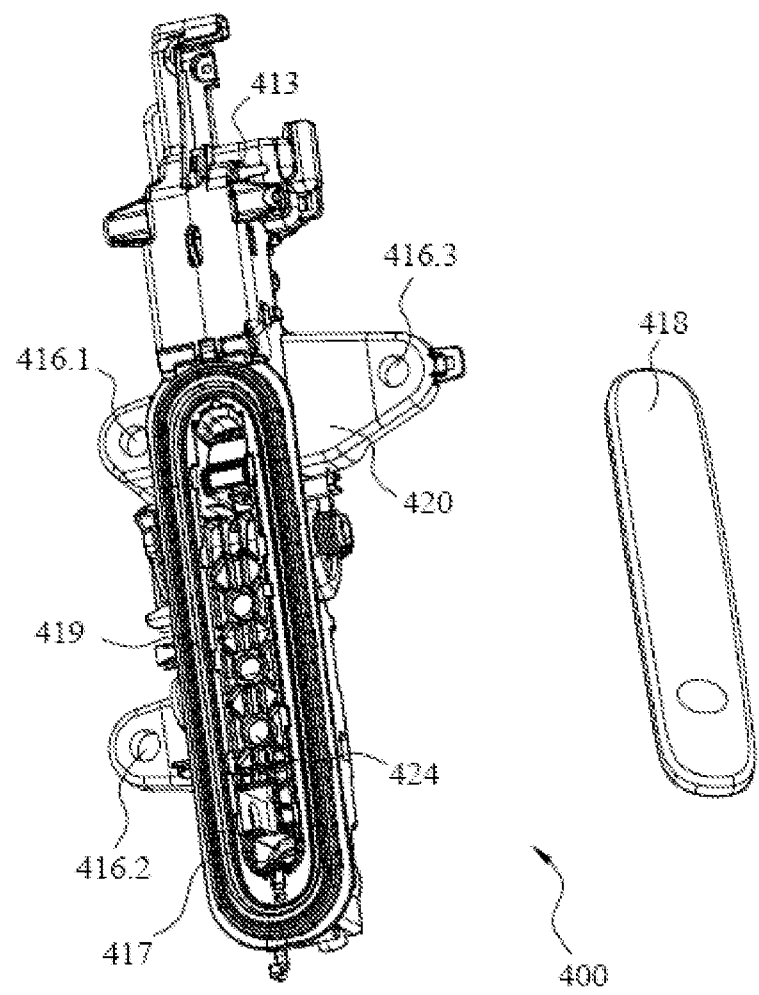


Figure 4A

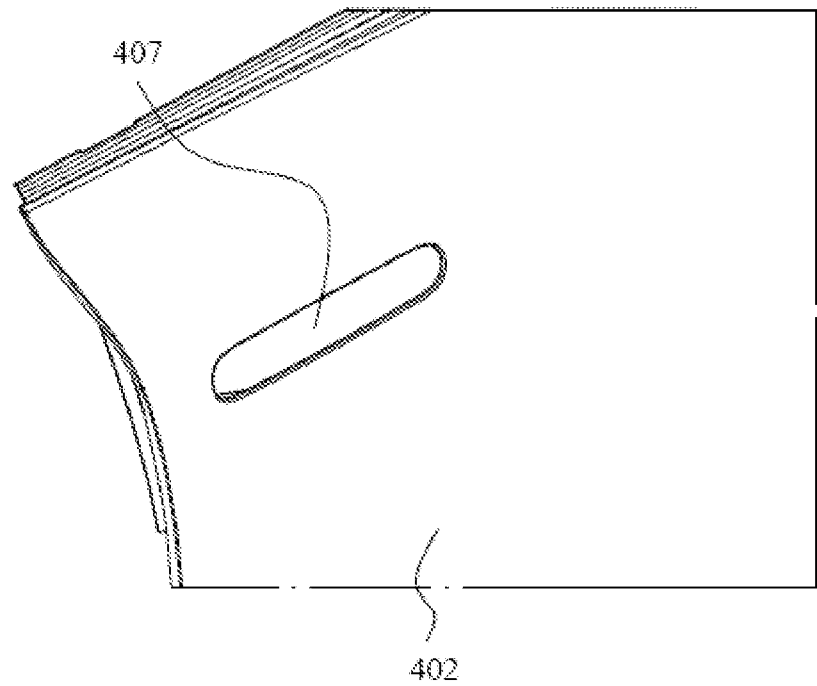


Figure 4B

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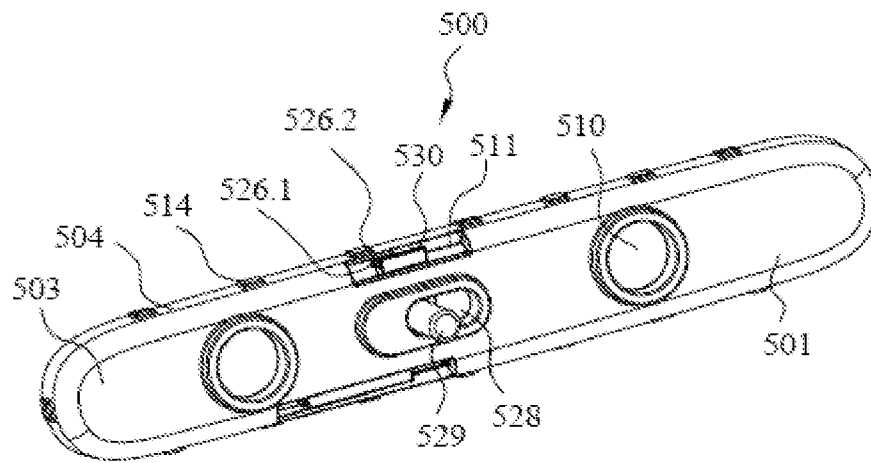


Figure 5A

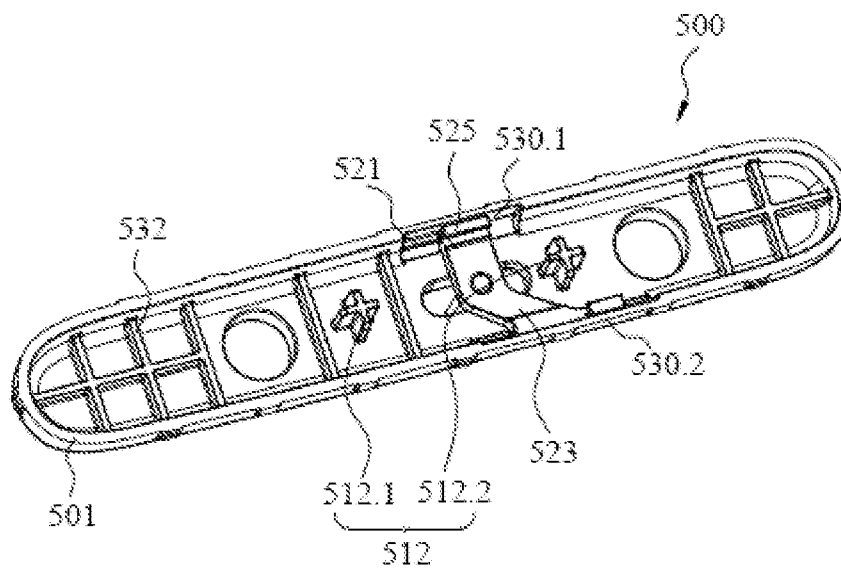


Figure 5B

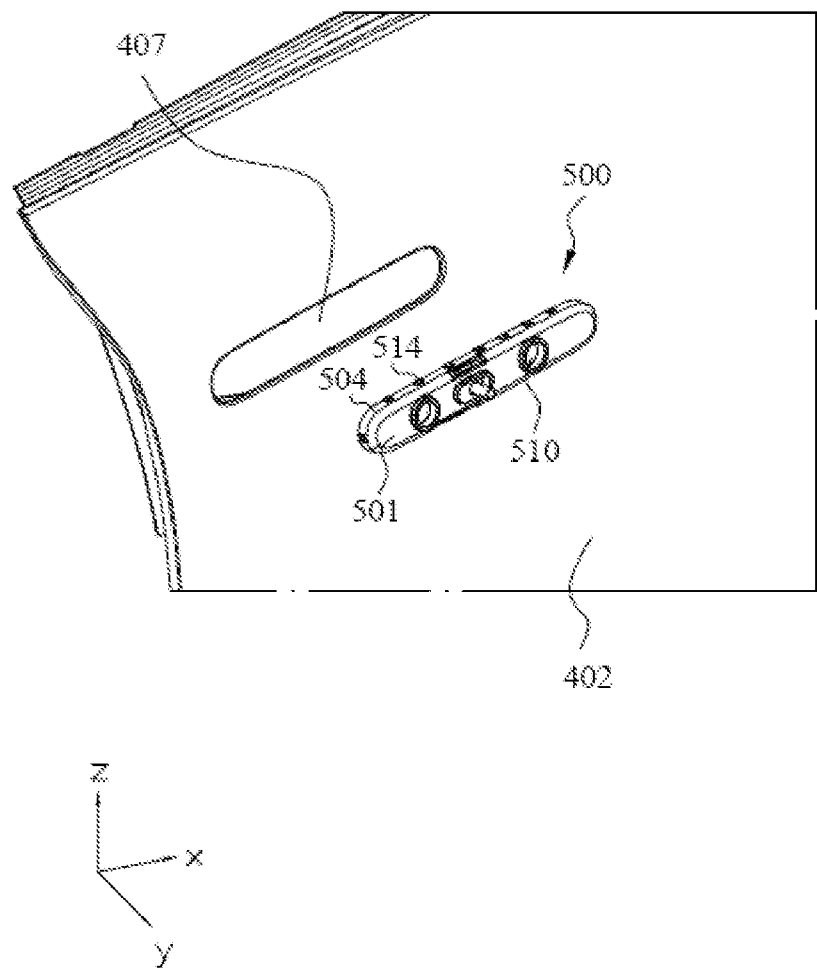


Figure 6A

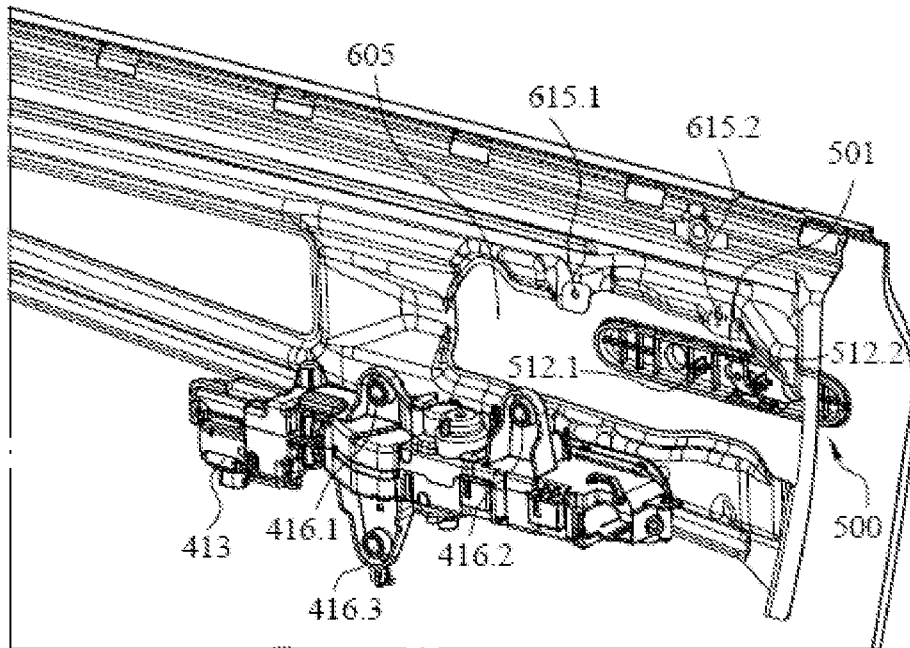


Fig. 6B

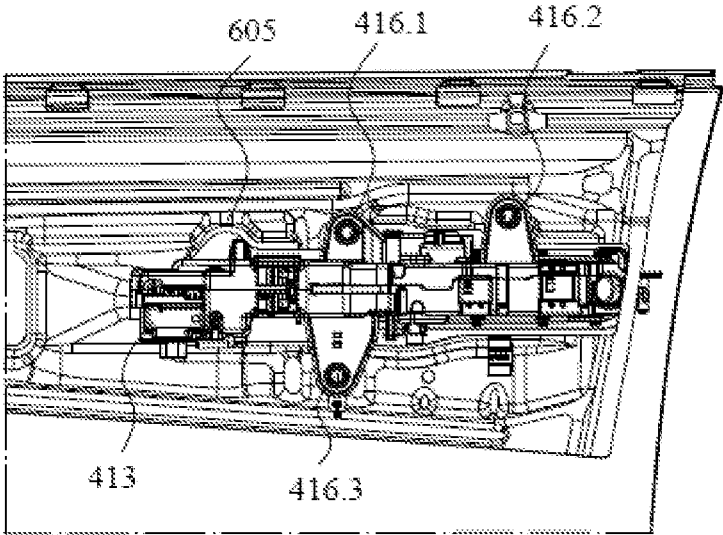


Figure 6C

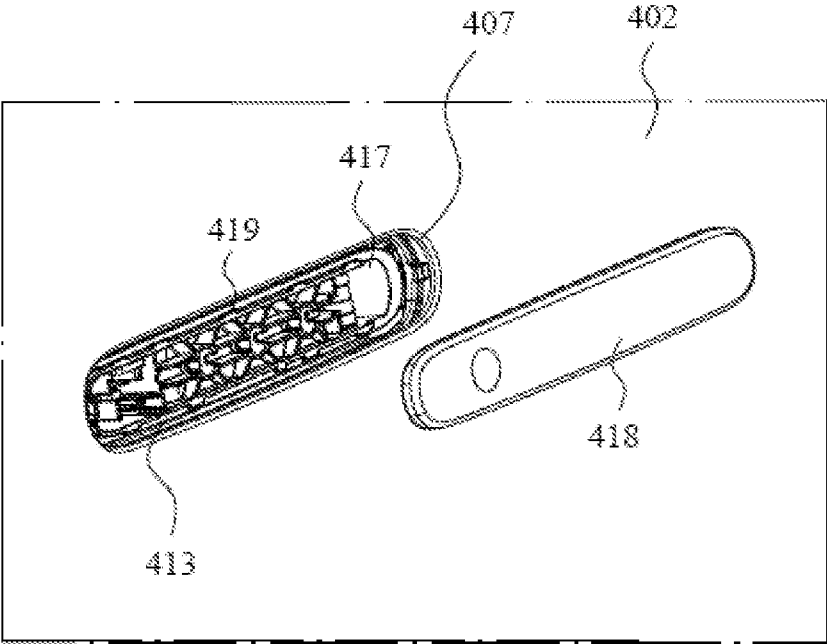


Figure 6D

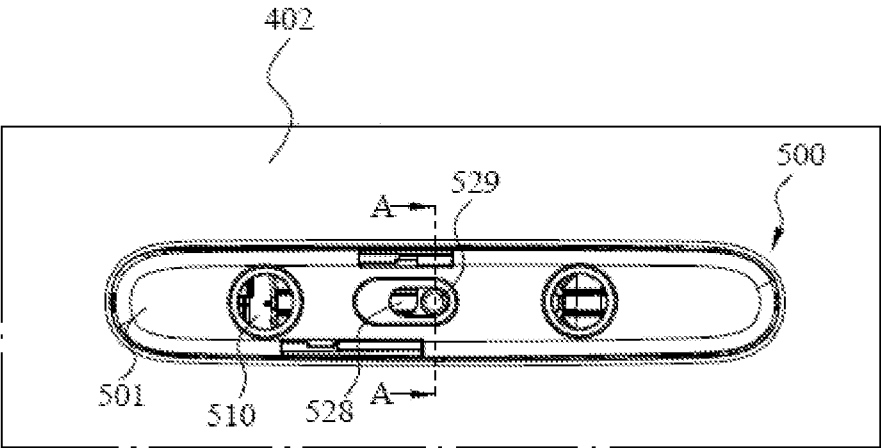


Figure 7A

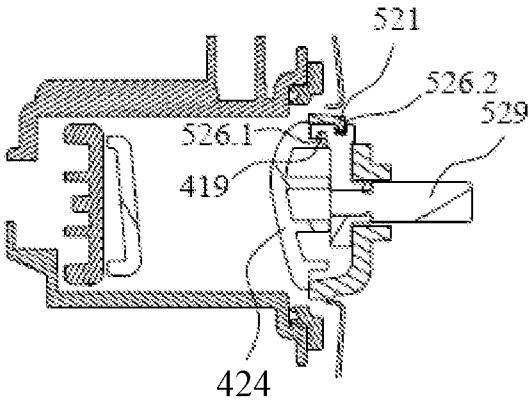


Figure 7B

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2018/066931

A. CLASSIFICATION OF SUBJECT MATTER

INV. E05B79/06 E05B85/10
ADD.

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)
E05B

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR 3 051 819 A1 (PEUGEOT CITROEN AUTOMOBILES SA) 1 December 2017 (2017-12-01) claim 10; figure 2 -----	1,10,13
A	WO 2017/211550 A1 (HUF HÜLSBECK & FÜRST GMBH & CO KG) 14 December 2017 (2017-12-14) claims 11-14; figures -----	1,10,13
A	WO 2016/188694 A1 (BOS GMBH & CO KG) 1 December 2016 (2016-12-01) the whole document -----	1



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"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

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"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

11 March 2019

Date of mailing of the international search report

19/03/2019

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Van Beurden, Jason

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2018/066931

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
FR 3051819	A1	01-12-2017	NONE	

WO 2017211550	A1	14-12-2017	CN 109154317 A	04-01-2019
			DE 102016110754 A1	14-12-2017
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