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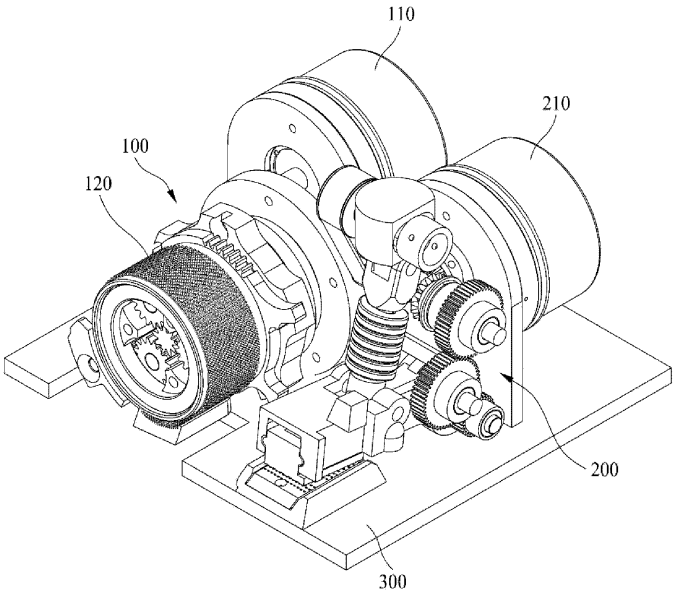
(54) INNER MODULE STRUCTURE OF AUTO STRAPPING PACKAGING TOOL

(57) Provided is an inner module structure of an auto strapping packaging tool including a tension module in which first power generated by a first dedicated motor disposed at a rear side is transmitted to a front side to provide a tensile force to a packaging plastic band, and a welding module which is disposed at one side of the tension module, and in which a gripper unit is opened or closed by second-1 power due to axial rotation in a forward direction of a second dedicated motor disposed at a rear side, and the gripper unit linearly reciprocates by second-2 power due to axial rotation in a reverse direction of the second dedicated motor to provide a friction force to the plastic band to which the tensile force is applied through the tension module.

【Fig. 1】



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Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to and the benefit of Korean Patent Application No. 10-2021-0006584, filed on 18 January 2021, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND

1. Field of the Invention

[0002] The present invention relates to an auto strapping packaging tool, and more particularly, to an auto strapping packaging tool used when packaging goods and the like using a plastic band.

2. Discussion of Related Art

[0003] Auto strapping packaging tools have portable tool types and are used to package goods such as boxes using plastic bands. Packaging is performed by wrapping goods using a plastic band to form a loop and tightening the plastic band using an auto packaging tool until a predetermined magnitude of tension is generated on the loop. Then, a subsequent process is performed by bonding portions of the plastic band which overlaps itself in two layers. In this case, the bonding is mainly performed by using friction heat generated by vibrating the plastic band in a state in which the plastic band is pressed. Accordingly, solid bonding between homogeneous materials is performed on the plastic band in a locally molten state. Then, when the bonded portions are cooled, a solid loop is formed.

[0004] Conventional auto strapping packaging tools have similar exteriors. This is because of a shape of a body housing, configuration of components disposed therein, an arrangement thereof, and the like. In addition, one cylindrical brushless direct current (BLDC) motor is disposed and controlled in the conventional strapping packaging tool. However, since an internal structure according to the conventional technology becomes complex, and high vibration due to linear reciprocating motion is transmitted to other apparatuses in a welding process, there is a problem of badly affecting the durability of internal components.

[0005] In addition, since a layout of the components is limited due to the long cylindrical BLDC motor, an unbalance occurs in the overall weight distribution, and thus inconvenience is raised in terms of usability. In addition, in the conventional auto packaging tool, due to a complex structure, a manufacturing cost is increased, it is difficult to deal with problems, and thus there is a problem in that costs of purchase, maintenance, and the like are increased.

[Prior Art]

[Patent Document]

[0006]

(Patent Document 1) Korean Patent Registration No. 10-1675003 (registered on Nov 4, 2016) "STRAPPING DEVICE WITH A GEAR SYSTEM DEVICE"
(Patent Document 2) Korean Patent Registration No. 10-1613247 (registered on Apr 11, 2016) "STRAPPING DEVICE WITH A TENSIONER"
(Patent Document 3) Korean Patent Publication No. 10-2019-0034662 (published on Apr 2, 2019) "STRAPPING APPARATUS"

SUMMARY OF THE INVENTION

[0007] The present invention is directed to providing an inner module structure of an auto strapping packaging tool, in which internal components are formed in units of modules so that automatic assembly of a product is realized.

[0008] In addition, the present invention is directed to improving a conventional complex structure by substituting a conventional motor with a motor having a new type and newly designing a dedicated motor to be disposed in each module.

[0009] In addition, the present invention is directed to minimizing an unbalance of internal weight due to components and improving user convenience.

[0010] In addition, the present invention is directed to maximizing productivity and assemblability by producing and assembling the product in units of modules, decreasing a manufacturing cost of the product, and securing price competitiveness.

[0011] According to an aspect of the present invention, there is provided an inner module structure of an auto strapping packaging tool, the inner module structure including a tension module in which first power generated by a first dedicated motor disposed at a rear side is transmitted to a front side to provide a tensile force to a packaging plastic band, and a welding module which is disposed at one side of the tension module, and in which a gripper unit is opened or closed by second-1 power due to axial rotation in a forward direction of a second dedicated motor disposed at a rear side in the welding module, and the gripper unit linearly reciprocates by second-2 power due to axial rotation in a reverse direction of the second dedicated motor to provide a friction force to the plastic band to which the tensile force is applied through the tension module, wherein each of the tension module and the welding module is formed in units of modules, and driving of the tension module and the welding module is individually controlled.

[0012] Each of the first dedicated motor and the second dedicated motor may be a flat motor.

[0013] The welding module may further include an

opening and closing unit which is coupled to an upper portion of the gripper unit and provides vertical movement for the gripper unit to open or close the gripper unit through an operation according to axial rotation when the second-1 power is transmitted, and a belt pully part disposed between the second dedicated motor and the opening and closing unit to transmit the second-1 power between the second dedicated motor and the opening and closing unit.

[0014] The opening and closing unit may include a first driven shaft which is driven by the second-1 power transmitted by the belt pully part and has a first eccentric element formed on an outer circumferential surface, a head part through which the first driven shaft passes, in which the first eccentric element is in contact with an inner side surface, and which performs cam movement according to axial rotation of the first driven shaft, and a connecting rod part having one end coupled to a lower side of the head part and the other end coupled to the gripper unit to vertically move the gripper unit according to movement of the head part.

[0015] An elastic member, which buffers vibration generated by linear reciprocating movement of the gripper unit, may be disposed on an outer circumferential surface of the connecting rod part.

[0016] The gripper unit may include a second driven shaft which is driven by the second-2 power and has a second eccentric element formed on an outer circumferential surface, an inner gripper part in which a half ring piece formed at one end of the inner gripper part is held on the second driven shaft to linearly and slidably reciprocate due to cam movement according to axial rotation of the second driven shaft, and guide protrusions are formed on both side surfaces, and an outer gripper part of which one end is axially rotatably coupled to the second driven shaft, and in which the inner gripper part is accommodated and slidably enters or exits.

[0017] The outer gripper part may further include protrusion grooves formed in an inner side surface to correspond to the guide protrusions and fastening holes on which parts of upper surfaces are open and to which an end portion of the connecting rod part is axially rotatably coupled.

[0018] The inner module structure may further include a spur gear part disposed between the second dedicated motor and the gripper unit to transmit the second-2 power between the second dedicated motor and the gripper unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The above and other objects, features and advantages of the present invention will become more apparent to those of ordinary skill in the art by describing exemplary embodiments thereof in detail with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view illustrating an inner module structure of an auto strapping packaging tool according to one embodiment of the present invention;

FIG. 2 is a plan view of FIG. 1 when viewed from another direction;

FIG. 3 is an exploded perspective view of FIG. 1;

FIG. 4 is an exploded perspective view illustrating an opening and closing unit of FIG. 1;

FIG. 5 is an exploded perspective view illustrating a gripper unit of FIG. 1;

FIGS. 6A and 6B are a set of views showing a process in which the gripper unit of FIG. 1 is opened and closed; and

FIG. 7 is a view showing a direction in which the gripper unit linearly reciprocates in FIG. 6B.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0020] Hereinafter, when the present invention is described, in a case in which it is determined that the detailed descriptions of related technologies well-known to those skilled in the art unnecessarily obscure the gist of the invention, the detailed descriptions will be omitted. The terminologies used herein are for the purpose of describing particular embodiments only and are not intended to be limiting to the invention. As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise.

[0021] It will be further understood that the terms "comprises," "comprising," "includes" and/or "including," when used herein, specify the presence of stated features, integers, steps, operations, elements, components, and/or groups thereof but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0022] Hereinafter, a specific embodiment of the present invention will be described in detail with reference to the accompanying drawings.

[0023] FIG. 1 is a perspective view illustrating an inner module structure of an auto strapping packaging tool according to one embodiment of the present invention, FIG. 2 is a plan view of FIG. 1 when viewed from another direction, FIG. 3 is an exploded perspective view of FIG. 1, FIG. 4 is an exploded perspective view illustrating an opening and closing unit of FIG. 1, and FIG. 5 is an exploded perspective view illustrating a gripper unit of FIG. 1.

[0024] Referring to FIGS. 1 to 5, the inner module structure of an auto strapping packaging tool according to one embodiment of the present invention may include a tension module 100, a welding module 200, a base plate 300, and the like. In the auto strapping packaging tool, a tensile force having a predetermined magnitude is applied to a plastic band through the tension module 100 after the packaging plastic band is disposed to wrap goods. In addition, in the auto strapping packaging tool, the plastic band receives friction heat caused by vibration

in a state in which the plastic band is pressed by the welding module 200, and portions of the plastic band, which overlaps itself in two layers, are locally melted and bonded. In this case, the plastic band may be formed of a polypropylene (PP) material, a polyethylene terephthalate (PET) material, or the like.

[0025] The base plate 300 according to one embodiment may be a portion forming a part of a body housing, particularly, that is, a bottom part. The base plate 300 allows the auto strapping packaging tool to be in surface contact with a flat surface of target goods or a ground surface paper so that the packaging tool is disposed to be perpendicular to the goods and the like. In addition, the base plate 300 may further include at least one holding element to allow various components forming the auto strapping packaging tool to be stably disposed, installed, and fixed.

[0026] In the tension module 100, first power generated by a first dedicated motor 110 disposed at a rear side in the tension module 100 is transmitted to a front side so as to provide a tensile force to the packaging plastic band. The tension module 100 is disposed at one side of an upper surface of the base plate 300 and receives a rotational force provided by the first dedicated motor 110 to wrap and pull one end of the plastic band. The tension module 100 may provide the tensile force to the plastic band through an operation of pulling the plastic band in a strapping process.

[0027] The tension module 100 may include a wheel driven shaft 121 which is disposed in a central portion thereof and axially rotated, a worm gear unit which is a gear assembly disposed on an outer circumference of the wheel driven shaft 121 and engaged with the wheel driven shaft 121 to be rotated at a reduced speed, and the like. In addition, the tension module 100 may further include a feed wheel part 120 which is coupled to an outer circumferential surface of the worm gear unit, is rotated therewith, and wraps and pulls the plastic band using a friction force caused by pressurization, and the like. In this case, the feed wheel part 120 has a cylindrical shape, and a knurling part is formed on an outer circumferential surface of the feed wheel part 120. In addition, a first driving shaft of the first dedicated motor 110 is disposed to be parallel to the wheel driven shaft 121. In addition, a spur gear, which transmits a rotational force to the wheel driven shaft 121, is coupled to the first driving shaft. As a result, the first power generated by the first dedicated motor 110 may be transmitted to the feed wheel part 120 through the first driving shaft, the wheel driven shaft 121, and the worm gear unit.

[0028] The welding module 200 is disposed at one side of the tension module 100, a gripper unit 220 is opened or closed by second-1 power caused by axial rotation in a forward (either of clockwise and counter-clockwise) direction of a second dedicated motor 210 disposed at a rear side in the welding module 200, and the gripper unit 220 linearly reciprocates due to second-2 power caused by axial rotation in the reverse direction of the second dedicated motor 210 to provide the friction force to the plastic band to which the tensile force is applied through the tension module 100.

[0029] In this case, the second dedicated motor 210 may provide a first rotational force through the rotation in the forward direction. In addition, the second dedicated motor 210 may provide a second rotational force through the rotation in the reverse direction. Meanwhile, a rotating speed, a rotating time, and the like of the second dedicated motor 210 are controlled by a control part (not shown). The first dedicated motor 110 and the second dedicated motor 210 may be electric motors operated by power provided from the outside (or a power source such as an internal battery).

[0030] A second driving shaft of the second dedicated motor 210 may be rotated in the forward or reverse direction according to axial rotation. In addition, a principle, a method, an operation, and the like in which the gripper unit 220 is opened or closed by the second-1 power according to one embodiment will be described below. In addition, a principle, a method, an operation, and the like in which the gripper unit 220 linearly reciprocates by the second-2 power according to one embodiment will also be described below.

[0031] Meanwhile, the first dedicated motor 110 and the second dedicated motor 210 according to one embodiment may be flat motors. In addition, since the first dedicated motor 110 and the second dedicated motor 210 are disposed in the modules, each of the tension module 100 and the welding module 200 is formed in units of modules, and thus driving of the tension module 100 and the welding module 200 may be individually controlled. In addition, since each of the first dedicated motor 110 and the second dedicated motor 210 is disposed at the rear side in the module, a weight of the auto strapping packaging tool may be easily distributed. This is a difference from an inner layout of a conventional auto strapping packaging tool and may improve user convenience. That is, since the weight applied to the auto strapping packaging tool may be effectively distributed, even when the user performs packaging work for a long time, there is no strain on a wrist joint and the like.

[0032] Specifically, the welding module 200 may include the second dedicated motor 210, the opening and closing unit 240, the gripper unit 220, a belt pully part 260, a spur gear part 280, and the like. The welding module 200 is disposed at one side of the tension module 100 and provides the friction heat to bond the plastic band disposed in two layers. Meanwhile, although not illustrated in the drawings, all or some of units, components, and the like included in the welding module 200 may be installed, held, and fixed using the above-described holding elements.

[0033] A bevel gear is coupled to the second driving shaft of the second dedicated motor 210. Meanwhile, due to an arrangement direction of the second dedicated motor 210, the packaging tool according to one embodiment may further include a spur gear part 280 disposed be-

tween the second dedicated motor 210 and the gripper unit 220 to transmit the second-2 power therebetween. The spur gear part 280 may include 1) a first connecting shaft 281 on which a bevel gear and a spur gear are coupled to an outer circumferential surface thereof, and which is perpendicularly engaged with the second driving shaft by the bevel gear and 2) a second connecting shaft 282 which is disposed to be parallel to the first connecting shaft, and to which a spur gear engaged with the spur gear of the first connecting shaft is coupled to be driven by a rotational force of the first connecting shaft. The spur gear part 280 may include the first connecting shaft 281 perpendicularly engaged with the second driving shaft.

[0034] In this case, a one-way clutch bearing may be coupled to the first connecting shaft 281. As a result, in a case in which the second dedicated motor 210 provides the second-1 power in the forward direction, the second-1 power is blocked from being transmitted to the gripper unit 220 through the spur gear part 280.

[0035] The belt pully part 260 is disposed between the second dedicated motor 210 and the opening and closing unit 240 to transmit the second-1 power therebetween. The belt pully part 260 may include 1) a first pully 261 including a first pully shaft in which a bevel gear is coupled to an outer circumferential surface, and to which the second driving shaft is perpendicularly engaged, 2) a second pully 262 disposed to be parallel to the first pully, and 3) a belt 263 coupled to outer circumferential surfaces of the first pully and the second pully. The belt pully part 260 may include the first pully shaft perpendicularly engaged with the second driving shaft of the second dedicated motor 210.

[0036] In this case, the one-way clutch bearing may be coupled to the first pully shaft. As a result, in a case in which the second dedicated motor 210 provides the second-2 power in the reverse direction, the second-2 power is blocked from being transmitted to the opening and closing unit 240 through the belt pully part 260.

[0037] The opening and closing unit 240 is coupled to an upper portion of the gripper unit 220, and when the second-1 power is transmitted, the opening and closing unit 240 provides vertical movement for the gripper unit 220 to open or close the gripper unit 220 through an operation according to axial rotation. The opening and closing unit 240 may include a first driven shaft 241, a head part 243, a connecting rod part 244, an elastic member 245, and the like. In the opening and closing unit 240, when the first driven shaft 241 disposed at an upper end thereof rotates, the connecting rod part 244 is moved downward, and the gripper unit 220 is pressed by the connecting rod part 244. In this case, the plastic band disposed in two layers between an inner gripper part 223 and a lower gripper part 229 is pressed. The opening and closing unit 240 may be driven by the second dedicated motor 210.

[0038] The first driven shaft 241 is driven by the second-1 power transmitted by the belt pully part 260, and a first eccentric element 242 is formed on an outer circumferential surface of the first driven shaft 241. In this case, one end of the first driven shaft 241 is fitted to the second pully. The first driven shaft 241 passes through the head part 243, the first eccentric element 242 is in contact with an inner surface of the head part 243, and the head part 243 performs cam movement according to axial rotation of the first driven shaft 241. One end of the connecting rod part 244 is coupled to a lower side of the head part 243, and the other end thereof is coupled to the gripper unit 220 to vertically move the gripper unit 220 according to the movement of the head part 243. In addition, an elastic member 245, which buffers vibration generated due to linear reciprocating movement of the gripper unit 220, may be disposed on an outer circumferential surface of the connecting rod part 244.

[0039] The second-1 power generated by the second dedicated motor 210 is finally transmitted to the gripper unit 220 through the second driving shaft, the belt pully part 260, the first driven shaft 241, the head part 243, and the connecting rod part 244. In this case, the second-1 power is blocked from being transmitted to the gripper unit 220 by the one-way clutch bearing coupled to the spur gear part 280.

[0040] The gripper unit 220 may include a second driven shaft 221, an inner gripper part 223, an outer gripper part 226, the lower gripper part 229, and the like. The second driven shaft 221 is driven by the second-2 power, and a second eccentric element 222 is formed on an outer circumferential surface of the second driven shaft 221. Meanwhile, a spur gear 230 engaged with the spur gear part 280 is coupled to one end of the second driven shaft 221.

[0041] As a half ring piece 224 formed at one end of the inner gripper part 223 is held on the second driven shaft 221, the inner gripper part 223 linearly and slidably reciprocates due to cam movement according to axial rotation of the second driven shaft 221, and guide protrusions 225 are formed on both side surfaces of the inner gripper part 223. The inner gripper part 223 is moved downward by the opening and closing unit 240 and linearly reciprocates due to the second-2 power generated by the second dedicated motor 210 within a predetermined stroke. That is, the inner gripper part 223 vibrates. Meanwhile, a knurling plate may be formed on a lower surface of the inner gripper part 223. Grooves are repeatedly formed in a lateral or diagonal direction to have a predetermined pattern in the knurling plate.

[0042] One end of the outer gripper part 226 is axially rotatably coupled to the second driven shaft 221, and the inner gripper part 223 may be accommodated in the outer gripper part 226 and may slidably enter or exit the outer gripper part 226. To this end, the outer gripper part 226 may further include protrusion grooves 227 formed in an inner side surface thereof to correspond to the guide protrusions 225 and fastening holes 228 on which parts of upper surfaces are open so that an end portion of the connecting rod part 244 is axially rotatably coupled. The lower gripper part 229 is disposed at a position facing a

lower side of the inner gripper part 223. Meanwhile, a knurling plate is also formed on an upper surface of the lower gripper part 229.

[0043] Meanwhile, the second-2 power generated by the second dedicated motor 210 is finally transmitted to the inner gripper part 223 through the second driving shaft, the spur gear part 280, and the second driven shaft 221. In this case, the second-2 power is blocked from being transmitted to the opening and closing unit 240 by the one-way clutch bearing coupled to the belt pully part 260. Meanwhile, the welding module 200 may further include a cutting unit (not shown) which is moved downward in conjunction with downward movement of the opening and closing unit 240 to cut the plastic band.

[0044] FIGS. 6A and 6B are a set of views showing a process in which the gripper unit of FIG. 1 is opened and closed. Referring to FIG. 6A, the gripper unit 220 is disposed at a predetermined inclination angle with respect to the base plate 300 (or the lower gripper part 229). The gripper unit 220 is in an open state. When the plastic band receives the tensile force through the tension module 100, the second-1 power due to axial rotation of the second dedicated motor 210 is transmitted through the opening and closing unit 240. In this case, the connecting rod part 244 moves the gripper unit 220 in a downward direction through axial rotation of the first driven shaft 241. The connecting rod part 244 is coupled to the outer gripper part 226, and the outer gripper part 226 may be axially rotated about the second driven shaft 221 by downward pressurization so that the outer gripper part 226 may be disposed to be parallel to the lower gripper part 229 (see FIG. 6B).

[0045] Since each of the tension module 100 and the welding module 200 according to one embodiment is formed in units of modules, driving thereof is individually controlled. That is, the tension module 100 and the welding module 200 are completely separated and independently operated. Therefore, the productivity is improved, and the assembly efficiency is maximized.

[0046] A strapping process performed by the auto strapping packaging tool will be described below. First, the plastic band receives the tensile force having a magnitude preset by the first power generated by the first dedicated motor 110. Accordingly, the tensile force providing process is completed. Then, the welding module 200 operates for welding. A welding process is started by an operation of the opening and closing unit 240. In this process, when the connecting rod part 244 is moved downward by the second-1 power generated by the second dedicated motor 210, the gripper unit 220 in the open state (see FIG. 6A) is switched to a closed state. Then, the gripper unit 220 linearly reciprocates due to the second-1 power generated by the second dedicated motor 210 to provide the friction force to the plastic band provided through the tension module 100. As a result, the plastic band, which overlaps itself in two layers, disposed between the inner gripper part 223 and the lower gripper part 229 is locally melted and two layers are bonded.

[0047] According to a solution of the objectives of the present invention, various effects including the following contents can be expected. However, the present invention is not implemented only when all of the following effects are acquired.

[0048] In an inner module structure of an auto strapping packaging tool according to one embodiment of the present invention, since internal components are formed in units of modules, automatic assembly of a product can be realized.

[0049] In addition, in the present module structure, a conventional complex structure can be effectively improved by substituting motors with a new kind of motor and newly designing a designated motor that is disposed in each module.

[0050] In addition, in the present module structure, an unbalance of internal weigh can be minimized to improve user convenience.

[0051] In addition, the present module structure can maximize productivity and assemblability, decrease a manufacturing cost of the product, and secure price competitiveness by producing and assembling a product in units of modules.

[0052] Although an example of the exemplary embodiment of the present invention has been described, the scope of the present invention is not limited to the specific embodiment and may be properly changed within the range described in the claims.

Claims

1. An inner module structure of an auto strapping packaging tool, comprising:

   a tension module in which first power generated by a first dedicated motor disposed at a rear side is transmitted to a front side to provide a tensile force to a packaging plastic band; and
   a welding module which is disposed at one side of the tension module, and in which a gripper unit is opened or closed by second-1 power due to axial rotation in a forward direction of a second dedicated motor disposed at a rear side in the welding module, and the gripper unit linearly reciprocates by second-2 power due to axial rotation in a reverse direction of the second dedicated motor to provide a friction force to the plastic band to which the tensile force is applied through the tension module,
   wherein each of the tension module and the welding module is formed in units of modules, and driving of the tension module and the welding module is individually controlled.

2. The inner module structure of claim 1, wherein each of the first dedicated motor and the second dedicated motor includes a flat motor.

3. The inner module structure of claim 1 or 2, wherein the welding module further includes:

an opening and closing unit which is coupled to an upper portion of the gripper unit and provides vertical movement for the gripper unit to open or close the gripper unit through an operation according to axial rotation when the second-1 power is transmitted; and
a belt pully part which is disposed between the second dedicated motor and the opening and closing unit to transmit the second-1 power between the second dedicated motor and the opening and closing unit.

4. The inner module structure of claim 3, wherein the opening and closing unit includes:

a first driven shaft which is driven by the second-1 power transmitted by the belt pully part and has a first eccentric element formed on an outer circumferential surface;
a head part through which the first driven shaft passes, in which the first eccentric element is in contact with an inner side surface and which performs cam movement according to axial rotation of the first driven shaft; and
a connecting rod part having one end coupled to a lower side of the head part and the other end coupled to the gripper unit to vertically move the gripper unit according to movement of the head part.

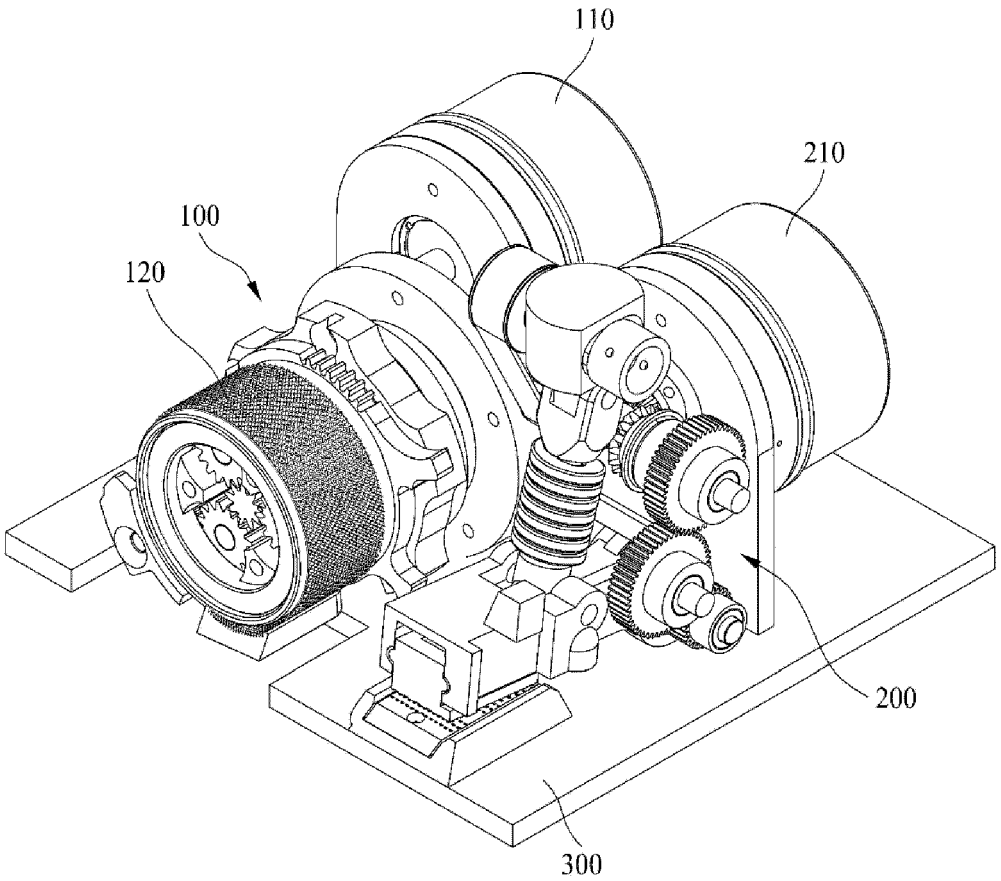
5. The inner module structure of claim 4, wherein an elastic member, which buffers vibration generated by linear reciprocating movement of the gripper unit, is disposed on an outer circumferential surface of the connecting rod part.

6. The inner module structure of any one of claims 1 to 5, wherein the gripper unit includes:

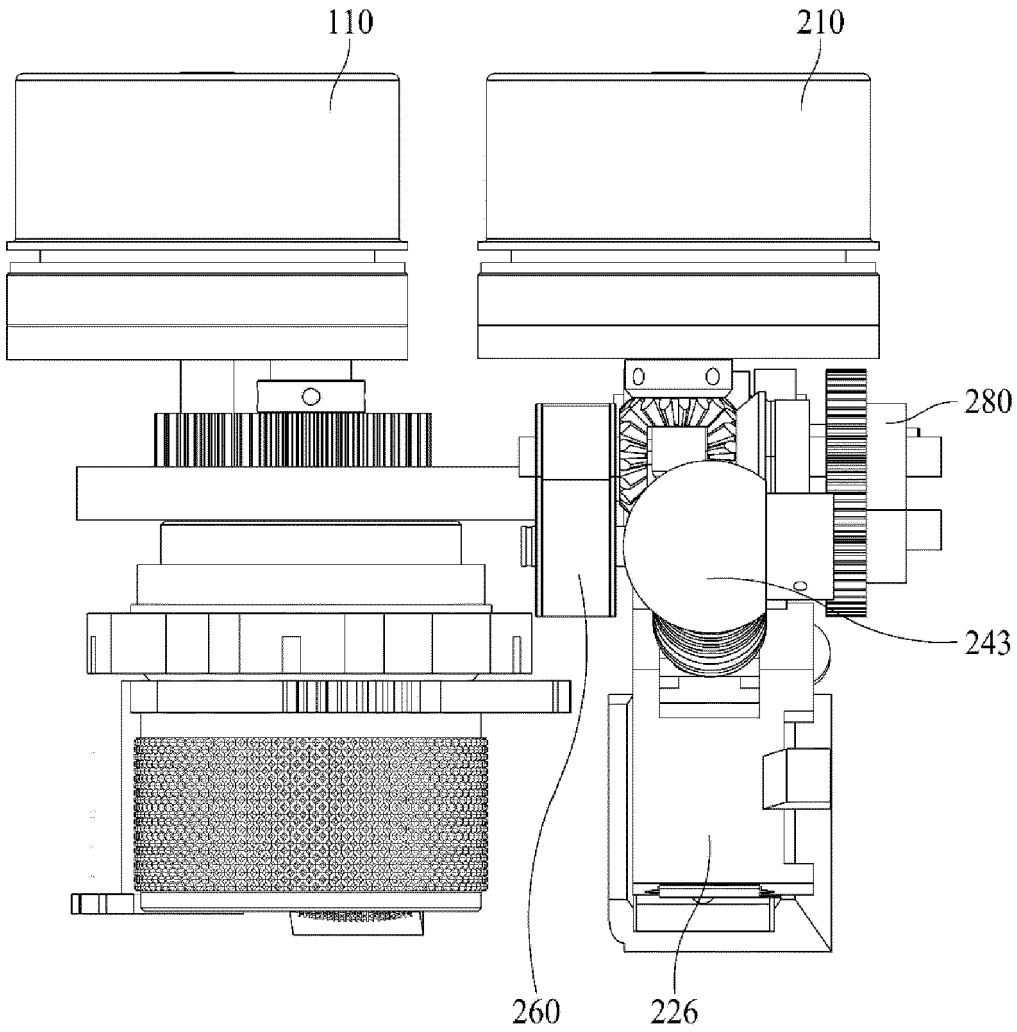
a second driven shaft which is driven by the second-2 power and has a second eccentric element formed on an outer circumferential surface;
an inner gripper part in which a half ring piece formed at one end of the inner gripper part is held on the second driven shaft to linearly and slidably reciprocate due to cam movement according to axial rotation of the second driven shaft, and guide protrusions are formed on both side surfaces; and
an outer gripper part of which one end is axially rotatably coupled to the second driven shaft, and in which the inner gripper part is accommodated and slidably enters or exits.

7. The inner module structure of claim 6, further comprising a spur gear part disposed between the second dedicated motor and the gripper unit to transmit the second-2 power between the second dedicated motor and the gripper unit.

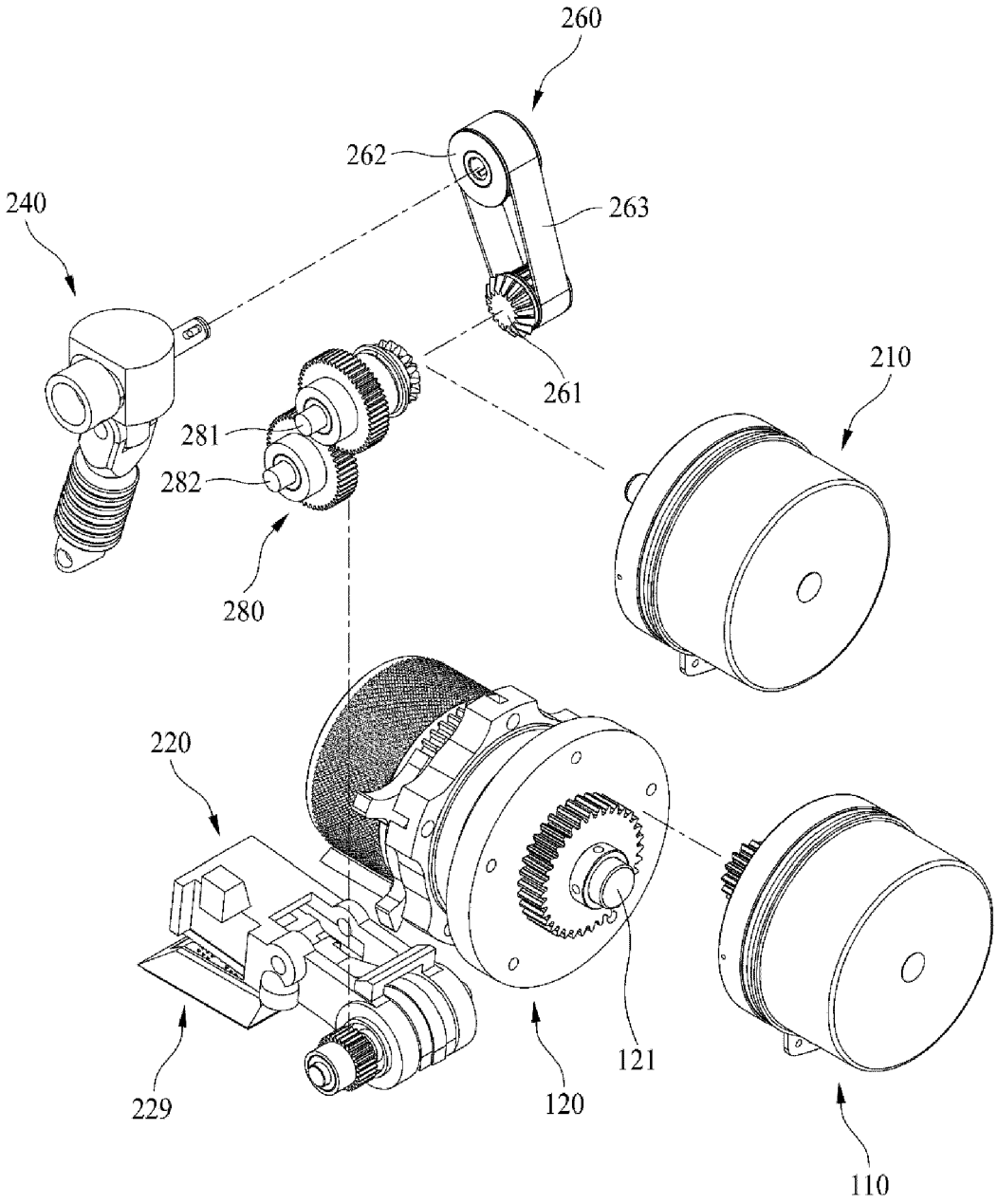
【Fig. 1】



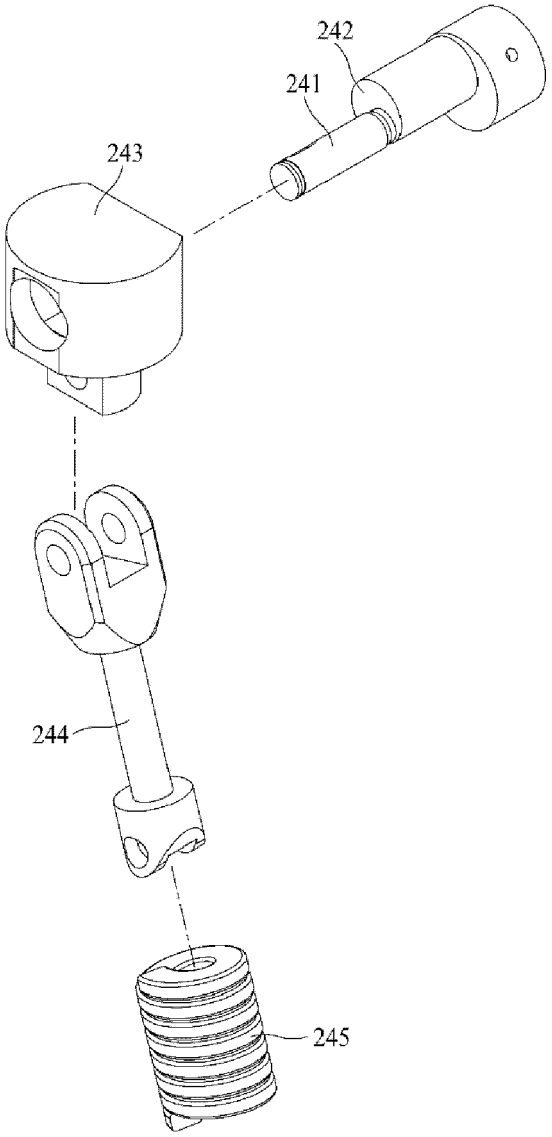
【Fig. 2】



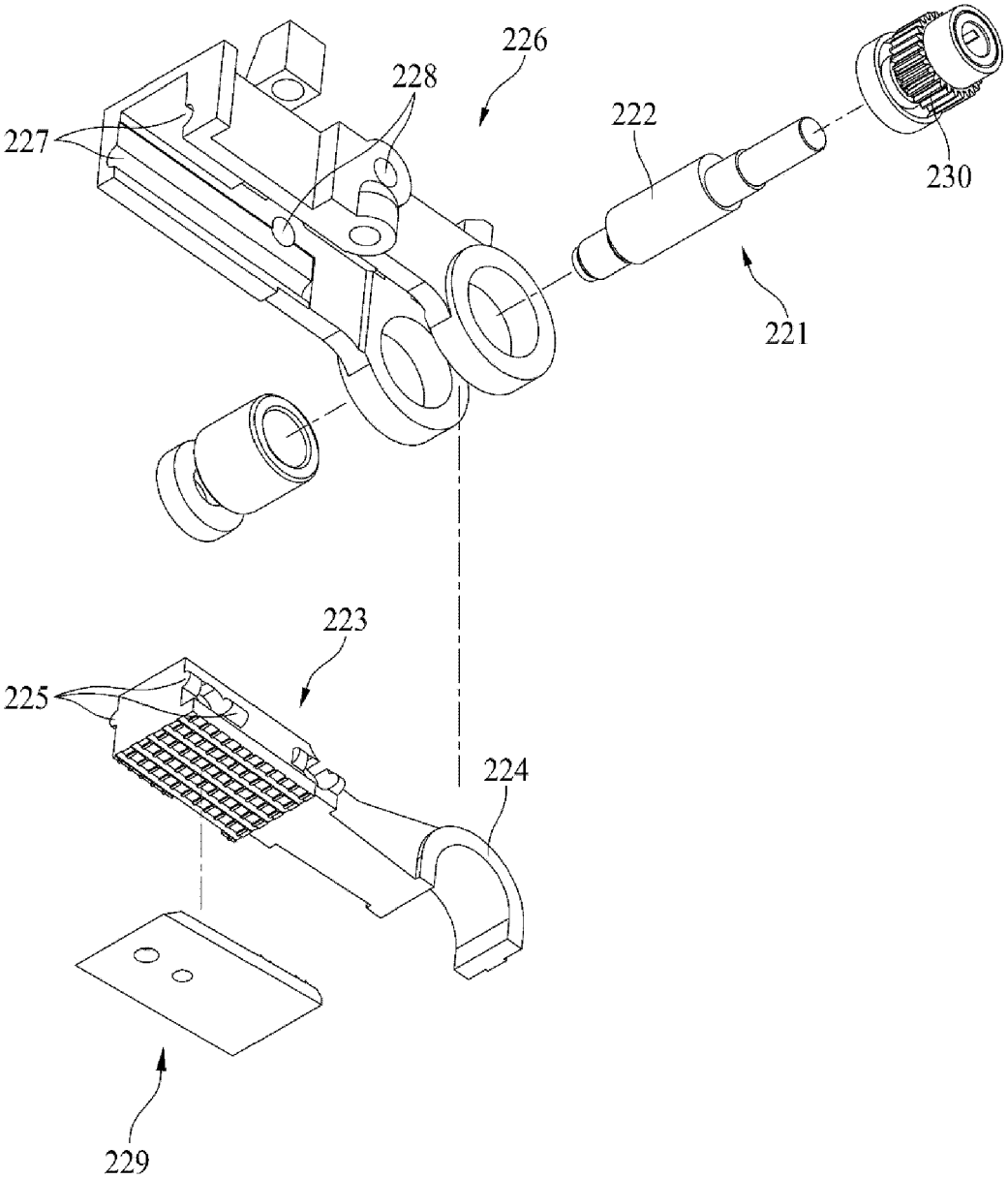
【Fig. 3】



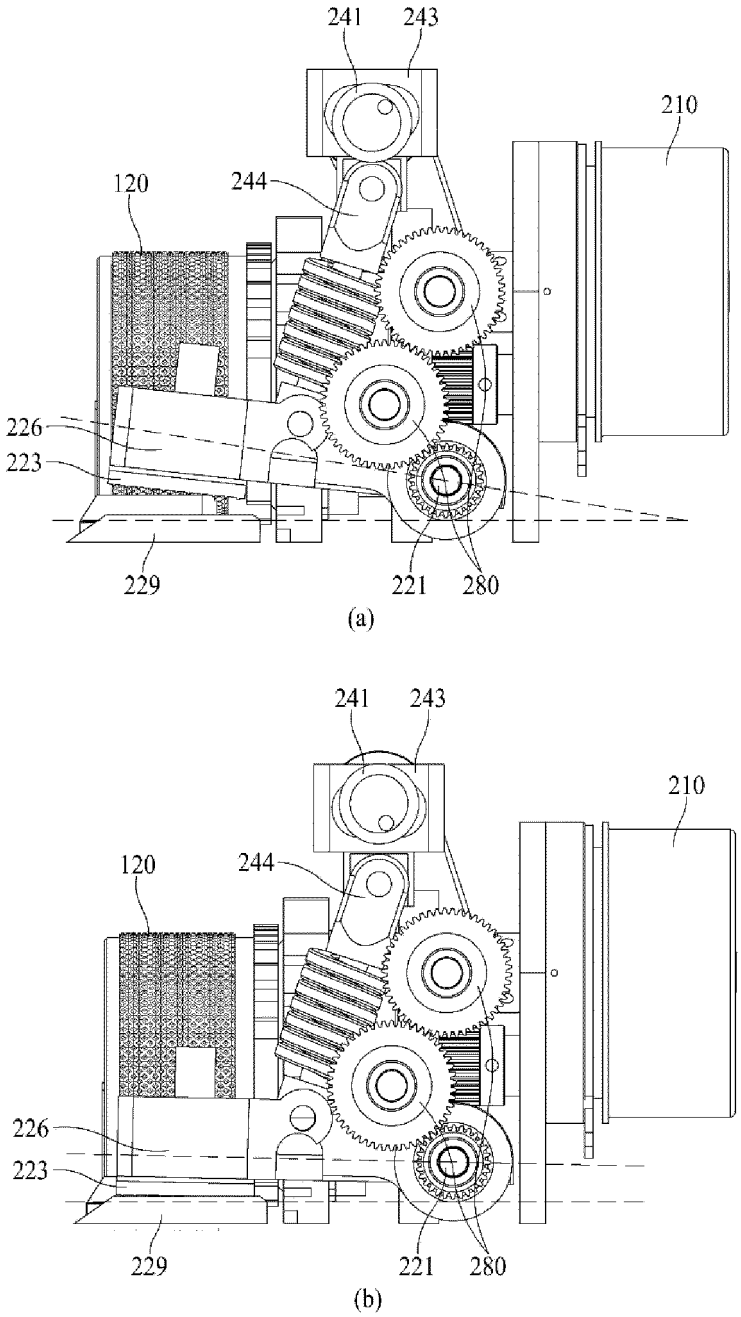
【Fig. 4】



【Fig. 5】



【Fig. 6】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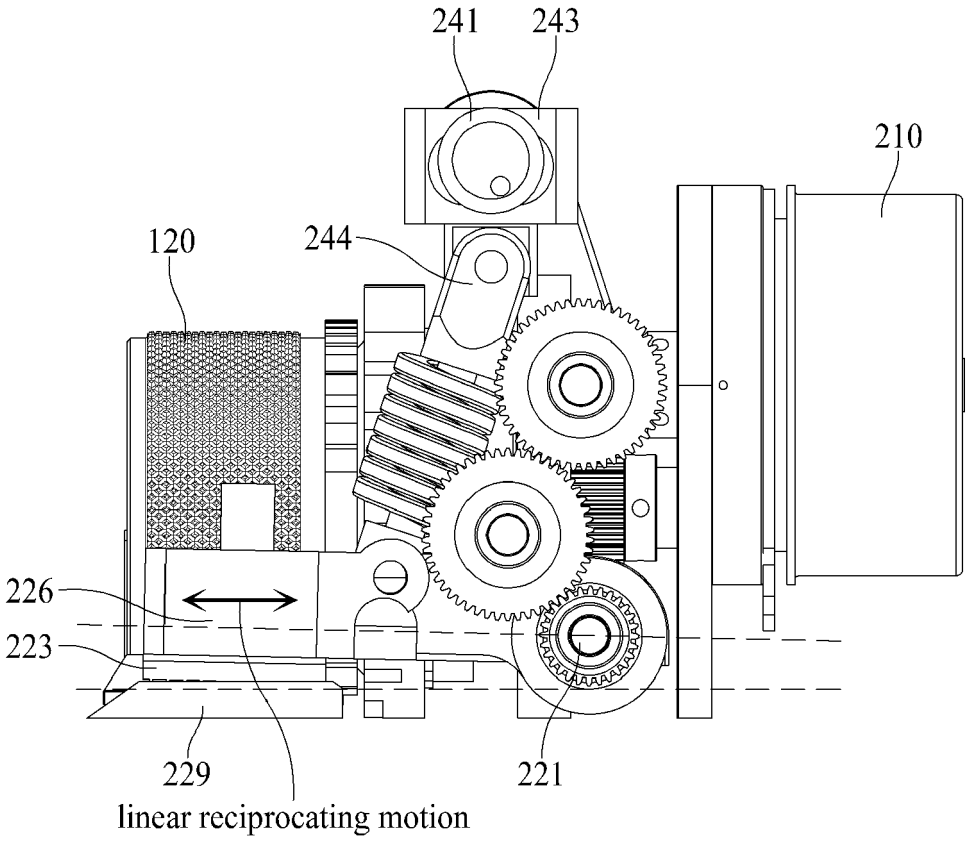
(b)

【Fig. 7】


241
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linear reciprocating motion

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EUROPEAN SEARCH REPORT

Application Number
EP 21 19 6924

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