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(54) Imaging apparatus for diagnosis with a motor drive apparatus

Abbildungsvorrichtung zur Diagnose mit einer Motorantriebsvorrichtung

Système d'imagerie pour diagnostic avec un appareil motorisé

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Description

[0001] The present invention generally relates to a motor drive apparatus and an imaging apparatus for diagnosis.

[0002] In particular, the present invention relates to an imaging apparatus according to the preamble of claim 1, such as it is for example known from WO98/12967 A1.

[0003] In the past, to diagnose arteriosclerosis, to perform diagnosis before a surgical operation or confirm a result after a surgical operation at the time of medical treatment inside a blood vessel by a highly-functional catheter such as a balloon catheter, a stent or the like, there has been utilized an imaging apparatus for diagnosis such as an intravascular ultrasound (IVUS) diagnostic apparatus, an optical coherent tomography (OCT) apparatus, an optical frequency domain imaging (OFDI) apparatus utilizing wavelength sweep, which is an improved type thereof, and the like (hereinafter, in this specification, the optical coherent tomography (OCT) apparatus and the optical frequency domain imaging (OFDI) apparatus utilizing wavelength sweep are referred to generically as "optical imaging apparatus for diagnosis").

[0004] In the optical imaging apparatus for diagnosis, an optical probe unit, into which an imaging core mounted with an optical lens and an optical mirror (transmitting and receiving unit) at the distal end of an optical fiber is positioned, is inserted inside a blood vessel, a measurement light is emitted into the inside of the blood vessel from the transmitting and receiving unit at the distal end while rotating the imaging core and concurrently, a radial scan inside the blood vessel is carried out by light-receiving a reflected light from a biological tissue. Then, based on the interference light generated by making the light-received reflected light and the reference light interfere, a cross-sectional image of the blood vessel is visualized.

[0005] Here, for the radial scan of the imaging core, there is utilized a motor drive apparatus referred to generally as a scanner & pull-back unit. The scanner & pull-back unit is constituted by a scanner unit and a pull-back unit, and the optical probe unit is freely detachably mounted on the scanner unit.

[0006] Then, for the scanner & pull-back unit mounted with the optical probe, various kinds of settings are carried out in an operating room or the like and thereafter, the unit is used under the condition of being covered by a unit cover (sterilization cover) and being moved to the vicinity of the patient.

[0007] In other words, in the inside of the operating room or the like, it is assumed for the scanner & pull-back unit to make the user (doctor, technologist, nurse or the like) move to a predetermined position if required, back away from the predetermined position and so on. Consequently, it is desirable for the scanner & pull-back unit to have a convenient shape to be carried. In particular, since the carrying of the scanner & pull-back unit is performed in a state of being covered by a unit cover, it is desirable for the unit to have a shape easily carried even

in such a state.

[0008] In addition, from the fact that it is necessary to deal with a plurality of works during a short period inside the operating room, it is desirable, on an occasion of carrying the scanner & pull-back unit, that there are assumed not only a case in which the user carries out the unit by both hands but also a case in which the user carries out the unit by a single hand.

[0009] The above objectives are achieved by an imaging apparatus according to claim 1. The dependent claims relate to advantageous embodiments.

FIG. 1 is a perspective view of an optical imaging apparatus for diagnosis according to one embodiment disclosed by way of example.

FIG. 2 is a perspective view of a scanner & pull-back unit forming a part of the apparatus shown in FIG. 1. FIG. 3A is a cross-sectional view of a scanner unit taken along the section line 3A-3A in FIG. 2.

FIG. 3B illustrates a way of carrying the scanner & pull-back unit by grasping and holding the scanner unit.

FIG. 4A is a cross-sectional view of the pull-back unit taken along the section line 4A-4A in FIG. 2.

FIG. 4B illustrates a way of carrying the scanner & pull-back unit by supporting the pull-back unit.

FIG. 5 is a side view of the scanner & pull-back unit.

[0010] The description which follows describes, with reference to the accompanying drawings, details and aspects of embodiments of an optical imaging apparatus, including a scanner & pull-back unit, disclosed as examples.

[0011] First, there will be explained a brief summary of the motor drive apparatus, i.e., scanner & pull-back unit, for use in a first embodiment. The motor drive apparatus has a shape configured in the manner described so it exhibits a convenient shape to be carried under an actual use condition.

[0012] In case of carrying it by a single hand, it is assumed that the user may grasp and hold the side surface center position of the scanner unit from the upper side of the unit, and there is employed a configuration in which a concave portion (and a convex portion) for hooking a fingertip (of a thumb and/or another finger) is provided such that the scanner unit does not slip off when being grasped and held from the upper side thereof. Also, in order to make it easier to recognize the grasping and holding position even in a state of being covered by a unit cover, a configuration is employed in which a convex portion is provided. Further, in order to avoid a situation in which the instruction unit arranged on the side surface of the pull-back unit is pressed accidentally when grasping and holding the scanner unit from the upper side thereof, there is employed a configuration in which the instruction unit is arranged at a deviated position with respect to the position to be grasped and held. It is possible, within the instruction unit, to arrange an instruction

button which does not exert influence on the operation of the pull-back unit even if pressed.

[0013] In case of carrying it by both hands, it is assumed that the user may support the lower surface of both the end positions in the forward and backward direction of the pull-back unit from the lower side and so there is employed a shape by which it is relatively easy for a fingertip to be slipped into the lower surface of the pull-back unit even in a state in which the scanner unit is installed. Also, there is employed a configuration in which a concave portion hooked by fingertips (thumb and other finger) is provided such that a situation does not arise in which it slips off from both hands.

[0014] By employing such a configuration, for the motor drive apparatus relating to this embodiment disclosed by way of example, there is created a situation in which the carrying thereof can be performed relatively easily by a single hand or by both hands in a state of being covered by the unit cover. Hereinafter, there will be explained details of this embodiment.

1. Overall Configuration of Optical Imaging Apparatus for Diagnosis

[0015] First, there will be explained an optical imaging apparatus for diagnosis provided with a motor drive apparatus. FIG. 1 illustrates the configuration of the overall optical imaging apparatus for diagnosis (optical coherent tomography (OCT) apparatus or optical frequency domain imaging (OFDI) apparatus utilizing wavelength sweep) 100 provided with a motor drive apparatus.

[0016] As shown in FIG. 1, the optical imaging apparatus for diagnosis 100 includes an optical probe unit (imaging probe) 101, a motor drive apparatus 102 and an operation control apparatus 103. The motor drive apparatus 102 and the operation control apparatus 103 are connected by a signal line 104.

[0017] The optical probe unit 101 is installed with an imaging core provided, at the distal end thereof, with a transmitting and receiving unit which is directly inserted into the inside of a body lumen such as a blood vessel or the like, transmits the transmitted measurement light continuously toward the biological tissue and concurrently, receives the reflected light continuously from the biological tissue, whereupon the state of the biological tissue is measured by using the imaging core. The optical probe unit 101 thus functions as an image obtaining probe unit for obtaining an image of the biological tissue.

[0018] The motor drive apparatus (scanner & pull-back unit) 102 is configured such that the optical probe unit 101 is freely detachably mounted on the motor drive apparatus 102. A radial operation (operation in axis direction and operation in rotation direction inside the body lumen) of the imaging core inserted into the optical probe unit 101 is performed by driving the built-in motor. The reflected light is received by the transmitting and receiving unit and concurrently the obtained reflected light is transmitted to the operation control apparatus 103

through the signal wire 104. Details of the shape or configuration of the motor drive apparatus 102 will be described below.

[0019] The operation control apparatus 103 is configured to allow the input of various kinds of setting values when carrying out the measurement, to process data obtained by the measurement and to display them as the cross-sectional image of the biological tissue.

[0020] The operation control apparatus 103 includes a main body control unit, whereby interference light data are generated by making the reflected light obtained by the measurement and the reference light obtained by separating the measurement light interfere, and concurrently a plurality of cross-sectional images are generated in the axial direction of the body lumen by processing the line data generated based on the interference light data. The operation control apparatus 103 also includes a printer 111-1 so that the result processed in the main body control unit 111 is printed. The operation control apparatus 103 is also provided with a hard disk drive and a DVD recorder for storing data.

[0021] An operation panel 112 allows a user to input various kinds of setting values and instructions. An LCD monitor 113 constitutes an example of a display apparatus that displays a plurality of cross-sectional images generated in the main body control unit 111.

2. Overall Configuration of Motor Drive Apparatus

[0022] Referring to FIG. 2, set forth next is a description of the overall configuration of the motor drive apparatus 102 according to one embodiment disclosed by way of example. As shown in FIG. 2, the motor drive apparatus 102 is detachably mounted on the optical probe unit 101 and is provided with a scanner unit 200 for axially rotating the imaging core inserted into the optical probe unit 101, and a pull-back unit 210 for making the imaging core inserted into the optical probe unit 101 operate in the axial direction inside a body lumen by operating the scanner unit 200 in a straight-ahead manner in the direction of the arrow 230.

[0023] A motor forms a part of the scanner unit 200. Such motor carries out rotation operation to rotate the imaging core at a maximum rotation speed of 9600rpm. On the other hand, the pull-back unit 210 incorporates a motor for straight-ahead operation for operating the imaging core in the axial direction inside the body lumen by operating the scanner unit 200 in a straight-ahead manner. Note that an operation unit 220 is provided on the side surface (right upper side in the drawing) of the pull-back unit 210.

[0024] The operation unit 220 includes an instruction unit 221 for instructing the rotation operation and the straight-ahead operation of the motor drive apparatus 102, and for instructing various kinds of settings, and thus, it is possible for the user to instruct the motor drive apparatus 102 to perform a desirable operation. The operation unit 220 also includes various kinds of lamps or

lights 222, forming an indicator indicating the inside state of the motor drive apparatus 102 and thus, in a case in which an anomaly occurs in the motor drive apparatus 102, it is possible for the user to recognize this anomaly.

[0025] The motor drive apparatus 102 having such operational characteristics includes a mechanism (portable mechanism for single hand 201), which facilitates carrying the motor drive apparatus 102 by a single hand, on the center position side surface in the arrow 230 direction (straight-ahead direction) of the scanner unit 200. That is, the portable mechanism for single hand 201 is positioned at a center location relative to the front-back direction represented by the arrow 230. FIG. 2 illustrates the portable mechanism for single hand 201 arranged on the right side, but a similar mechanism is arranged on the opposite side so that a pair of portable mechanisms for single hand 201 exists on opposite sides of the motor drive apparatus 102.

[0026] The motor drive apparatus 102 also includes mechanisms (portable mechanisms for both hands 223, 224) which facilitate carrying the motor drive apparatus 102 by both hands on the side surface of the pull-back unit 210. Although not shown in FIG. 2, there are further provided mechanisms which facilitate carrying the motor drive apparatus 102 by both hands on the bottom surface of the pull-back unit 210.

3. Details of Portable Mechanism for Single Hand in Motor Drive Apparatus

[0027] Set forth next, with reference to FIG. 3A is an explanation of details of the portable mechanism for single hand 201. FIG. 3A illustrates in cross-section the housing of the scanner unit 200. FIG. 3 does not illustrate the pull-back unit 210.

[0028] As shown in FIG. 3A, the housing of the scanner unit 200 includes an upper housing portion 310 and a lower housing portion 320. A convex portion (outwardly projecting part) 311 and a convex portion (outwardly projecting part) 312 are provided on opposite side surfaces of the upper housing portion 310. A convex portion (outwardly projecting part) 321 and a convex portion (outwardly projecting part) 322 are also provided on opposite side surfaces of the lower housing portion 320. The convex portion 311 and the convex portion 321 are formed so as to be continuous with one another. Similarly, the convex portion 312 and the convex portion 322 are formed so as to be continuous with one another.

[0029] Providing the convex portions on the side surface of the housing of the scanner unit 200 makes it possible to recognize the position at which the motor drive apparatus 102 should be grasped and held when the user sees the unit from above, even in a state in which the scanner unit 200 is covered by the unit cover.

[0030] A reason for employing a configuration in which the convex portion 311 of the upper housing portion 310 and the convex portion 321 of the lower housing portion 320 are combined (and the convex portion 312 of the

upper housing 310 and the convex portion 322 of the lower housing 320 are combined) to form the convex portion (projection) on the side surface of the scanner unit 200 is to suppress bending of the side surface of the housing of the scanner unit 200 when being grasped and held by the user so that the carrying becomes easier.

[0031] The side surface of the lower housing 320 is further provided with a concave portion (recess) 323 and a concave portion (recess) 324. A common surface forms the upper end surface of the concave portion (recess) 323 and the lower end surface of the convex portion (outwardly projecting part) 321. That is, the upper end surface of the concave portion (recess) 323 and the lower end surface of the convex portion (outwardly projecting part) 321 are the same surface. Similarly, a common surface forms the upper end surface of the concave portion (recess) 324 and the lower end surface of the convex portion (outwardly projecting part) 322 so that the upper end surface of the concave portion 324 and the lower end surface of the convex portion 322 represent the same surface. The convex portion 321 together with the underlying recess 323 form a projection or ledge which projects in a cantilever manner on one of the side surfaces of the scanner unit. Similarly, the convex portion 322 together with the underlying recess 324 form a projection or ledge which projects in a cantilever manner on the opposite side surface of the scanner unit.

[0032] Employing a configuration in which the concave portion exists in the side surface of the housing of the scanner unit 200 provides an arrangement in which the user's fingertips (thumb and other finger) are hooked on the end surface of the concave portion (and end surface of the convex portion) when the scanner unit 200 is grasped and held from the upper side, whereby the carrying thereof becomes easy.

[0033] FIG. 3B illustrates the scanner unit 200 while grasped and held from the upper side. As shown in FIG. 3B, the tip of the user's index finger (and any other finger(s) except the thumb) is inserted into the concave portion (recess) 323 and so the periphery of the first joint of the user's finger contacts the upper end surface of the concave portion 323 and the lower end surface of the convex portion 321 which is formed integrally with the upper end surface of the concave portion 323. It thus becomes possible to avoid a situation in which the motor drive apparatus 102 slips from the user's fingertips while being lifted up in the direction of the arrow 330.

[0034] Similarly, the tip of the user's thumb is positioned in the concave portion 324 so that the first joint of the user's finger contacts the upper end surface of the concave portion 324 and the lower surface of the convex portion 322 which is formed integrally with the upper end surface of the concave portion 324. This makes it possible to avoid a situation in which the motor drive apparatus 102 slips from the fingertips while being lifted up in the direction of the arrow 330.

[0035] The portable mechanism for single hand 201 is arranged at the center position in the arrow 230 direction

of the scanner unit 200 such that the portable mechanism for single hand 201 is at approximately a balanced position in the arrow 230 direction of the motor drive apparatus 102 in a state in which the scanner unit 200 has moved to the advanced end position.

4. Details of Portable Mechanism for Both Hands in Motor Drive Apparatus

[0036] Set forth next, with reference to FIG. 4A, is a detailed description of aspects of a portable mechanism for both hands. FIG. 4A is a cross-section of the housing of the pull-back unit 210 in FIG. 2. The scanner unit 200 is not shown in FIG. 4A. As shown in FIG. 2, the portable mechanism for both hands is provided at both end positions of the pull-back unit 210 in the direction of the arrow 230, but both sides have similar configurations. Thus, the description which follows will describe the configuration of the distal position, it being understood that the configuration at the opposite end is the same.

[0037] As shown in FIG. 4A, a portable mechanism for both hands 400 is constituted by a first portable mechanism for both hands 223 provided on the side surface of the pull-back unit 210 (side surface on the side on which the operation unit 220 is arranged) and a second portable mechanism for both hands 420 provided on the bottom surface of the pull-back unit 210.

[0038] The first portable mechanism for both hands 223 includes a shelf portion 411 which extends outwardly (laterally) from the side surface of the pull-back unit 210 and an upstanding side wall portion 412 which surrounds the periphery of the shelf portion 411. The shelf portion 411 has a predetermined height with respect to (is spaced from) the bottom surface of the pull-back unit 210. That is, the bottom surface of the shelf portion 411 is spaced from the bottom surface of the pull-back unit 210 so that a space 413 exists on the lower side of the shelf portion 411. Also, the upper end portion (upper surface) of the side wall portion 412 is higher than the upper surface of the shelf portion 411 and so a concave portion or recessed portion is formed by the upper surface of the shelf portion 411 and the encircling upper end portion of the side wall portion 412.

[0039] Providing the side wall portion 412 with respect to the shelf portion 411 which extends outwardly from the side surface of the pull-back unit 210, makes it possible for the user to hook a thumb when supporting the pull-back unit 210 from the lower side, whereby the carrying of the pull-back unit 210 becomes easier. Also, providing the space 413 on the lower side of the shelf portion 411 makes it possible to insert the user's fingertips relatively easily when the user's fingertips (fingertips of fingers except thumb) are inserted into the bottom surface of the pull-back unit 210 in order to support the pull-back unit 210 from the lower side.

[0040] Approximately at the center position in the direction of the arrow 430 (the direction approximately perpendicular to the direction of the arrow 230 direction in

FIG. 2) of the bottom surface of the pull-back unit 210, there is further arranged a groove portion 421 along the arrow 230 direction. The groove portion 421 constitutes the second portable mechanism for both hands 420. Employing a configuration in which the groove portion 421 is arranged at the center position of the bottom surface of the pull-back unit 210 makes it possible for the user to hook the index finger and the like when the pull-back unit 210 is supported from the lower side, whereby the carrying thereof becomes easier. The length of the groove portion 421 in the arrow 230 direction can be configured such that it becomes possible for two to four of the user's fingers to be inserted into the groove portion 421.

[0041] FIG. 4B illustrates the pull-back unit 210 supported from the lower side. As shown in FIG. 4B, by inserting the tip of the user's index finger (any of other fingers except thumb) toward the direction of the arrow 440 with respect to the space 413 (see (a) of FIG. 4B), the motor drive apparatus 102 rotates in an arrow 450 direction as a whole (see (b) of FIG. 4B). Thus, it is possible to insert fingers (fingers except thumb) toward an arrow 460 direction relatively easily with respect to the bottom surface of the pull-back unit 210.

[0042] When the user's fingers are inserted toward the bottom surface of the pull-back unit 210 and the tips of the user's fingers reach the groove portion 421, it is possible for the user to hook the fingertips on the side surface of the groove portion 421 by bending the fingertips. On the other hand, by bending the thumb after inserting the thumb toward the upper surface of the shelf portion 411, the periphery of the first joint of the user's thumb contacts the side wall portion 412. Thus, there is created a situation in which the pull-back unit 210 rotates slightly toward the arrow 470 direction and the pull-back unit 210 is held stably by fingers other than thumb, which are hooked on the side surface of the groove portion 421, and the thumb hooked on the side wall portion 412 (see (c) of FIG. 4B).

[0043] In this state, by lifting up the pull-back unit 210 in the arrow 480 direction, it becomes possible to support the motor drive apparatus 102 from the lower side by both hands without the motor drive apparatus 102 slipping off from the fingertips (see (d) of FIG. 4B).

[0044] There are various reasons why the first portable mechanism for both hands 223 is provided on the side surface of the pull-back unit 210 and on the side surface on the side on which the operation unit 220 is arranged. After operating the operation unit 220, it is possible for the user to carry the unit directly by inserting his fingertips along the bottom surface of the pull-back unit 210 without changing the direction of the motor drive apparatus 102. Compared with the pull-back unit 210 in which a motor and the like exist, the operation unit 220 has only buttons and wirings, whereby the weight thereof is relatively light, so that it is fairly easy to rotate the unit in the arrow 450 direction.

5. Configuration of Operation Unit in Motor Drive Apparatus

[0045] Set forth next, with reference to FIG. 5, is a description of the configuration of the operation unit 220 in the motor drive apparatus. FIG. 5 shows the motor drive apparatus 102 seen from the side surface, with the optical probe unit 101 not yet mounted. In FIG. 5, the scanner unit 200 lies at the advanced end position in the arrow 230 direction. In the abovementioned position, the portable mechanism for single hand 201 is positioned approximately at a center position in the arrow 230 direction of the pull-back unit 210.

[0046] On the other hand, in the operation unit 220, only various kinds of lamps 222 are arranged at the abovementioned center position and the instruction unit 221 is aligned in the position other than the center position. In this manner, in the motor drive apparatus 102 relating to this embodiment disclosed by way of example, there is employed such a configuration, in a state in which the scanner unit 200 lies at the advanced end position and in which it is possible for the motor drive apparatus 102 to be carried, that the instruction unit 221 is not located at the position corresponding to the portable mechanism for single hand 201.

[0047] Thus, when the scanner unit 200 is grasped and held from the upper side, it becomes possible to avoid a situation in which the instruction unit is pressed erroneously. It is possible to provide an instruction button which does not have any operational problem even if pushed down erroneously, that is, to provide a button having nothing to do with the operation of the pull-back unit, corresponding to the portable mechanism for single hand 201. For example, it is possible to install an instruction button (scan button) by which the imaging core is rotated at a low speed as idling before the pull-back.

[0048] As clear from the explanation above, the motor drive apparatus 102 according to this embodiment employs a configuration in which the concave portions or recesses (and convex portions or projections) for hooking fingertips (thumb and other fingers) are provided so as not to be slipped off when supported from the upper side on the assumption that the user grasps and holds the center position of the side surface of the scanner unit from the upper side while being carried by a single hand. Also, there is employed a configuration in which the convex portions or projections are provided so as to recognize the grasping and holding position relatively easily even in a state in which the unit is covered by the unit cover. Furthermore, a configuration is employed in which the instruction unit is displaced or shifted such that a situation will not occur in which the instruction unit is pressed erroneously when the motor drive apparatus 102 is grasped and held from the upper side. In case of being carried by both hands, there is employed a shape by which it is relatively easy for the fingertips to slip along the lower surface fairly easily even in a state in which the motor drive apparatus is placed so that the lower surfaces

of both the end positions in the forward and backward directions of the pull-back unit will be supported from the lower side. Also, the concave portions (or groove portions) for hooking fingertips (thumb and other finger) are provided such that the unit does not slip off from both the hands when supported from the lower side.

[0049] According to this result, the carrying becomes relatively easy under the actual use environment.

[0050] The description above does not describe specific materials for the portable mechanism for single hand 201 or the portable mechanism for both hands 400. But possible, for example, to employ a configuration in which anti-slip rubber is disposed on the upper end surfaces of the concave portions 323, 324 and the lower end surfaces of the convex portions 321, 322 of the portable mechanism for single hand 201. Similarly, it is possible to employ a configuration in which anti-slip rubber is disposed on the side wall portion 412 and on the groove portion 421 in the portable mechanism for both hands 400.

[0051] The embodiment described above by way of example refers to an optical imaging apparatus for diagnosis as an example. It is also possible to apply the disclosure here to an imaging apparatus for diagnosis using an ultra-sound probe (image obtaining probe unit) which uses ultra-sound instead of light.

[0052] The detailed description above describes features and aspects of an embodiment of an imaging apparatus for diagnosis disclosed by way of example. But the invention is not limited to the precise embodiments and variations described. Changes, modifications and equivalents can be effected by one skilled in the art without departing from the scope of the invention as defined in the appended claims. It is expressly intended that all such changes, modifications and equivalents which fall within the scope of the claims are embraced by the claims.

Claims

1. An imaging apparatus (100) for diagnosis comprising an imaging probe (101), an operation control apparatus (103) and a motor drive apparatus (102) having a transmitting and receiving unit which is configured to carry out continuous signal transmission and reception, the motor drive apparatus comprising:

a scanner unit (200) configured to axially rotate the transmitting and receiving unit,
the scanner unit possessing opposite side surfaces each extending in a straight-ahead direction of the scanner unit;
a pull-back unit (210) configured to operate the scanner unit in a straight-ahead direction in order to axially move the transmitting and receiving unit in a body lumen, the pull-back unit possessing a forward end and an oppositely located rear end in the straight-ahead direction of the

scanner unit, the pull-back unit also possessing a bottom surface;

an operation unit (220) comprising an instruction unit (221) permitting instruction input to control the scanner unit and the pull-back unit, and an indicator (222) indicating a state of the motor drive apparatus (102), the instruction unit (221) and the indicator (222) being aligned on a side surface of the pull-back unit (210);

the operation unit (220) being positioned only on one side surface of the pull-back unit (210); **characterized in that** said pull-back unit further comprises a portable mechanism (400) for both hands comprising a shelf portion (411) at the forward end of the pull-back unit (210) on the side of the pull-back unit (210) on which the operation unit (220) is arranged and a shelf portion (411) at the rear end of the pull-back unit (210) on the side of the pull-back unit (210) on which the operation unit (220) is arranged;

each of the shelf portions (411) possessing an upper surface and also possessing a bottom surface spaced from the bottom surface of the pull-back unit (210) so that a space (413) exists on the lower side of each of the shelf portions (411); side wall portions (412) surrounding each of the shelf portions (411), each side wall portion (412) possessing an upper end portion higher than the upper surface of the shelf portion (411) so that a concave portion or recessed portion is formed by the upper surface of the shelf portion (411) and the encircling of the side wall portion (412); and

the bottom surface of the pull-back unit (210) at the forward end of the pull-back unit (210) including a groove (421), and the bottom surface of the pull-back unit (210) at the rear end of the pull-back unit (210) including a groove (421), each groove (421) extending for a predetermined length along the straight-ahead direction of the scanner unit (200), the grooves (421) being located at an approximately center position relative to a direction perpendicular to the straight-ahead direction, wherein the shelf portion (411) and the grooves (412) are configured to permit a user to grasp one of the shelf portions together with one of the grooves using fingers of one hand of the user and to grasp the other shelf portion together with the other groove using fingers of the user's other hand.

2. The imaging apparatus (100) for diagnosis according to Claim 1, wherein the instruction unit (221) is positioned entirely between the shelf portions (411) relative to the straight-ahead direction.
3. The imaging apparatus (100) for diagnosis according to Claim 1, wherein the instruction unit (221) com-

prises a plurality of user operable buttons, and the indicator comprises a plurality of lamps (222).

4. The imaging apparatus (100) for diagnosis according to Claim 1, configured to generate a plurality of cross-sectional images in the axis direction of the body lumen based on a signal transmitted from the motor drive apparatus.
5. The imaging apparatus (100) according to any of claims 1 to 4, wherein the motor drive apparatus (102) comprises,
 - an outwardly projecting convex portion (311, 312) on each of the opposite side surfaces of the scanner unit (200), each convex portion (311, 312) extending in the lengthwise direction of the scanner unit (200) over a predetermined length;
 - a concave portion (323, 324) on each of the opposite side surfaces of the scanner unit (200), each concave portion (323, 324) extending in the lengthwise direction of the scanner unit (200) over a predetermined length; and
 - each concave portion (323, 324) having an upper end surface which also constitutes a lower end surface of one of the convex portions (311, 312).
6. The imaging apparatus (100) according to Claim 5, wherein the instruction unit (221) comprises instruction buttons and all of the instruction buttons related to operation of the pull-back unit (210) are located at positions not aligned in the lengthwise direction of the scanner unit (200) with the convex portions in a state in which the scanner unit (200) is located at an advanced end position of the scanner unit (200).
7. The imaging apparatus (100) according to Claim 5, wherein each of the convex portions (321, 322) is located in a middle of the scanner unit (200) in the lengthwise direction of the scanner unit (200).

Patentansprüche

1. Abbildungsvorrichtung (100) zur Diagnose, umfassend eine Abbildungssonde (101), eine Betriebssteuerungsvorrichtung (103) und eine Motorantriebsvorrichtung (102) mit einer Sende- und Empfangseinheit, die konfiguriert ist, um eine kontinuierliche Signalübertragung und einen kontinuierlichen Signalempfang durchzuführen, wobei die Motorantriebsvorrichtung umfasst:

eine Abtasteinheit (200), die konfiguriert ist, um die Sende- und Empfangseinheit axial zu drehen, wobei die Abtasteinheit gegenüberliegende Seitenflächen aufweist, die sich jeweils in einer Geradeausrichtung der Abtasteinheit erstrecken;

eine Rückzugseinheit (210), die konfiguriert ist, um die Abtasteinheit in einer Geradeausstellung zu betreiben, um die Sende- und Empfangseinheit axial in einem Körperlumen zu bewegen, wobei die Rückzugseinheit ein vorderes Ende und ein entgegengesetzt angeordnetes hinteres Ende in der Geradeausstellung der Abtasteinheit aufweist, wobei die Rückzugseinheit auch eine Bodenfläche aufweist;
 eine Betriebseinheit (220), die eine Befehlseinheit (221) umfasst, welche eine Befehlseingabe zum Steuern der Abtasteinheit und der Rückzugseinheit ermöglicht, und eine Anzeigeeinrichtung (222), die einen Zustand der Motorantriebsvorrichtung (102) anzeigt, wobei die Befehlseinheit (221) und die Anzeigeeinrichtung (222) auf einer Seitenfläche der Rückzugseinheit (210) ausgerichtet sind;
 wobei die Betriebseinheit (220) nur auf einer Seitenfläche der Rückzugseinheit (210) positioniert ist;
dadurch gekennzeichnet, dass die Rückzugseinheit ferner einen tragbaren Mechanismus (400) für beide Hände umfasst, der einen Ablageabschnitt (411) am vorderen Ende der Rückzugseinheit (210) auf der Seite der Rückzugseinheit (210), auf der die Betätigungseinheit (220) angeordnet ist, und einen Ablageabschnitt (411) am hinteren Ende der Rückzugseinheit (210) auf der Seite der Rückzugseinheit (210) umfasst, auf der die Betätigungseinheit (220) angeordnet ist;
 wobei jeder der Ablageabschnitte (411) eine Oberseite aufweist und auch eine Unterseite aufweist, die von der Unterseite der Rückzugseinheit (210) beabstandet ist, sodass ein Raum (413) auf der Unterseite jedes der Ablageabschnitte (411) vorhanden ist;
 Seitenwandabschnitte (412), die jeden der Ablageabschnitte (411) umgeben, wobei jeder Seitenwandabschnitt (412) einen oberen Endabschnitt aufweist, der höher als die Oberseite des Ablageabschnitts (411) ist, sodass ein konkaver Abschnitt oder vertiefter Abschnitt durch die Oberseite des Ablageabschnitts (411) und die Umrandung des Seitenwandabschnitts (412) gebildet wird; und
 die Unterseite der Rückzugseinheit (210) an dem vorderen Ende der Rückzugseinheit (210) eine Aussparung (421) aufweist, und die Unterseite der Rückzugseinheit (210) an dem hinteren Ende der Rückzugseinheit (210) eine Aussparung (421) aufweist, wobei sich jede Aussparung (421) über eine vorbestimmte Länge entlang der Geradeausrichtung der Abtasteinheit (200) erstreckt, wobei die Aussparungen (421) in einer annähernd mittigen Position relativ zu einer Richtung senkrecht zur Geradeaus-

richtung angeordnet sind, wobei der Ablageabschnitt (411) und die Aussparungen (412) konfiguriert sind, um es einem Benutzer zu ermöglichen, einen der Ablageabschnitte zusammen mit einer der Aussparungen unter Verwendung der Finger von einer Hand des Benutzers zu ergreifen und den anderen Ablageabschnitt zusammen mit der anderen Aussparung unter Verwendung der Finger der anderen Hand des Benutzers zu ergreifen.

2. Abbildungsvorrichtung (100) zur Diagnose nach Anspruch 1, wobei die Befehlseinheit (221) vollständig zwischen den Ablageabschnitten (411) in Bezug auf die Geradeausrichtung positioniert ist.
3. Abbildungsvorrichtung (100) zur Diagnose nach Anspruch 1, wobei die Befehlseinheit (221) eine Vielzahl von benutzerbedienbaren Tasten umfasst und die Anzeige eine Vielzahl von Lampen (222) umfasst.
4. Abbildungsvorrichtung (100) zur Diagnose nach Anspruch 1, die konfiguriert ist, um eine Vielzahl von Querschnittsbildern in der Achsenrichtung des Körperlumens basierend auf einem von der Motorantriebsvorrichtung übertragenen Signal zu erzeugen.
5. Abbildungsvorrichtung (100) nach einem der Ansprüche 1 bis 4, wobei die Motorantriebsvorrichtung (102) umfasst,
 - einen nach außen vorstehenden konvexen Abschnitt (311, 312) auf jeder der gegenüberliegenden Seitenflächen der Abtasteinheit (200), wobei sich jeder konvexe Abschnitt (311, 312) in der Längsrichtung der Abtasteinheit (200) über eine vorbestimmte Länge erstreckt;
 - einen konkaven Abschnitt (323, 324) auf jeder der gegenüberliegenden Seitenflächen der Abtasteinheit (200), wobei sich jeder konkave Abschnitt (323, 324) in der Längsrichtung der Abtasteinheit (200) über eine vorbestimmte Länge erstreckt; und
 - jeder konkave Abschnitt (323, 324) eine obere Endfläche aufweist, die auch eine untere Endfläche von einem der konvexen Abschnitte (311, 312) bildet.
6. Abbildungsvorrichtung (100) nach Anspruch 5, wobei die Befehlseinheit (221) Befehlstasten umfasst und alle Befehlstasten, die im Zusammenhang mit der Bedienung der Rückzugseinheit (210) stehen, an Positionen angeordnet sind, die nicht in Längsrichtung der Abtasteinheit (200) mit den konvexen Abschnitten in einem Zustand ausgerichtet sind, in dem die Abtasteinheit (200) an einer fortgeschrittenen Endposition der Abtasteinheit (200) angeordnet ist.
7. Abbildungsvorrichtung (100) nach Anspruch 5, wo-

bei jeder der konvexen Abschnitte (321, 322) in einer Mitte der Abtasteinheit (200) in der Längsrichtung der Abtasteinheit (200) angeordnet ist.

Revendications

1. Appareil d'imagerie (100) pour diagnostic comprenant une sonde d'imagerie (101), un appareil de commande d'imagerie (103) et un appareil d'entraînement par moteur (102) comportant une unité d'émission et de réception qui est configurée pour réaliser une émission et réception de signal continue, l'appareil d'entraînement par moteur comprenant :

une unité de balayage (200) configurée pour mettre en rotation axiale l'unité d'émission et réception, l'unité de balayage ayant des surfaces latérales opposées qui s'étendent chacune dans une direction en ligne droite de l'unité de balayage ;

une unité de retour (210) configurée pour faire fonctionner l'unité de balayage dans une direction en ligne droite afin de déplacer axialement l'unité d'émission et réception dans une lumière corporelle, l'unité de retour possédant une extrémité avant et une extrémité arrière située à l'opposé dans la direction en ligne droite de l'unité de balayage, l'unité de retour possédant également une surface inférieure ;

une unité de fonctionnement (220) comprenant une unité d'instruction (221) permettant une saisie d'instructions pour commander l'unité de balayage et l'unité de retour, et un indicateur (222) indiquant un état de l'appareil d'entraînement par moteur (102), l'unité d'instruction (221) et l'indicateur (222) étant alignés sur une surface latérale de l'unité de retour (210) ; l'unité de fonctionnement (220) n'étant positionnée que sur une surface latérale de l'unité de retour (210) ;

caractérisé en ce que ladite unité de retour comprend en outre un mécanisme portable (400) pour les deux mains comprenant une partie de rebord (411) à l'extrémité avant de l'unité de retour (210) sur le côté de l'unité de retour (210) sur lequel est placée l'unité de fonctionnement (220) et une partie de rebord (411) à l'extrémité arrière de l'unité de retour (210) sur le côté de l'unité de retour (210) sur lequel est placée l'unité de fonctionnement (220) ; chacune des parties de rebord (411) possédant une surface supérieure et possédant également une surface inférieure distante de la surface inférieure de l'unité de retour (210) de sorte qu'un espace (413) existe sur la face inférieure de chacune des parties de rebord (411) ;

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des parties de paroi latérale (412) entourant chacune des parties de rebord (411), chaque partie de paroi latérale (412) possédant une partie d'extrémité supérieure plus haute que la surface supérieure de la partie de rebord (411), de sorte qu'une partie concave ou une partie en retrait est formée par la surface supérieure de la partie de rebord (411) et le cerclage de la partie de paroi latérale (412) ; et

la surface inférieure de l'unité de retour (210) à l'extrémité avant de l'unité de retour (210) comportant une rainure (421), et la surface inférieure de l'unité de retour (210) à l'extrémité arrière de l'unité de retour (210) comportant une rainure (421), chaque rainure (421) s'étendant sur une longueur prédéterminée le long de la direction en ligne droite de l'unité de balayage (200), les rainures (421) étant situées en une position approximativement centrale par rapport à une direction perpendiculaire à la direction en ligne droite, la partie de rebord (411) et les rainures (412) étant configurées pour permettre à un utilisateur de saisir l'une des parties de rebord en même temps que l'une des rainures en utilisant les doigts d'une main de l'utilisateur et de saisir l'autre partie de rebord en même temps que l'autre rainure en utilisant les doigts de l'autre main de l'utilisateur.

2. Appareil d'imagerie (100) pour diagnostic selon la revendication 1, dans lequel l'unité d'instruction (221) est positionnée entièrement entre les parties de rebord (411) relativement à la direction en ligne droite.

3. Appareil d'imagerie (100) pour diagnostic selon la revendication 1, dans lequel l'unité d'instruction (221) comprend une pluralité de boutons actionnables par l'utilisateur, et l'indicateur comprend une pluralité de lampes (222).

4. Appareil d'imagerie (100) pour diagnostic selon la revendication 1, configuré pour générer une pluralité d'images en coupe dans la direction axiale de la lumière corporelle en se basant sur un signal transmis par l'appareil d'entraînement par moteur.

5. Appareil d'imagerie (100) selon l'une quelconque des revendications 1 à 4, dans lequel l'appareil d'entraînement par moteur (102) comprend :

une partie convexe faisant saillie vers l'extérieur (311, 312) sur chacune des surfaces latérales opposées de l'unité de balayage (200), chaque partie convexe (311, 312) s'étendant dans la direction de la longueur de l'unité de balayage (200) sur une longueur prédéterminée ; une partie concave (323, 324) sur chacune des

surfaces latérales opposées de l'unité de balayage (200), chaque partie concave (323, 324) s'étendant dans la direction de la longueur de l'unité de balayage (200) sur une longueur prédéterminée ; et

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chaque partie concave (323, 324) ayant une surface d'extrémité supérieure qui constitue aussi une surface d'extrémité inférieure de l'une des parties convexes (311, 312).

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6. Appareil d'imagerie (100) selon la revendication 5, dans lequel l'unité d'instruction (221) comprend des boutons d'instruction et tous les boutons d'instruction se rapportant au fonctionnement de l'unité de retour (210) sont situés en des positions non alignées dans la direction de la longueur de l'unité de balayage (200) avec les parties convexes dans un état dans lequel l'unité de balayage (200) se trouve en une position d'extrémité avancée de l'unité de balayage (200).

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7. Appareil d'imagerie (100) selon la revendication 5, dans lequel chacune des parties convexes (321, 322) se situe au milieu de l'unité de balayage (200) dans la direction de la longueur de l'unité de balayage (200).

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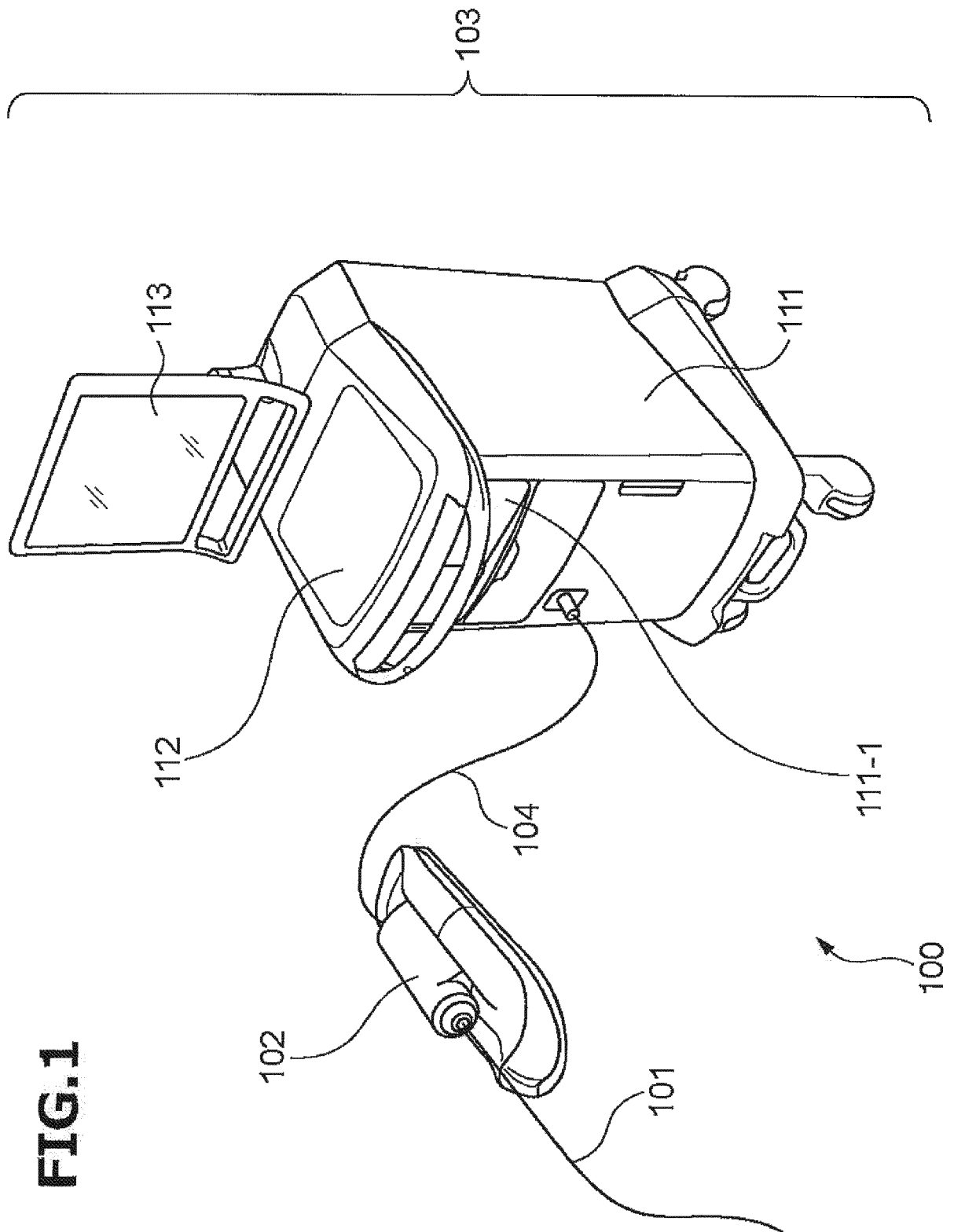


FIG. 2

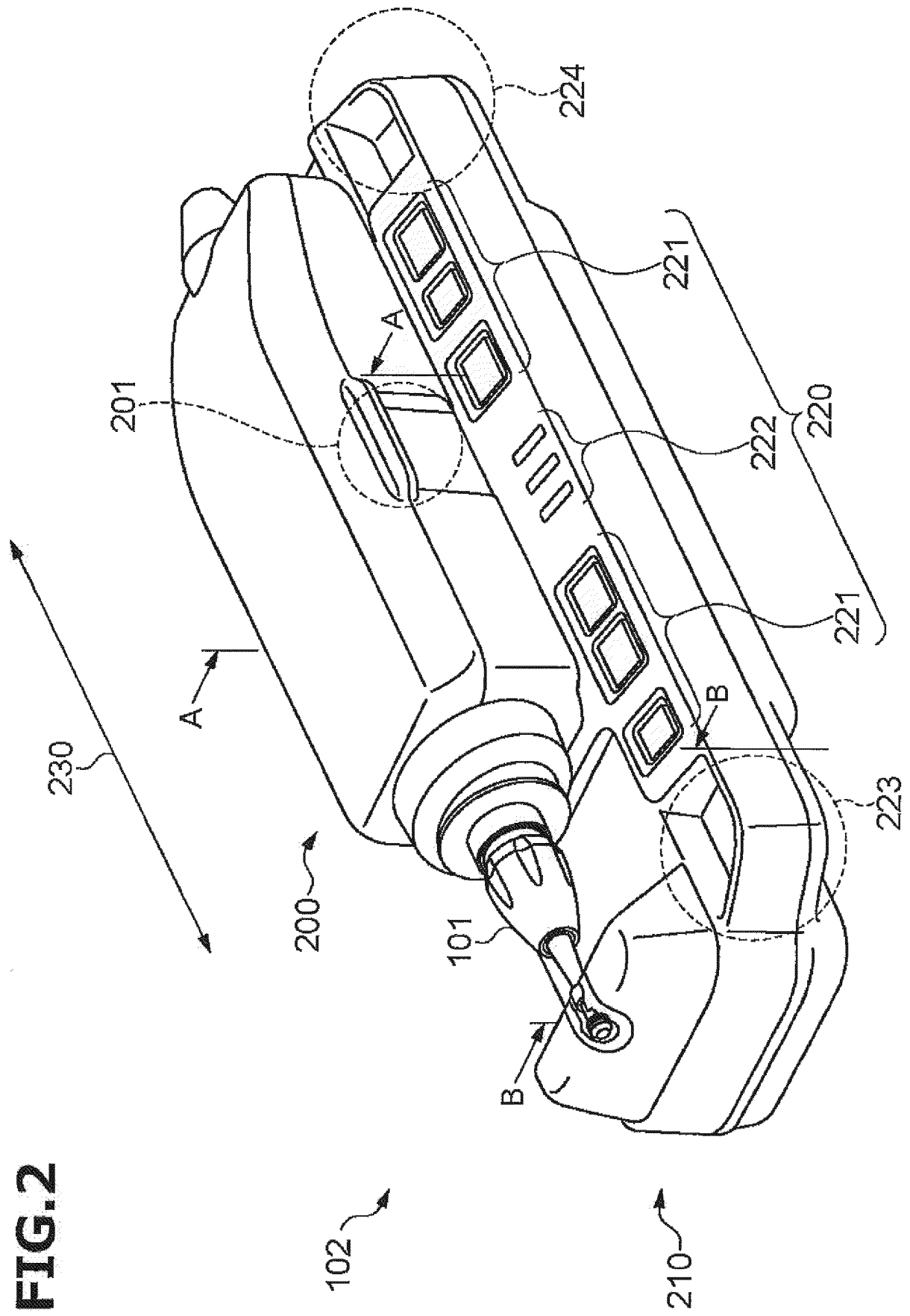


FIG. 3A

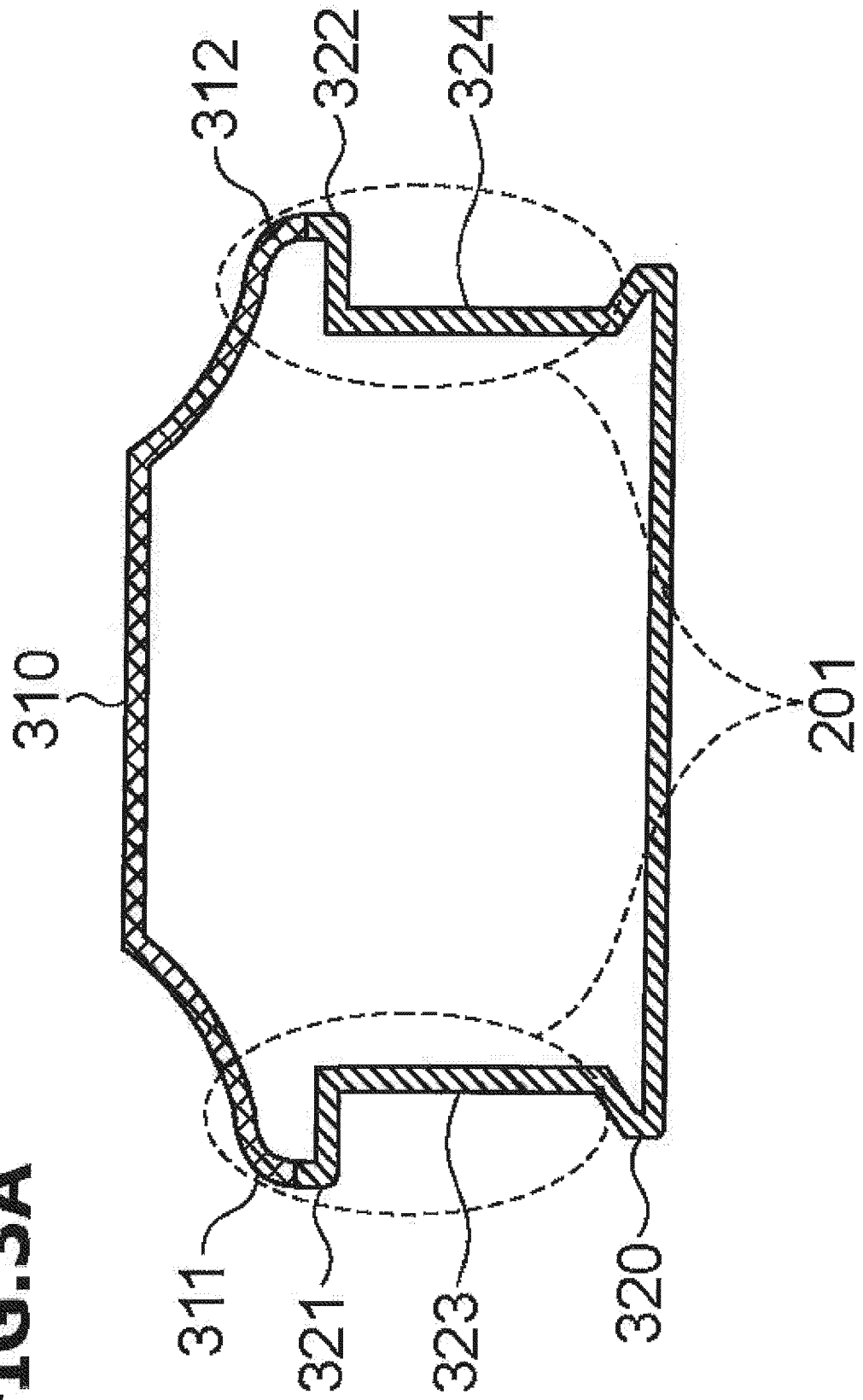
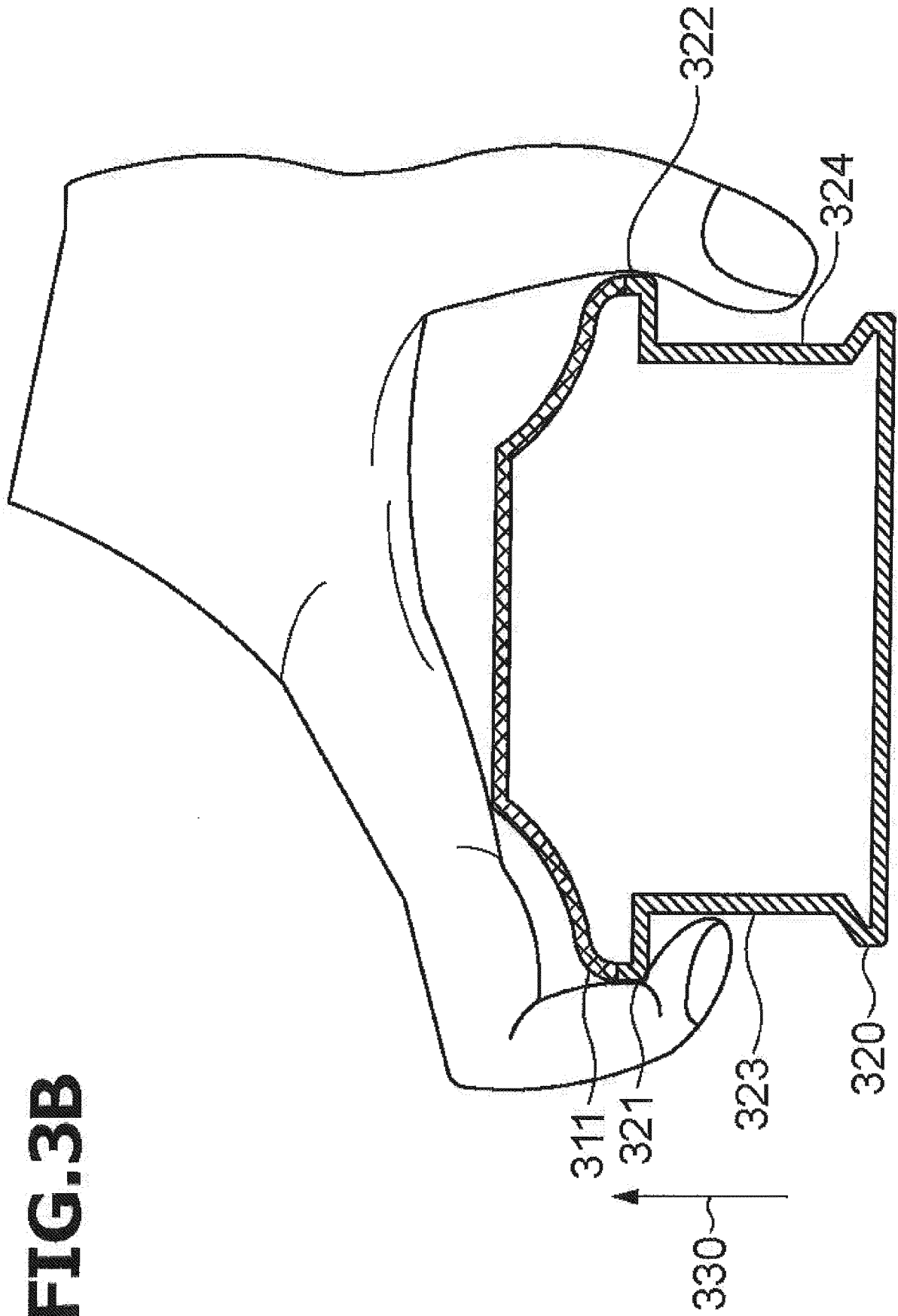
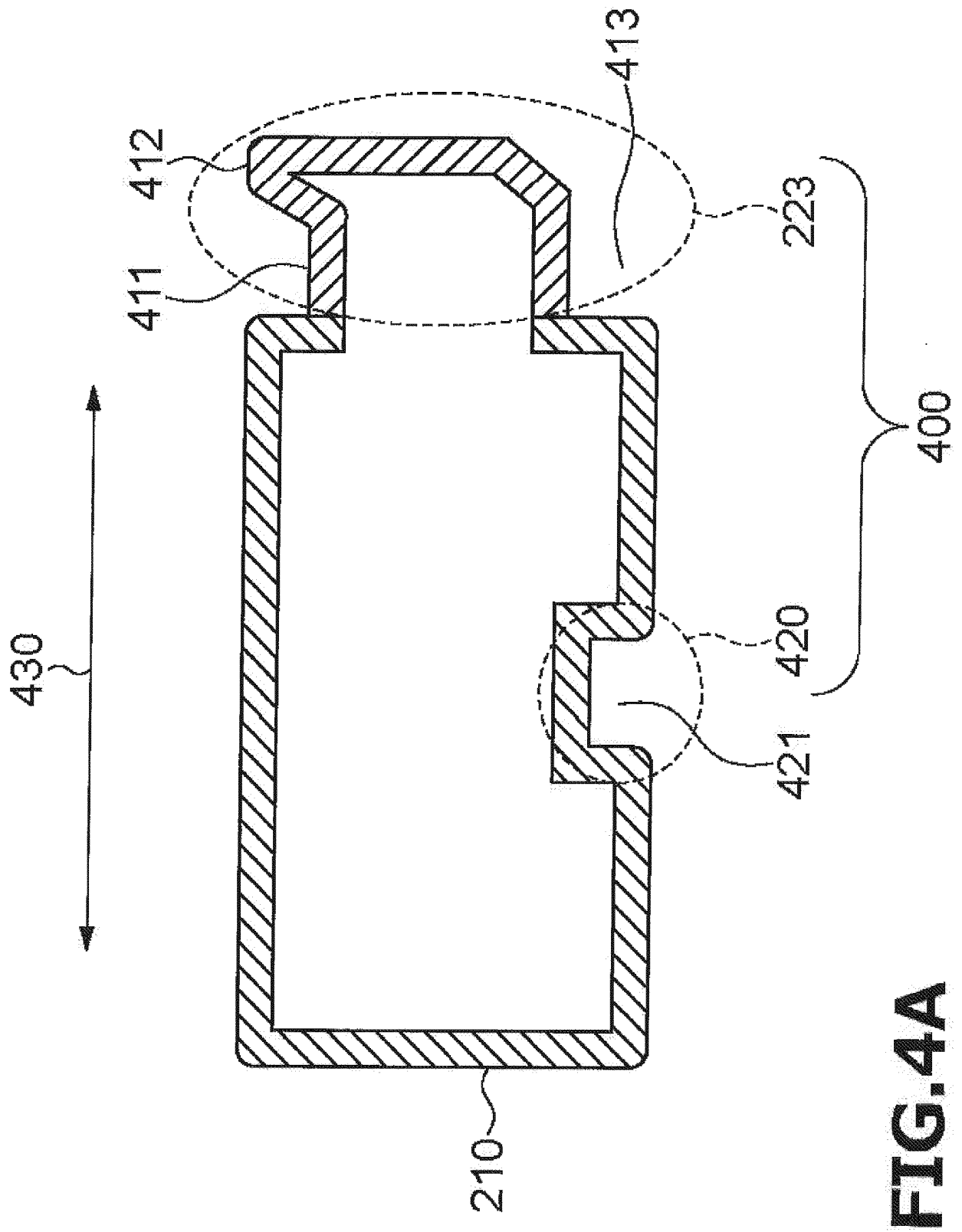


FIG. 3B





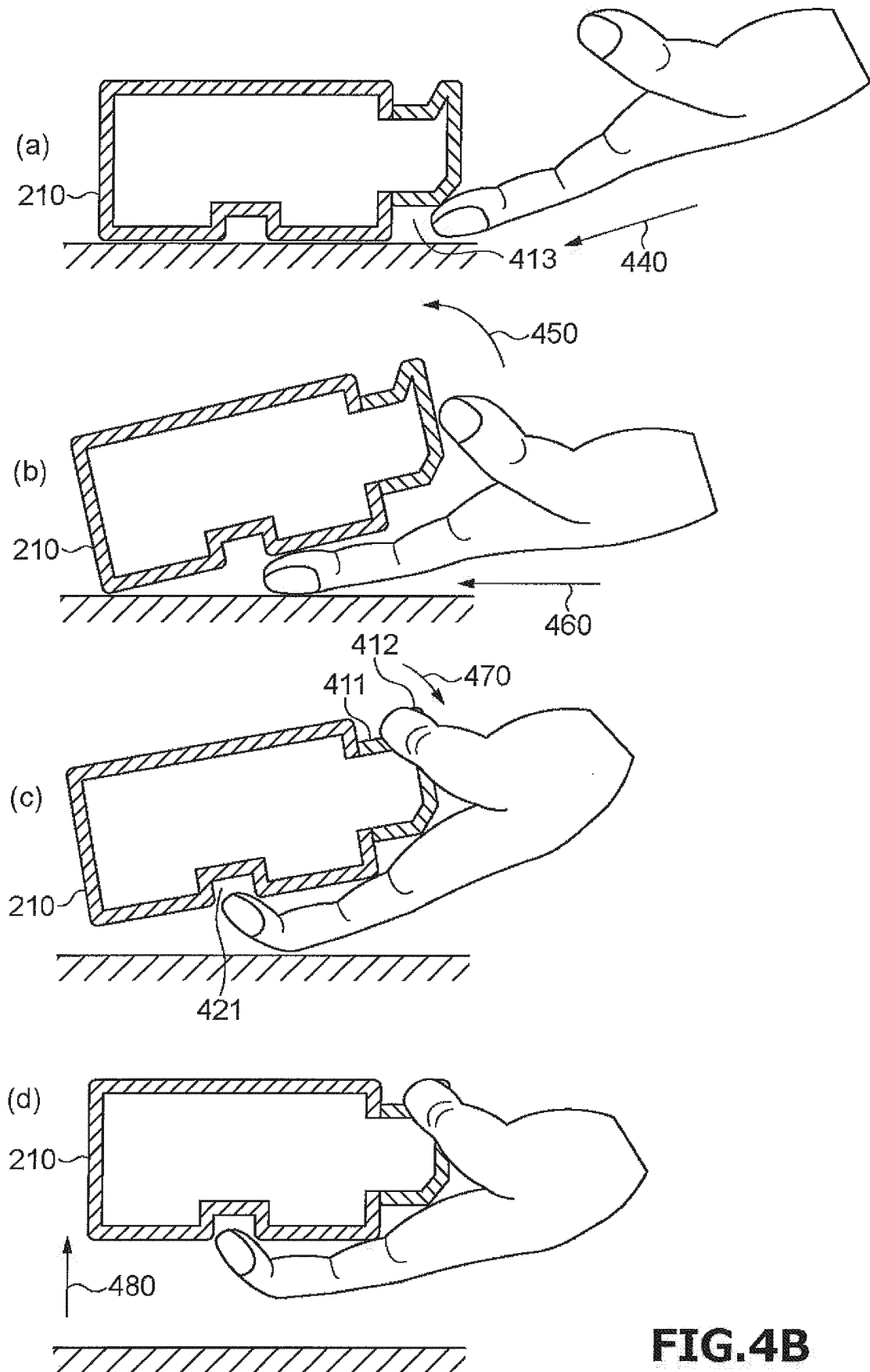
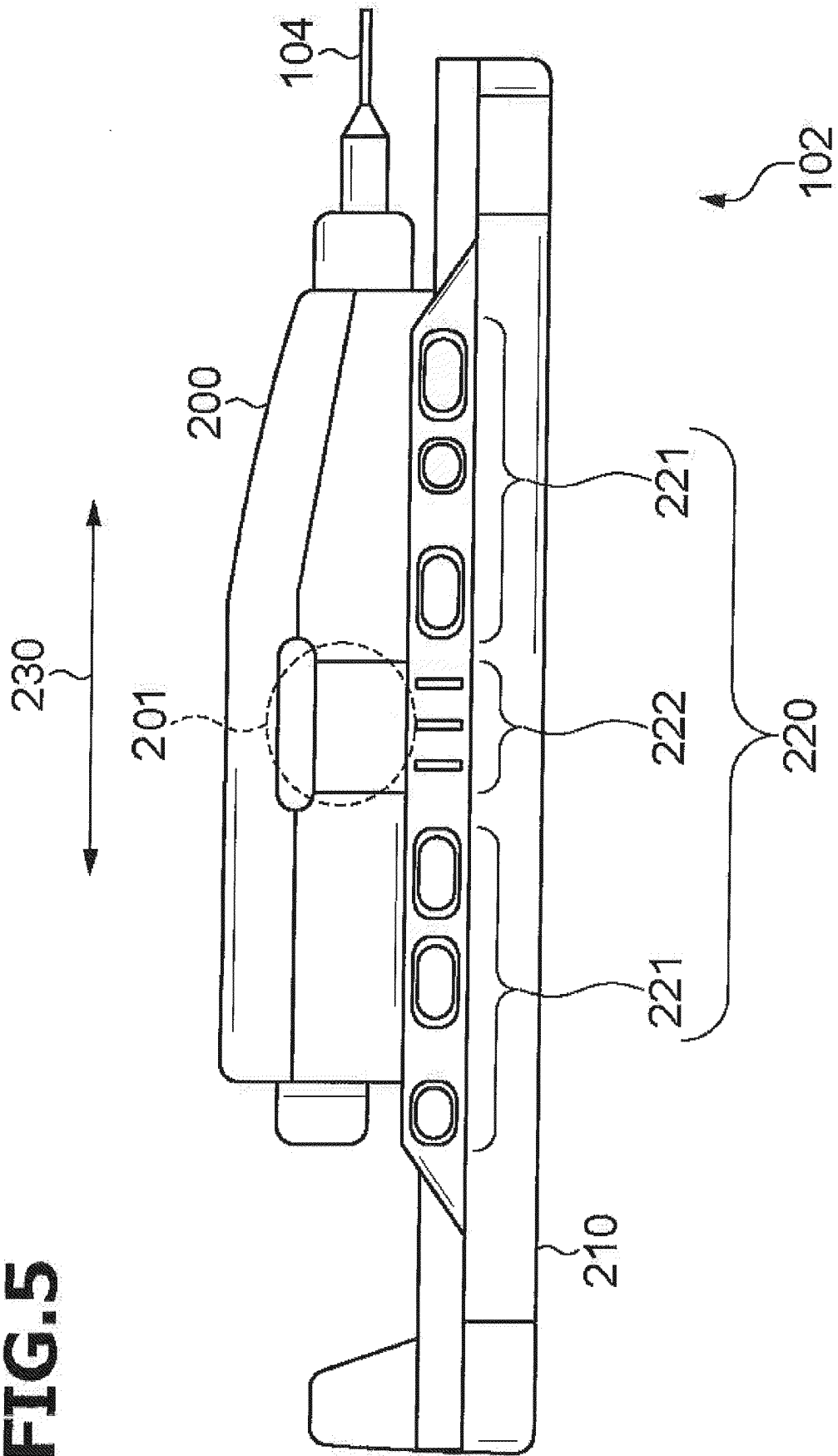


FIG.4B

FIG. 5



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 9812967 A1 [0002]

专利名称(译)	用于利用电动机驱动装置诊断的成像设备		
公开(公告)号	EP2540219B1	公开(公告)日	2019-03-06
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[标]申请(专利权)人(译)	泰尔茂株式会社		
申请(专利权)人(译)	泰尔茂株式会社		
当前申请(专利权)人(译)	泰尔茂株式会社		
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优先权	2011146297 2011-06-30 JP		
其他公开文献	EP2540219A1		
外部链接	Espacenet		

摘要(译)

一种安装有成像探头的电动机驱动装置，该成像探头具有连续进行信号发送和接收的发送和接收单元，包括：扫描器单元（200）；拉回单元（210）；操作单元（220），其中在扫描仪单元的侧表面上，在彼此面对的位置处形成沿扫描仪单元的直行方向形成预定长度的凸起部分（201）凹形部分具有上端表面，该上端表面形成与凸起部分的下端表面相同的表面。

