



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
29.04.2020 Bulletin 2020/18

(51) Int Cl.:
A62B 9/04 (2006.01) A62B 18/08 (2006.01)

(21) Application number: **19205218.1**

(22) Date of filing: **24.10.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(72) Inventors:
• **GANGADHAR, Durgam**
Morris Plains, NJ 07950 (US)
• **VAMSI PASALA, Surya**
Morris Plains, NJ 07950 (US)

(74) Representative: **Haseltine Lake Kempner LLP**
Lincoln House, 5th Floor
300 High Holborn
London WC1V 7JH (GB)

(30) Priority: **26.10.2018 IN 201811040490**

(71) Applicant: **Honeywell International Inc.**
Morris Plains, NJ 07950 (US)

(54) **ADAPTOR FOR RESPIRATORS**

(57) Various embodiments described herein relate to an adaptor and associated respirator system that facilitate engagement of a respirator cartridge with a respirator. The adaptor includes an adaptor top and an adaptor bottom. The adaptor top includes a top portion configured to mechanically engage with a respirator bayonet cartridge. The adaptor top also includes a bottom portion that extends from the top portion to couple the adaptor

top to a respirator. The adaptor top also includes one or more ratchet gears. The adaptor bottom engages with the adaptor top and includes one or more pawl teeth configured to engage with at least one of the one or more ratchet gears of the adaptor top so as to limit rotation of the adaptor top with respect to the adaptor bottom to a single direction.

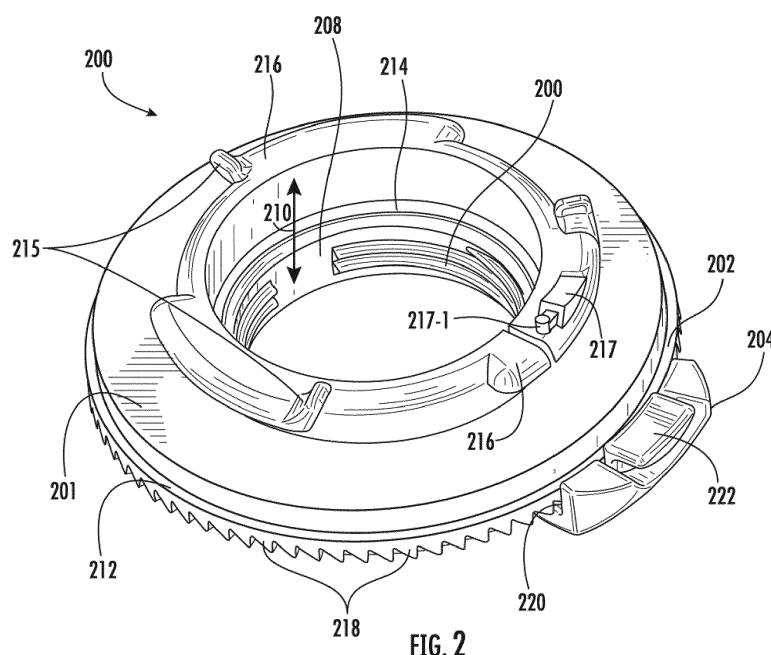


FIG. 2

Description

TECHNOLOGICAL FIELD

[0001] Embodiments of the present disclosure relate generally to air purification and, more particularly, to facilitating secure connection between respirator elements.

BACKGROUND

[0002] Respirator cartridges are used with respirators such as air purifying masks, supplied air respirators, and/or the like. Respirator cartridges often engage with the respirator to provide removable filtering elements that prevent a user from inhaling harmful substances (e.g., toxic gases, airborne fluids, suspended particulates, etc.). Applicant has identified a number of deficiencies and problems associated with conventional respirator cartridges and respirator systems. Through applied effort, ingenuity, and innovation, many of these identified problems have been solved by developing solutions that are included in embodiments of the present disclosure, many examples of which are described in detail herein.

BRIEF SUMMARY

[0003] Various embodiments described herein relate to an adaptor and associated respirator system. An example adaptor includes an adaptor top and an adaptor bottom. The adaptor top may include a top portion that receives a respirator bayonet cartridge attached thereto, and a bottom portion extending from the top portion that couples the adaptor top to a respirator. The adaptor top may further include a plurality of ratchet gears. The adaptor bottom may engage with the adaptor top and may include one or more pawl teeth configured to engage at least one of the plurality of ratchet gears of the adaptor top so as to limit rotation of the adaptor top with respect to the adaptor bottom to a single direction.

[0004] In some embodiments, the adaptor top may define one or more snap elements configured to receive corresponding elements of the bayonet cartridge attached thereto.

[0005] In other embodiments, the adaptor top includes a disk element extending outwardly from a junction between the top portion of the adaptor top and the bottom portion of the adaptor top, and the disk element defines the plurality of ratchet gears. In such an embodiment, the adaptor may include an adaptor gasket disposed adjacent the disk shaped element of the adaptor top.

[0006] In some cases, upon engagement of the adaptor top with the adaptor bottom, the adaptor may be rotatable in a clockwise direction relative to the adaptor bottom. In such an embodiment, upon engagement of the adaptor top with the adaptor bottom, the one or more pawl teeth may prevent an anti-clockwise rotation of the adaptor top with respect to the adaptor bottom via en-

gagement with at least one of the plurality of ratchet gears.

[0007] In some example embodiments, the adaptor bottom includes a tab element communicably coupled with the one or more pawl teeth and configured to, when actuated, disengage the one or more pawl teeth from the at least one of the plurality of ratchet gears so as to allow rotation of the adaptor top with respect to the adaptor bottom in either direction.

[0008] In other embodiments, the bottom portion may include a threaded connection configured to mechanically engage with a corresponding threaded connector of the respirator.

[0009] In some embodiments, the adaptor also includes a piston unit configured to generate tactile or audible feedback in an instance in which the adaptor and bayonet cartridge attached thereto are successfully coupled to the respirator.

[0010] In some cases, the adaptor top and the adaptor bottom each further include corresponding openings such that, in an instance in which the bottom portion of the adaptor top couples the adaptor top to the respirator, the adaptor bottom is disposed between the adaptor top and the respirator. In such an example, the adaptor top and corresponding opening may define a casing having a threaded connection on an inner surface of the casing configured to receive a corresponding threaded connector of the respirator.

[0011] In some embodiments, the adaptor may include an adaptor gasket configured to be fitted co-axially over the adaptor top. In an instance in which the adaptor top receives a respirator bayonet cartridge attached thereto, the adaptor gasket may be disposed between the adaptor top and the respirator bayonet cartridge.

[0012] The above summary is provided merely for purposes of providing an overview of one or more embodiments described herein so as to provide a basic understanding of some aspects of the disclosure. Accordingly, it will be appreciated that the above-described embodiments are merely examples and should not be construed to narrow the scope or spirit of the disclosure in any way. It will be appreciated that the scope of the disclosure encompasses many potential embodiments in addition to those here summarized, some of which are further explained within the following detailed description and its accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The description of the embodiments can be read in conjunction with the accompanying figures. It will be appreciated that for simplicity and clarity of illustration, elements illustrated in the figures have not necessarily been drawn to scale. For example, the dimensions of some of the elements are exaggerated relative to other elements. Embodiments incorporating teachings of the present disclosure are shown and described with respect to the figures presented herein, in which:

FIG. 1 illustrates an exploded view of an example adaptor and respirator system, in accordance with some example embodiments described herein.

FIG. 2 illustrates a perspective view of the adaptor of FIG. 1, in accordance with some example embodiments described herein.

FIG. 3 illustrates an exploded view of an assembly of the adaptor unit, in accordance with some example embodiments described herein.

FIG. 4 illustrates a side view of the adaptor and an engagement of one or more ratchet gears of an adaptor top with at least one pawl teeth of an adaptor bottom of the adaptor, in accordance with some example embodiments described herein.

FIG. 5A illustrates a perspective view of the one or more ratchet gears of the adaptor top, in accordance to some example embodiments described herein.

FIG. 5B illustrates a perspective view of a portion of the adaptor bottom including one or more pawl teeth and a tab element, in accordance with some example embodiments described herein.

FIG. 6A illustrates a sectional view of an example adaptor, in accordance with some example embodiments described herein.

FIG. 6B illustrates a sectional view of an engagement of the adaptor top to the adaptor bottom, in accordance with some example embodiments described herein.

FIG. 7 illustrates a side view and a sectional view of an adaptor unit engaged to a respirator cartridge, in accordance with an embodiment described herein.

FIG. 8 illustrates an example adaptor for engaging a respirator cartridge with a respirator, in accordance with some example embodiments described herein.

DETAILED DESCRIPTION

[0014] Some embodiments of the present disclosure will now be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all embodiments of the disclosure are shown. Indeed, these disclosures may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout. Terminology used in this patent is not meant to be limiting in so far as devices described herein, or portions thereof, may be attached or utilized in other orientations

[0015] The phrases "in one embodiment," "according to one embodiment," and the like generally mean that the particular feature, structure, or characteristic following the phrase may be included in at least one embodiment of the present disclosure, and may be included in more than one embodiment of the present disclosure (importantly, such phrases do not necessarily refer to the same embodiment)

[0016] The word "exemplary" is used herein to mean "serving as an example, instance, or illustration." Any implementation described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other implementations.

[0017] If the specification states a component or feature "may," "can," "could," "should," "would," "preferably," "possibly," "typically," "optionally," "for example," "often," or "might" (or other such language) be included or have a characteristic, that particular component or feature is not required to be included or to have the characteristic. Such component or feature may be optionally included in some embodiments, or it may be excluded.

[0018] "Respirator bayonet cartridge" is used herein to refer to a respirator cartridge having snap fitting elements for engaging the respirator cartridge with a respirator. In contrast, "Respirator threaded cartridge" is used herein to refer to a respirator cartridge having threaded connections for engaging the respirator cartridge with the respirator.

[0019] "Threaded connector respirators" are used herein to refer to respirators having threaded based connector elements for engaging with respirator threaded cartridges. In contrast, "Bayonet connector respirators" are used herein to refer to respirators having snap fittings for engaging with respirator bayonet cartridges.

[0020] The term "threadings" is used herein to refer to any threaded connection (e.g., threaded fitting, screw fitting, or the like). The term "anti-clockwise" is used interchangeably with counterclockwise as would be evident to one of ordinary skill in the art.

[0021] Adaptor units (e.g., adaptors) are widely used to provide flexibility to users for connecting respirator cartridges with one type of connection to a respirator having another type of connection mechanism. For instance, some adaptor units are configured to engage the respirator bayonet cartridges with the threaded connector respirators. Similarly, another type of adaptor units are configured to engage respirator threaded cartridges with bayonet connector respirators. In some conventional systems, an adaptor unit is first engaged with the respirator, and thereafter the cartridge is engaged over an assembly of the adaptor unit engaged to the respirator. In this regard, some adaptor units are configured from one end to engage with threading based engagement means, like threaded connectors of the respirator and from an opposite end are configured to engage with bayonet based cartridge filters having snap fittings. Often in instances in which the cartridge requires replacement, attempts to disengage the respiratory bayonet cartridge also results in disengagement of the adaptor attached thereto (e.g., due to the limited tolerances of mechanical engagement of the adaptor unit over the respirator). Sudden disengagement of the adaptor unit from the respirator may result in undesired inflow of polluted or toxic air to the interior of the respirator which may impact the performance of the respirator or health of a user.

[0022] Various example embodiments described here-

in relate to adaptor units (e.g., adaptors) that facilitate engagement of a respirator with a respirator cartridge. According to some example embodiments, an adaptor unit that facilitates engagement of a threaded connector respirator to a respirator bayonet cartridge is described. The adaptor unit includes an adaptor top, an adaptor bottom, and a gasket. The adaptor bottom also includes one or more threadings (e.g., threaded connection elements) that are configured to engage with threaded connectors of the threaded connector respirator, thereby facilitating an engagement of the adaptor unit with the threaded connector respirator. A portion of the adaptor top also includes one or more snaps that are configured to engage with snap fittings of the respirator bayonet cartridge. Accordingly, the one or more snaps of the adaptor top facilitate engagement of the respirator bayonet cartridge with the adaptor unit. The adaptor top also includes multiple ratchet gears and the adaptor bottom also includes one or more pawl teeth.

[0023] In accordance with various example embodiments described herein, the adaptor top is configured to be engaged mechanically over the adaptor bottom. In this regard, upon engagement of the adaptor top over the adaptor bottom, the one or more ratchet gears of the adaptor top are positioned within grooves defined by the one or more pawl teeth of the adaptor bottom. When the adaptor top is engaged over the adaptor bottom, the adaptor top is operable to be rotated in a clockwise direction relative to the adaptor bottom. In this way, the structure of the one or more pawl teeth of the adaptor bottom restrict an anti-clockwise rotation of the adaptor top relative to the adaptor bottom. A tab element is also provided on the adaptor bottom of the adaptor unit that is configured to, when actuated, disengage the engagement of the one or more ratchet gears with the one or more pawl teeth so as to allow an anti-clockwise rotation of the adaptor unit (e.g., rotation in either direction). Thus, the engagement of the one or more ratchet gears of the adaptor top with the one or more pawl teeth of the adaptor bottom ensures that undesired disengagement of the adaptor unit from the respirator is prevented.

[0024] FIG. 1 depicts an example adaptor unit for engaging a respirator cartridge with a respirator (e.g., respirator system). In accordance with various example embodiments described herein, a respirator assembly 100 includes a respirator 102 comprising one or more threaded connectors 104-1 and 104-2 (not shown) configured for engaging one or more respirator cartridges (e.g., respirator threaded cartridges). The respirator 102 may correspond to a full-face piece mask air purifying respirator (APR). In another example embodiment, the respirator 102 may correspond to a half-face piece mask APR. An adaptor unit 106 of the respirator assembly 100 is configured to facilitate an engagement of a respirator bayonet cartridge 108-1 with the respirator 102. The adaptor unit 106 includes an adaptor top 110, an adaptor bottom 112, and an adaptor gasket 114. In this regard, the adaptor top 110 is configured to be engaged with the adaptor

bottom 112 and the adaptor gasket 114 to form the adaptor unit 106.

[0025] The adaptor top 110 of the adaptor unit 106 at a top portion includes one or more engagement elements such as snap fittings that are configured to engage with corresponding snap fit engagement elements of the respirator bayonet cartridge 108-1. The adaptor top 110 at its bottom portion includes threadings (e.g., threaded connection elements) that are configured to engage mechanically with the threaded connector 104-1 of the respirator 102. In some example embodiments, a gasket 105 may be fitted around the threadings 104-1 of the respirator 102 so as to prevent any leakage of airflow when the adaptor unit 106 is engaged with the respirators 102 via the threadings 104-1. In accordance with said example embodiments, the adaptor unit 106 from its one end 116 is configured to be engaged with the threaded connector 104-1 and from its other end 118, opposite to the end 116, is configured to engage with snap fittings based bayonet engagement elements of the respirator bayonet cartridge 108-1.

[0026] Further, in accordance with various example embodiments described herein, the adaptor top 110 also includes multiple ratchet gears, and the adaptor bottom 112 includes one or more pawl teeth that ensure proper fit of the adaptor unit 106 with the respirator 102. Details related to the structure and operation of the adaptor top 110 including the multiple ratchet gears and the adaptor bottom 112 including the at least one pawl teeth are described hereafter with reference to FIGS. 2-6B.

[0027] FIG. 2 illustrates a perspective view of an adaptor unit in accordance with some example embodiments described herein. An adaptor unit 200 includes an adaptor gasket 201, an adaptor top 202, and an adaptor bottom 204. The adaptor top 202 includes a first portion, for example a top portion 206, and a second portion, for example a bottom portion 208. Illustratively, in accordance with said example embodiments, the bottom portion 208 extends from the top portion 206 so as to define a casing 210 that through passes coaxially from a disc shaped element 212 of the adaptor top 202. In this regard, the disc shaped element 212 (e.g., disk element 212) of the adaptor top 202 extends outwardly from a junction 214 of the top portion 206 and the bottom portion 208 of the adaptor top 202. The top portion 206 of the adaptor top 202 includes at least one snap element 216. The at least one snap element 216 of the top portion 206 is configured to be mechanically engaged with respective snap elements (not shown) that may be present on a respirator bayonet cartridge (e.g., the respirator bayonet cartridge 108-1 as illustrated in FIG. 1. In some embodiments, the at least one snap 216 of the adaptor top 202 also includes respective stopper element 215 that supports the engagement of the at least one snap 216 of the adaptor top 202 with the respective snap elements of the respirator bayonet cartridge 108-1 and also prevents any slippage of the respirator bayonet cartridge 108-1 when engaged to the adaptor unit 200.

[0028] In accordance with some example embodiments, the top portion 216 of the adaptor top 202 may also include a piston unit 217 that facilitates generation of a continuous click sound upon engagement of the respirator bayonet cartridge over the adaptor top 202. The click sound (e.g., or equivalent audio or tactile feedback) provides to a user an indication of the amount of clockwise rotation to be performed in order to engage the respirator bayonet cartridge over the adaptor top. In this regard, as the respirator bayonet cartridge is rotated clockwise over the adaptor top 202, a rib on the bottom surface of the respirator bayonet cartridge slides over a slanted surface of the piston unit 217 and subsequently hits to a piston element 217-1 of the piston unit 217 so as to produce the click sound indicative of proper engagement of the snap elements 216 on respective snap elements of the respirator bayonet cartridge. Accordingly, the user may halt rotation of the respirator bayonet cartridge over the adaptor top 202.

[0029] In accordance with various example embodiments described herein, the disc shaped element 212 of the adaptor top 202 includes one or more ratchet gears 218 defined along a periphery of a bottom surface of the disc shaped element 212. The adaptor bottom 204 of the adaptor unit 200 includes at least one pawl teeth 220 (e.g., one or more pawl teeth 220). In this regard, at least one pawl teeth 220 of the adaptor bottom 204 is configured to engage with at least one of the one or more ratchet gears 218 of the adaptor top 202. The at least one pawl teeth 220 of the adaptor bottom 204 are of a complementary shape with the one or more ratchet gears 218. As such, the at least one pawl teeth 220 is configured to engage with at least one of the one or more ratchet gears 218 such that the engagement allows a clockwise movement of the adaptor top 202 with respect to the adaptor bottom 204, but prevents an anti-clockwise movement of the adaptor top 202 relative to the adaptor bottom 204. Further details of the engagement of the multiple ratchet gears 218 with the at least one pawl teeth 220 are described with reference to FIGS. 3-6B.

[0030] The adaptor bottom 204 also includes a tab element 222 extending from the at least one pawl teeth 220 of the adaptor bottom 204. In some embodiments, the tab element 222 is configured to disengage, in response to user actuation, an engagement of the at least one pawl teeth 220 with at least one of the plurality of the ratchet gears 218. This disengagement allows a rotation of the adaptor top 202 in anti-clockwise direction with respect to the adaptor bottom 204 (e.g., in both directions).

[0031] FIG. 3 illustrates a perspective view of the adaptor unit 200, a top-to-bottom exploded view 350, and a bottom-to-top exploded view 301. The adaptor unit 300 includes the adaptor gasket 201, the adaptor top 202, and the adaptor bottom 204, as described with reference to FIG. 2. The adaptor top 202 includes a first face 302 and a second face 304 that extends opposite from the first face 302. The first face 302 includes a first portion

306 protruding outwardly from the first face 302 and the second face 304 includes a second portion 308 protruding outwardly from the second face 304. In some embodiments, the first face 302 and the second face 304 of the adaptor top 202 define a disc shaped element 309 of the adaptor top 202 such that, at a periphery of the disc shaped element 309 towards the second face 304 one or more ratchet gears 310 are defined. The first portion 306 of the first face 302 extends to the second portion 308 of the second face 304 to define a casing 312. In this regard, the casing 312 defined by the first portion 306 and the second portion 308 is co-axial to the disc shaped element 309 defined by the first face 302 and the second face 304. As shown, the casing 312 is defined along an axis AA' that is perpendicular to an axis BB' of the disc shaped element 309.

[0032] As illustrated, the first portion 306 of the adaptor top 202 extends out from the first face 302 and includes one or more snap elements 314 defined at a periphery of a first end 313 of the casing 312. For instance, the first portion 306 of the adaptor top 202 may include three snap elements 314 defined at the first end 313 of the casing 312. In accordance with various example embodiments described herein, the one or more snap elements 314 of the adaptor top 202 are configured to be mechanically engaged with respective snap elements (not shown) of a respirator bayonet cartridge (e.g., the respirator bayonet cartridge 108-1 as described in FIG. 1). In this regard, the one or more snap elements 314 of the adaptor top 202 facilitate an engagement of the respirator bayonet cartridge with the adaptor unit 200. Further details related to the engagement of the respirator bayonet cartridge with the adaptor unit 200 are described with reference to FIG. 7.

[0033] As the top portion 306 of the adaptor top 202 protrudes outwardly along the linear axis AA' from the disc shaped element 309, a part 316 of the first portion 306 of the adaptor top 202 is defined as a complementary shape to a shape of the adaptor gasket 201. In this regard, the adaptor gasket 201 is configured to be engaged over the part 316 of the adaptor top 202. The adaptor gasket 201, in accordance with some example embodiments, may be of a flexible material such as, but not limited to, flexible plastic or silicon, that may upon engagement over the adaptor top 202 be gripped over the part 316 of the adaptor top 202. In this regard, upon an engagement of the respirator bayonet cartridge with a respirator via the adaptor unit 200, the adaptor gasket 201 prevents any leakage of air flow between the respirator bayonet cartridge and the respirator (e.g., forms a seal).

[0034] Referring to the bottom-to-top exploded view 301, the second portion 308 of the adaptor top 202 extends outwardly from the second face 304 along the linear axis AA'. The second portion 308 includes one or more snap fits 319 that are configured to facilitate an engagement of the adaptor top 202 with the adaptor bottom 204. For the engagement of the adaptor top 202 with the adaptor bottom 204, according to one example embodiment,

the adaptor top 202 is press-fit over the adaptor bottom 204 that causes the engagement of the snap fits 319 of the adaptor top 202 with corresponding snap fits (not shown) of shape complimentary to the snap fits 319 on the adaptor bottom 204. As illustrated, an inner surface of the casing 312 defined by the second portion 308 includes one or more threadings 318. In this aspect, the one or more threadings 318 (e.g., threaded connection elements) are configured to mechanically engage with a threaded connector of a respirator (e.g., the threaded connector 104-1 of the respirator 102 as described in FIG. 1). In this regard, in accordance with various example embodiments described herein, the adaptor unit 200 is assembled with the threaded connector 104-1 of the respirator 102 based on a threaded engagement.

[0035] In some embodiments, the threadings 318 (e.g., threaded connection elements) on the adaptor unit 200 are configured to ensure proper fit of the adaptor unit 200 with a threaded connector respirator (e.g., the respirator 102 as described in FIG. 1). In this aspect, according to various example embodiments described herein, the adaptor unit 200 may be rotated in a clockwise direction about the axis AA' with respect to the respirator 102, to facilitate an engagement of the threadings 318 of the adaptor unit 200 with the threadings 104-1 of the respirator 102. To this extent, in some example embodiments, upon the clockwise rotation, the engagement of the adaptor unit 200 with the respirator 102 generates a continuous click sound during the rotation. The continuous click sound, may be generated due to an engagement of the threadings 318 with the threaded connector 104-1 of the respirator, and may indicate to a user engaging the adaptor unit 200 with the respirator 102 a necessary amount of force to be used for rotating the adaptor unit 200 with respect to the respirator 102.

[0036] In accordance with various example embodiments described herein, the adaptor bottom 204 includes one or more pawl teeth 320 and one or snap fits 322. The one or more snap fits 322 are configured to be engaged with the snap fits 319 of the adaptor top 202, thereby facilitating an engagement of the adaptor top 202 with the adaptor bottom 204. Upon engagement of the adaptor top 202 with the adaptor bottom 204, the one or more ratchet gears 310 of the adaptor top 202 are received within grooves defined by the one or more pawl teeth 320. The one or more pawl teeth 320 of the adaptor bottom 204 mechanically engage with the one or more ratchet gears 310 of the adaptor top 202 so as to allow a clockwise rotation of the adaptor top 202 with respect to the adaptor bottom 204, but restrict an anti-clockwise rotation of the adaptor top 202 with respect to the adaptor bottom 204. In this regard, each of the one or more pawl teeth 320 of the adaptor bottom may be of a form factor such that, upon engaging the adaptor top 202 over the adaptor bottom 204, if an anti-clockwise rotation of the adaptor top 202 with respect to the adaptor bottom 204 is attempted, the one or more ratchet gears 310 of the adaptor top 202 are engaged mechanically within

grooves of the one or more pawl teeth 320 to restrict the anti-clockwise rotation. Further details of the mechanical engagement of the one or more ratchet gears 310 of the adaptor top 202 with the one or more pawl teeth 320 are described with reference to FIGS. 4-5B.

[0037] Referring to the perspective view, the adaptor unit 200 includes the adaptor top 202 engaged with the adaptor bottom 204 and the adaptor gasket 201 fitted coaxially over the adaptor top 202. In this regard, the adaptor unit 200 is configured to be mechanically engaged over a respirator (e.g., the respirator 102 as described in FIG. 1) by rotating the adaptor unit 200 clockwise with respect to the axis AA'. For engaging the adaptor unit 200 over a like the respirator 102, the adaptor unit 200 is rotated in a clockwise direction about the axis AA' that causes engagement of the one or more threadings 318 of the adaptor top 202 with the threaded connector 104-1 of the respirator 102. Similarly, once the adaptor unit 200 is engaged with the respirator, an anti-clockwise rotation of the adaptor unit 200 about the axis AA', causes disengagement of the one or more threadings 318 of the adaptor top 202 with the threaded connector 104-1 of the respirator 102, thereby disengaging the adaptor unit 200 with the respirator 102. However, in accordance with various example embodiments described herein, the anti-clockwise rotation of the adaptor unit 200 about the axis AA' may not be performed ordinarily unless a tab element 324 of the adaptor bottom 204 is pressed down (e.g., actuated by a user). In this aspect, the anti-clockwise rotation of the adaptor top 202 relative to the adaptor bottom 204 is restricted due to the mechanical engagement of the one or more pawl teeth 320 of the adaptor bottom 204 with the one or more ratchet gears 310 of the adaptor top 202. The adaptor bottom 204 includes the tab element 324 that extends out from the one or more pawl teeth 320. The tab element 324 is configured to disengage the engagement of the one or more pawl teeth 320 with the one or more ratchet gears 310, thereby allowing a rotation of the adaptor top 202 anti-clockwise relative to the adaptor bottom 204 to facilitate a disengagement of the adaptor unit 200 from the respirator. Further details related to the engagement of the one or more pawl teeth 320 with the one or more ratchet gears 310 that restrict anti-clockwise rotation of the adaptor unit 200 are described with reference to FIGS. 4-6B.

[0038] FIG. 4 illustrates a side view 410 of the adaptor unit 200 and a perspective view 450 showing an engagement 402 of the one or more ratchet gears 310 of the adaptor top 202 with the one or more pawl teeth 320 of the adaptor bottom 204. Referring to the side view 410, the adaptor unit 200 includes an adaptor top 202 engaged over the adaptor bottom 204. Further, as illustrated, the adaptor gasket 201 is also engaged over the adaptor top 201. Referring to the perspective view 450, the engagement 402 of the one or more ratchet gears 310 of the adaptor top 202 with the one or more pawl teeth 320 of the adaptor bottom 204 is illustrated. In this aspect, the engagement 402 may be such that a rotation of the adap-

tor top 202 in a clockwise direction with respect to the adaptor bottom 204 is allowed and an anticlockwise rotation of the adaptor top 202 with respect to the adaptor bottom 204 is restricted. As described with reference to FIG.2, the adaptor top 202 on its bottom surface (e.g., the second face 304) defines the one or more ratchet gears 310 (e.g., a first ratchet gear 310-1, a second rather gear 310-2, etc.) at a periphery of the second face 304. Also, the adaptor bottom 204 of the adaptor unit 200 defines the one or more pawl teeth 320 (e.g., a first pawl teeth 320-1, a second pawl teeth 320-2, and a third pawl teeth 320-3 collectively referred as the one or more pawl teeth 320 for brevity). As the adaptor top 202 is engaged over the adaptor bottom 204, one or more of the first ratchet gear 310-1, the second ratchet gear 310-2, and the third ratchet gear 310-3 are received within grooves defined by the respective one or more pawl teeth 320 (i.e., the first pawl teeth 320-1, the second pawl teeth 320-2, and the third pawl teeth 320-3, respectively). The form factor of the one or more pawl teeth 320 is defined such that, upon receiving the one or more ratchet gears 310, the adaptor top 202 can be rotated clockwise relative to the adaptor bottom 204, but cannot be rotated anti-clockwise relative to the adaptor bottom 204. Said differently an overall anti-clockwise rotation of the adaptor unit 200, in instances when the adaptor unit 200 is engaged to the respirator 102, is restricted. In this aspect, a tab element 404 of the adaptor bottom 204 extends from the one or more pawl teeth 320. The tab element 404, according to various example embodiments, is configured to disengage the one or more ratchet gears 310 from the one or more pawl teeth 320 so as to allow an anticlockwise rotation of the adaptor top 202 relative to the adaptor bottom 204 (e.g., rotation in either direction). Further details of structure and form factor of the one or more ratchet gears 310, the one or more pawl teeth 320, and the tab element 404 are described with reference to FIGS. 5A-5B and 6A-6B, respectively.

[0039] FIG. 5A illustrates a perspective view 500 of the one or more ratchet gears 310 of the adaptor top 202, in accordance to some example embodiments described herein. As illustrated, a periphery of the disc shaped element 309 of the adaptor top 202 defines the multiple ratchet gears 310-1, 310-2, 310-3.... 310-n (collectively referred as one or more ratchet gears 310, herein throughout the description for brevity). In this regard, each of the one or more ratchet gears 310 may be of a form factor that defines a tapered end 502 and a slanted end 504 (i.e., forming one teeth shape structure that defines one gear). In accordance with various example embodiments described herein, the tapered end 502 and the slanted end 504 of the one or more ratchet gears 310 form pre-defined angles A1 and A2, respectively, relative to a bottom surface 505 of the adaptor top 202. In this aspect, the angle A2 defined by the slanted end 504 of the one or more ratchet gears 310 is such that, upon engagement of the adaptor top 202 with the adaptor bottom 204, in an instance when the adaptor top 202 rotates

clockwise relative to the adaptor bottom 204, the slanted end 502 slides over a surface of the one or more pawl teeth 320 of the adaptor bottom 204. Further, the angle A1 defined by the tapered end 502 of the one or more ratchet gears 310 is such that, upon engagement of the adaptor top 202 with the adaptor bottom 204, an attempt to rotate the adaptor top 202 anti-clockwise relative to the adaptor bottom 204 causes the tapered end 502 to engage with the one or more pawl teeth 320 of the adaptor bottom 204 so as to restrict the anti-clockwise rotation of the adaptor top 202 relative to the adaptor bottom 204. In accordance with various example embodiments, the angle A1 defined by the tapered end 502 of the one or more ratchet gears 310 may be within a range from about 30 degrees to about 50 degrees with respect to the bottom surface 505, or more preferably within a range from about 40 degrees to about 50 degrees with respect to the bottom surface 505 of the adaptor top 202. Further, in accordance with various example embodiments, the angle A2 defined by the tapered end 502 of the one or more ratchet gears 310 may be within a range from about 2 degrees to about 10 degrees with respect to the bottom surface 505, or more preferably within a range from about 3 degrees to about 8 degrees with respect to the bottom surface 505 of the adaptor top 202.

[0040] FIG. 5B illustrates a perspective view 550 of a portion of the adaptor bottom 204 representing the one or more pawl teeth 320, for instance the first pawl teeth 320-1, the second pawl teeth 320-2, and the third pawl teeth 320-3, and the tab element 404 that extends from the one or more pawl teeth 320. In this aspect, each of the one or more pawl teeth 320 includes a first wall 506 and a second wall 508 that defines a form factor of the one or more pawl teeth 320. In accordance with various example embodiments described herein, upon engaging the adaptor top 202 over the adaptor bottom 204, the one or more ratchet gears 310 are received in grooves defined between the one or more pawl teeth 320. For example, in one example embodiment, upon engaging the adaptor top 202 over the adaptor bottom 204, the first ratchet gear 310-1 is received in a first groove 512-1 defined by the first pawl teeth 320-1 and the second pawl teeth 320-2. Accordingly, the second ratchet gear 310-2 is received in a second groove 512-2 defined by the second pawl teeth 320-2 and the third pawl teeth 320-3.

[0041] Upon clockwise rotation of the adaptor top 202 relative to the adaptor bottom 204, the one or more ratchet gears 310 slide over a surface of the one or more pawl teeth 320. For example, upon the clockwise rotation of the adaptor top 202, the second ratchet gear 310-2 slides over the second groove 512-2 and is recessed in the first groove 512-1. Similarly, upon the clockwise rotation of the adaptor top 202, remaining ratchet gears 310 of the adaptor top 202 slide through the one or more pawl teeth 320 of the adaptor bottom 204. In accordance with various example embodiments described herein, upon an attempt to rotate the adaptor top 202 anti-clockwise relative to the adaptor bottom 204, the one or more ratchet

gears 310 are engaged with the one or more pawl teeth 320 so as to restrict any anti-clockwise motion of the adaptor unit 200.

[0042] The tab element 404 in accordance with various example embodiments described herein, is pivoted about an end 510 and may be pushed down (e.g., actuated) relative to two extensions 512-1 and 512-2 defined by the adaptor bottom 204. In this aspect, as the tab element 404 is pushed down, the one or more ratchet gears 310 are disengaged from the one or more pawl teeth 320, thereby allowing the adaptor top 202 to rotate in any of the clockwise or the anticlockwise direction relative to the adaptor bottom 204. Accordingly, referring to FIGS. 1-5, in situations where a user desires to disengage the adaptor unit 200 from the respirator 102, the tab element 404 may be pushed down to allow the anticlockwise rotation of the adaptor unit 200 to disengage the threadings 318 (e.g., threaded connection elements) from the threaded connector 104-1 of the respirator 102.

[0043] FIG. 6A illustrates a sectional view 600 of the adaptor unit 200, in accordance with some example embodiments described herein. As illustrated, the adaptor top 202 is mechanically engaged over the adaptor bottom 204 via the snap elements 319 of the adaptor bottom 204. As shown, the adaptor top 200 defines the casing 312 including the threadings 318 defined at one end of the casing 312. As illustrated, the adaptor gasket 201 is fitted over the adaptor top 202 such that the adaptor gasket 201 thereby surrounds a cross section of the casing 319 of the adaptor top 202. Further, the adaptor top 201 at its one end defines the one or more snap elements 314 having respective stoppers 315 that are configured to support an engagement of a respirator bayonet cartridge on the adaptor unit 200. FIG. 6B, schematically depicts another sectional view 650 depicting an engagement of the adaptor top 202 of the adaptor unit 200 to the adaptor bottom 204, in accordance with an embodiment described herein. The adaptor top 202 is engaged over the adaptor bottom 204 based on the snap element 319 defined on an outer surface of the casing 312 of the adaptor top 204.

[0044] FIG. 7 illustrates depicts a side view 700 and a sectional view 750 of the adaptor unit 200 engaged to a respirator cartridge 702, in accordance with an embodiment described herein. The respirator cartridge 702 is engaged to the adaptor unit 200 based on a snap fit arrangement 704. In this regard, the snap fit arrangement 704 represents an engagement of the one or more snap fits 314 defined at a top portion of the adaptor top 202 with corresponding snap fits (not shown) of the respirator cartridge 702. In one example embodiment, the respirator cartridge 702 is a respirator bayonet cartridge having snap fits that are configured to engage with the snap fits 314 of the adaptor top 202.

[0045] Referring to the sectional view 750, the respirator cartridge 102 is engaged with the adaptor unit 200 such that a bottom portion 706 of the respirator cartridge 702 is co-axial to the adaptor top 202 of the adaptor unit

200. In this regard, to engage the adaptor unit 200 to the respirator cartridge 702, the respirator cartridge 702 may be positioned over the adaptor top 202 and rotated in a clockwise direction relative to the adaptor top 202. This rotation facilitates an engagement of the one or more snap fits 314 of the adaptor top 202 with corresponding snap fits on the bottom portion 706 of the respirator cartridge 702. Accordingly, to replace or disengage the respirator cartridge 702 from the adaptor unit 200, the respirator cartridge 702 may be rotated in an anticlockwise direction relative to the adaptor top 202. As illustrated, the respirator cartridge 702 includes one or more filter elements 708 that may be configured to filter an inflow of air, as the air passes through a cross section 710 of the respirator cartridge, and to a respirator (e.g., the respirator 102 via the adaptor unit 200). A sectional view 770 represents the respirator cartridge 702 engaged over a respirator like the respirator 102 via the adaptor unit 200.

[0046] FIG. 8 illustrates an example scenario 800 including the adaptor unit 106 for engaging the one or more respirator cartridges 108-1 and/or 108-2 with another respirator 802, in accordance with some example embodiments described herein. In this regard, the respirator 802 is a half face piece mask air purifying respirator. While described herein with reference to a separate adaptor unit, the present disclosure also contemplates that one or more of the elements may be form integral with a respirator mask and/or as part of a respirator system.

[0047] In accordance with various example embodiments described herein, in operation to engage a threaded connector respirator with a respirator bayonet cartridge, various components of the adaptor unit may be first assembled. For instance, firstly, the adaptor top 202 may be assembled with the adaptor bottom 204 and the adaptor gasket 201. Thereafter, the assembly of the adaptor unit 200 is engaged to the threaded connector respirator. In this aspect, the assembly of the adaptor unit 200 may be positioned over the threading connector respirator such that the threadings 318 of the adaptor top 202 mates with the threaded connector like the threaded connector 104-1 of the respirator 102.

[0048] Accordingly, the assembly of the adaptor unit 200 may be rotated clockwise relative to the respirator to facilitate an engagement of the threadings 318 of the adaptor top 202 with the threaded connector like the threaded connector 104-1 of the respirator 102, thereby engaging the adaptor unit 200 with the respirator 102. Thirdly, a respirator bayonet cartridge is engaged over an assembly of the adaptor unit 200 with the respirator 102. In this regard, the respirator bayonet cartridge may be positioned over the top portion 306 of the adaptor top 202 such that snap elements of the respirator bayonet cartridge mate with the snap fits 314 of the adaptor top 202. Accordingly, the respirator bayonet cartridge is rotated clockwise with respect to the assembly of the adaptor unit 200 and the respirator which facilitates an engagement of the snap elements 314 of the adaptor top

202 with respective snap elements of the respirator bayonet cartridge, thereby engaging the respirator bayonet cartridge with the adaptor unit 200. This facilitates a fluidic communication of the respirator bayonet cartridge with the respirator 102.

[0049] In accordance with various example implementations of said embodiments, both respirator threaded cartridges or respirator bayonet cartridges may be used. Accordingly, a user without performing any modifications to an existing threaded connector respirator may use either a respirator threaded cartridge or respirator bayonet cartridge.

[0050] In some example embodiments, certain ones of the operations herein may be modified or further amplified as described below. Moreover, in some embodiments additional optional operations may also be included. It should be appreciated that each of the modifications, optional additions or amplifications described herein may be included with the operations herein either alone or in combination with any others among the features described herein.

[0051] The foregoing method descriptions and the process flow diagrams are provided merely as illustrative examples and are not intended to require or imply that the steps of the various embodiments must be performed in the order presented. As will be appreciated by one of skill in the art the order of steps in the foregoing embodiments may be performed in any order. Words such as "thereafter," "then," "next," etc. are not intended to limit the order of the steps; these words are simply used to guide the reader through the description of the methods. Further, any reference to claim elements in the singular, for example, using the articles "a," "an" or "the" is not to be construed as limiting the element to the singular.

[0052] Many modifications and other embodiments of the inventions set forth herein will come to mind to one skilled in the art to which these inventions pertain having the benefit of teachings presented in the foregoing descriptions and the associated drawings. Although the figures only show certain components of the apparatus and systems described herein, it is understood that various other components may be used in conjunction with the supply management system. Therefore, it is to be understood that the inventions are not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Moreover, the steps in the method described above may not necessarily occur in the order depicted in the accompanying diagrams, and in some cases one or more of the steps depicted may occur substantially simultaneously, or additional steps may be involved. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

Claims

1. An adaptor comprising:

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an adaptor top comprising:

a top portion, wherein the top portion is configured to receive a respirator bayonet cartridge attached thereto;

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a bottom portion extending from the top portion, wherein the bottom portion is configured to couple the adaptor top to a respirator; and

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a plurality of ratchet gears; and

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an adaptor bottom configured to engage with the adaptor top, wherein the adaptor bottom comprises one or more pawl teeth configured to engage at least one of the plurality of ratchet gears of the adaptor top so as to limit rotation of the adaptor top with respect to the adaptor bottom to a single direction.

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2. The adaptor according to Claim 1, wherein the adaptor top defines one or more snap elements configured to receive corresponding elements of the bayonet cartridge attached thereto.

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3. The adaptor according to Claim 1 or 2, wherein the adaptor top further comprises a disk element extending outwardly from a junction between the top portion of the adaptor top and the bottom portion of the adaptor top, and wherein the disk element defines the plurality of ratchet gears.

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4. The adaptor according to one of Claims 1-3, wherein, upon engagement of the adaptor top with the adaptor bottom, the adaptor top is configured to be rotatable in a clockwise direction relative to the adaptor bottom.

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5. The adaptor according to Claim 4, wherein, upon engagement of the adaptor top with the adaptor bottom, the one or more pawl teeth are configured to prevent an anti-clockwise rotation of the adaptor top with respect to the adaptor bottom via engagement with at least one of the plurality of ratchet gears.

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6. The adaptor according to one of Claims 1-5, wherein the adaptor bottom further comprises a tab element communicably coupled with the one or more pawl teeth and configured to, when actuated, disengage the one or more pawl teeth from the at least one of the plurality of ratchet gears so as to allow rotation of the adaptor top with respect to the adaptor bottom in either direction.

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7. The adaptor according to one of Claims 1-6, wherein

the adaptor top and the adaptor bottom each further comprise corresponding openings such that, in an instance in which the bottom portion of the adaptor top couples the adaptor top to the respirator, the adaptor bottom is disposed between the adaptor top and the respirator.

8. The adaptor according to one of Claims 1-7, further comprising a piston unit configured to generate tactile or audible feedback in an instance in which the adaptor and bayonet cartridge attached thereto are successfully coupled to the respirator.
9. A respirator system for use with bayonet cartridges, the system comprising:
 - an adaptor comprising:
 - an adaptor top comprising:
 - a top portion, wherein the top portion is configured to receive a respirator bayonet cartridge attached thereto;
 - a bottom portion extending from the top portion; and
 - a plurality of ratchet gears; and
 - an adaptor bottom configured to engage with the adaptor top, wherein the adaptor bottom comprises one or more pawl teeth configured to engage at least one of the plurality of ratchet gears of the adaptor top so as to limit rotation of the adaptor top with respect to the adaptor bottom to a single direction; and
 - a respirator mask, wherein the respirator mask defines a connection configured to engage the bottom portion of the adaptor top so as to secure the adaptor to the respirator mask.
10. The respirator system according to Claim 9, wherein the adaptor top defines one or more snap elements configured to receive corresponding elements of the bayonet cartridge attached thereto.
11. The respirator system according to Claim 9 or 10, wherein the adaptor top further comprises a disk element extending outwardly from a junction between the top portion of the adaptor top and the bottom portion of the adaptor top, and wherein the disk element defines the plurality of ratchet gears.
12. The respirator system according to one of Claims 9-11, wherein, upon engagement of the adaptor top with the adaptor bottom, the adaptor top is configured to be rotatable in a clockwise direction relative to the adaptor bottom.

13. The respirator system according to Claim 12, wherein, upon engagement of the adaptor top with the adaptor bottom, the one or more pawl teeth are configured to prevent an anti-clockwise rotation of the adaptor top with respect to the adaptor bottom via engagement with at least one of the plurality of ratchet gears.

14. The respirator system according to one of Claims 9-13, wherein the adaptor bottom further comprises a tab element communicably coupled with the one or more pawl teeth and configured to, when actuated, disengage the one or more pawl teeth from the at least one of the plurality of ratchet gears so as to allow a rotation of the adaptor with respect to the adaptor bottom in either direction.

15. The respirator system according to one of Claims 9-14, further comprising a piston unit configured to generate tactile or audible feedback indicative of successful coupling between the respirator mask and the bayonet cartridge attached thereto via the adaptor.

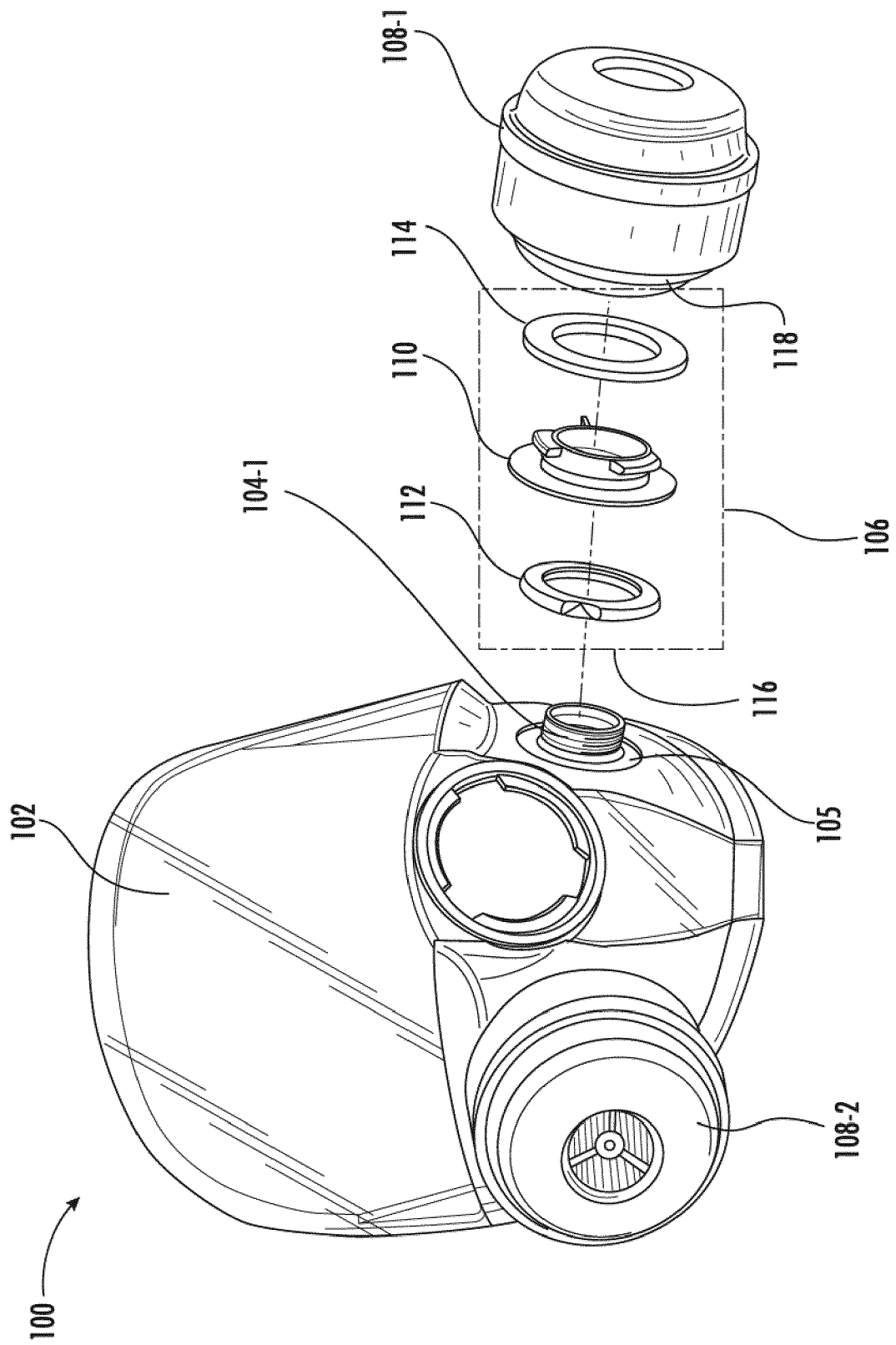
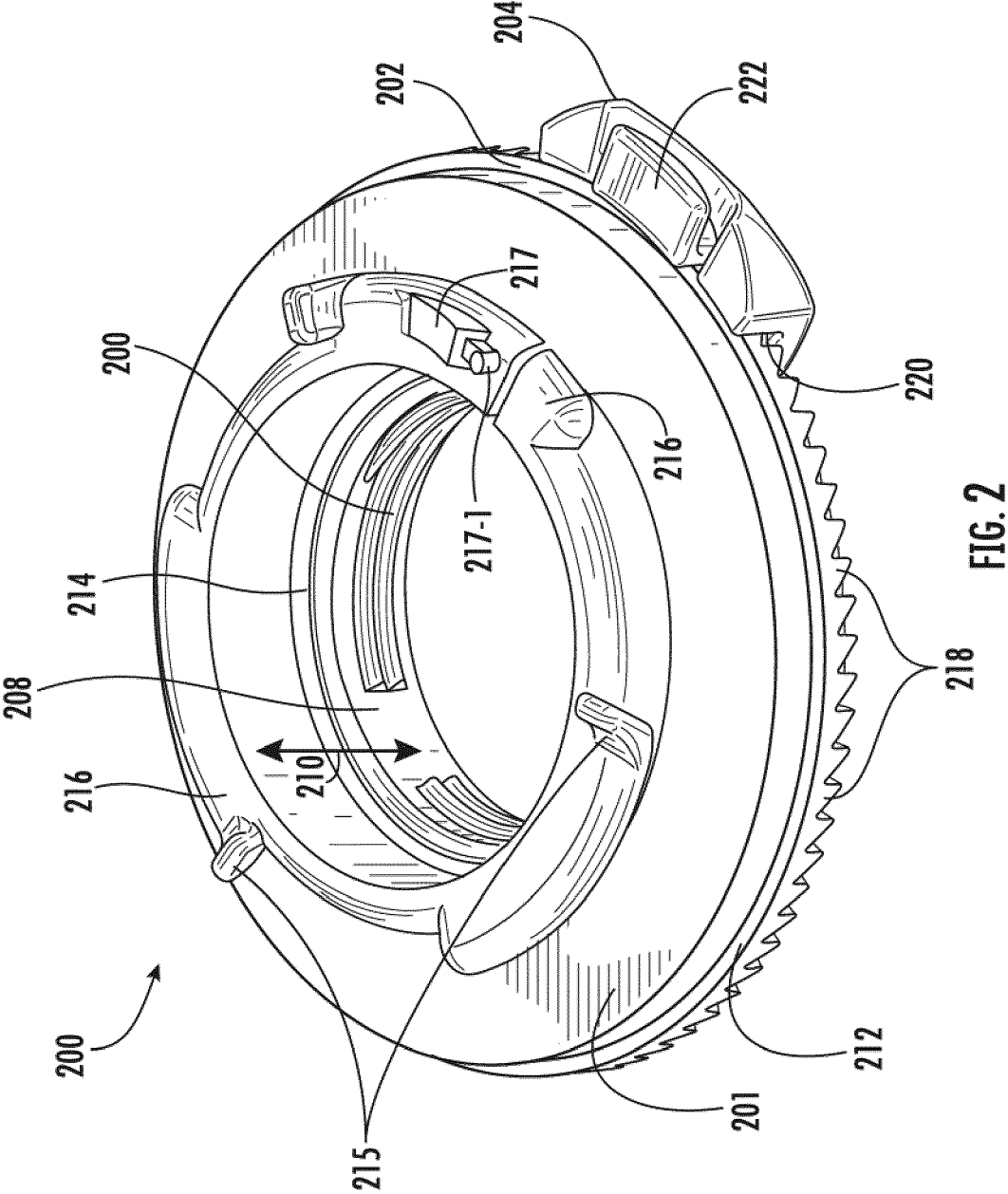
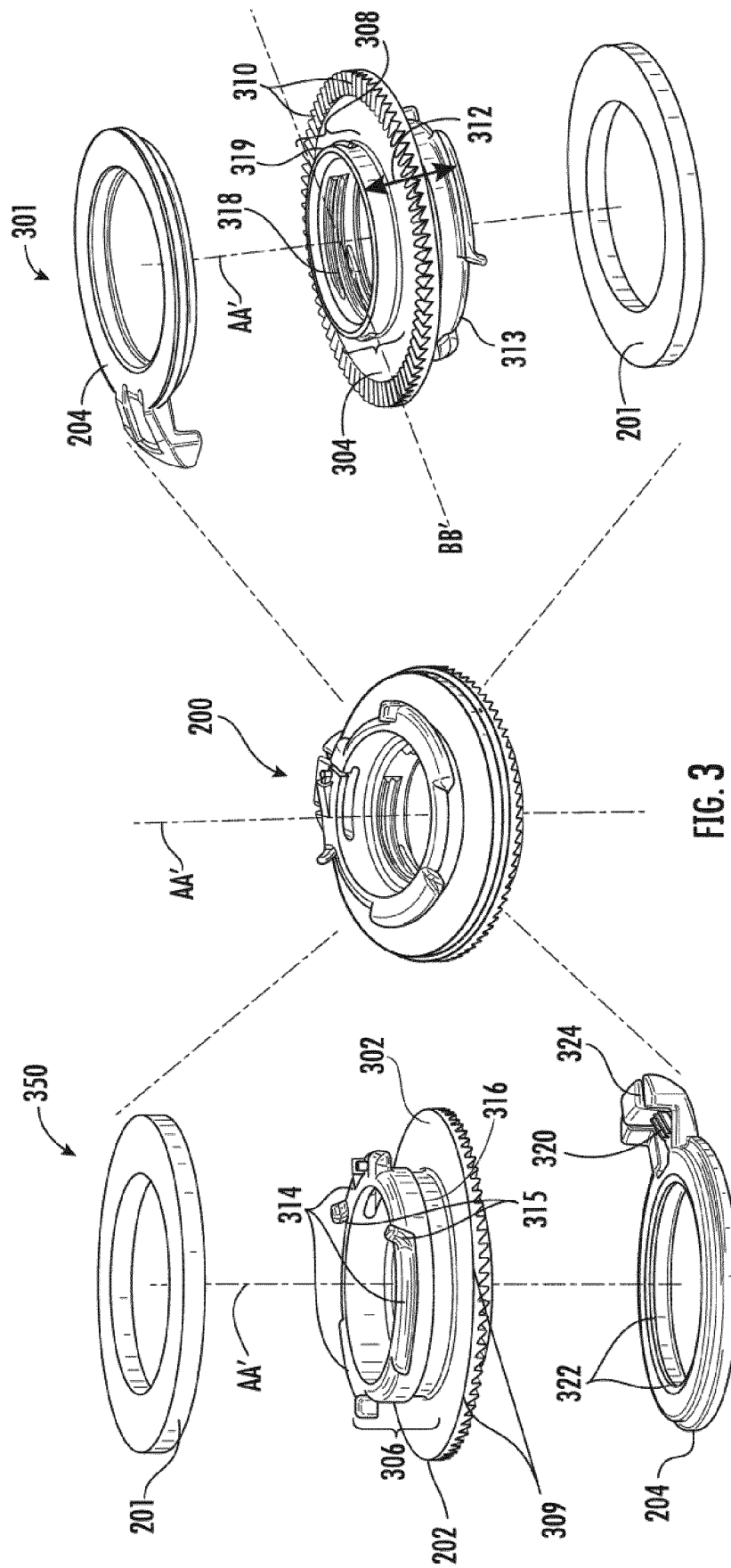


FIG. 1





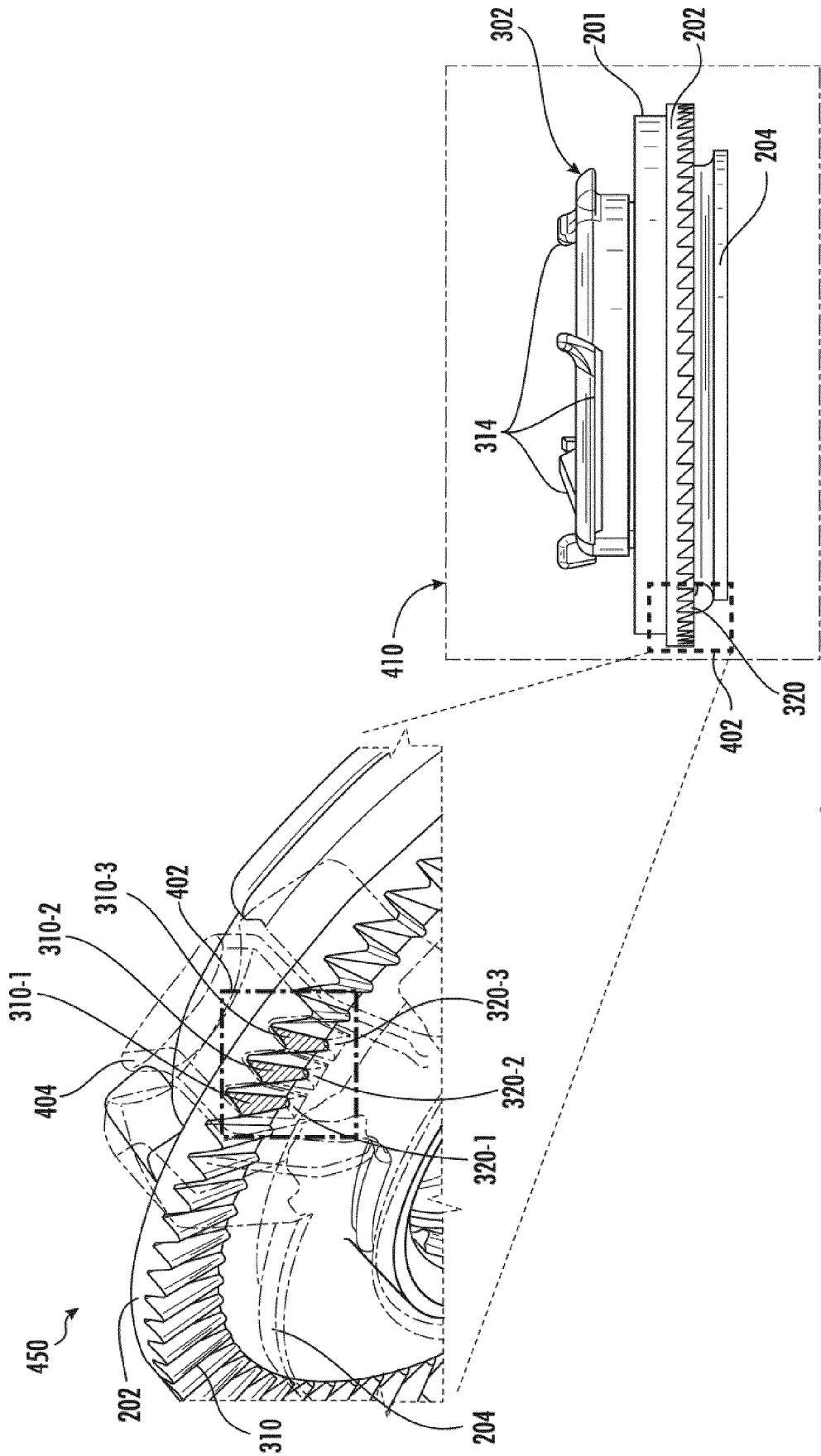


FIG. 4

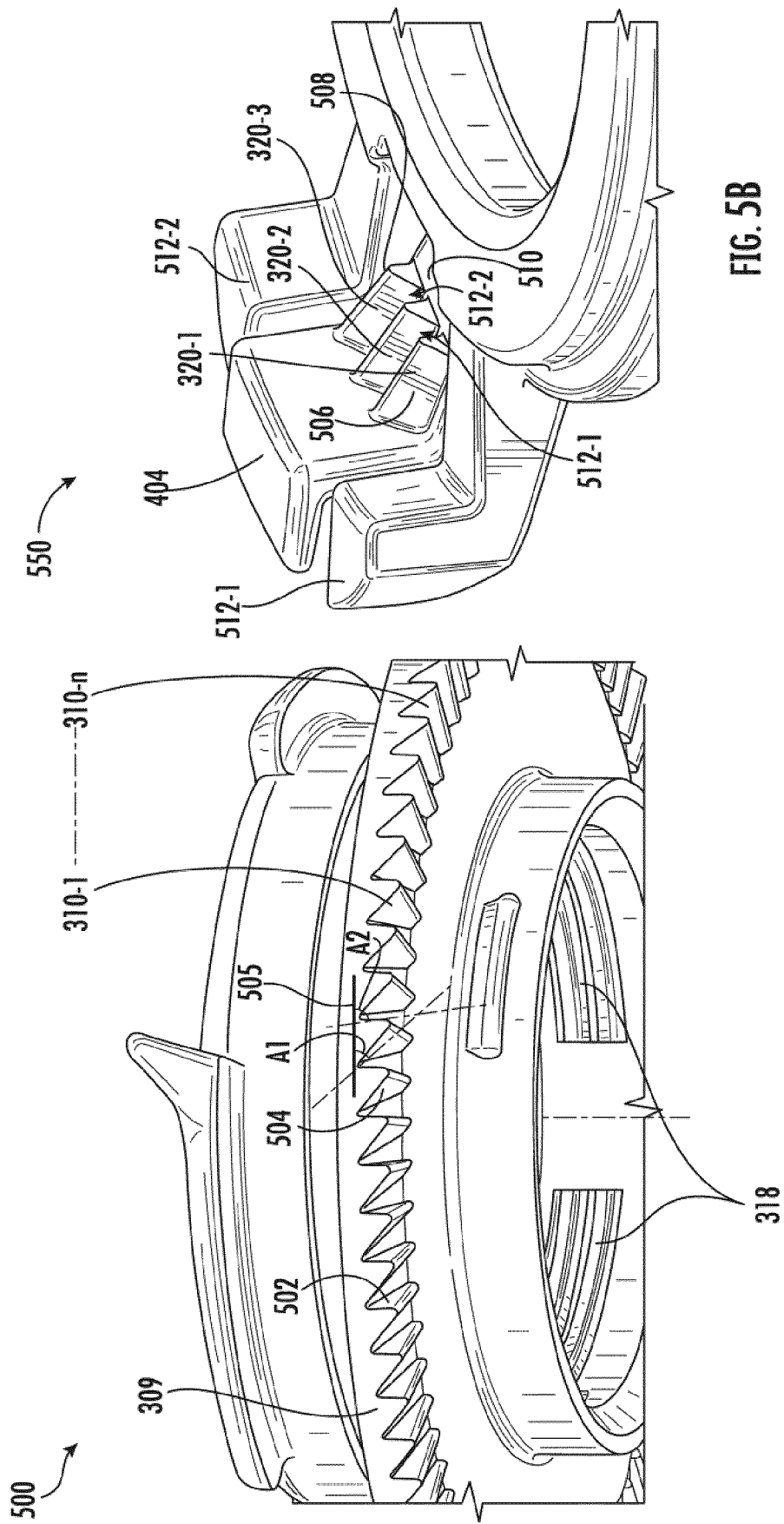


FIG. 5B

FIG. 5A

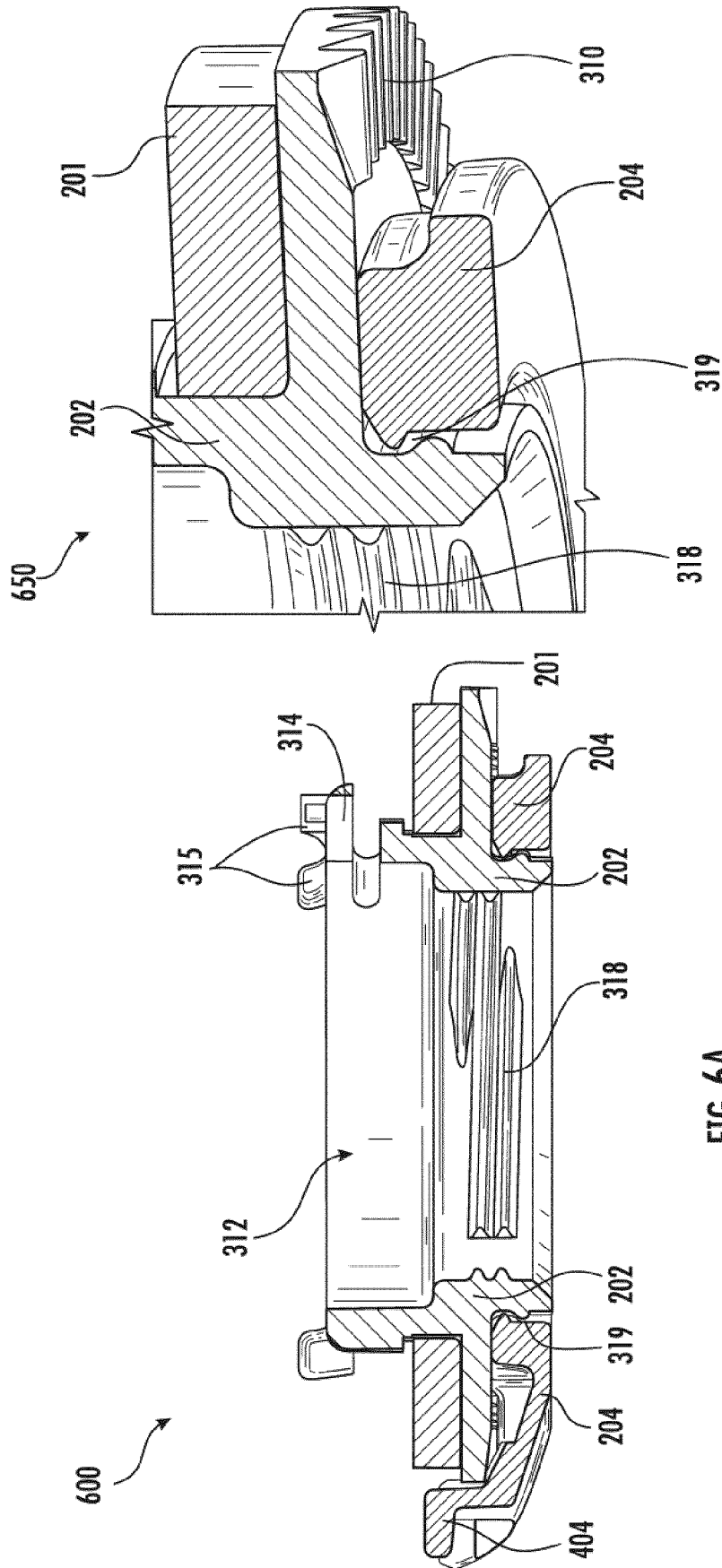
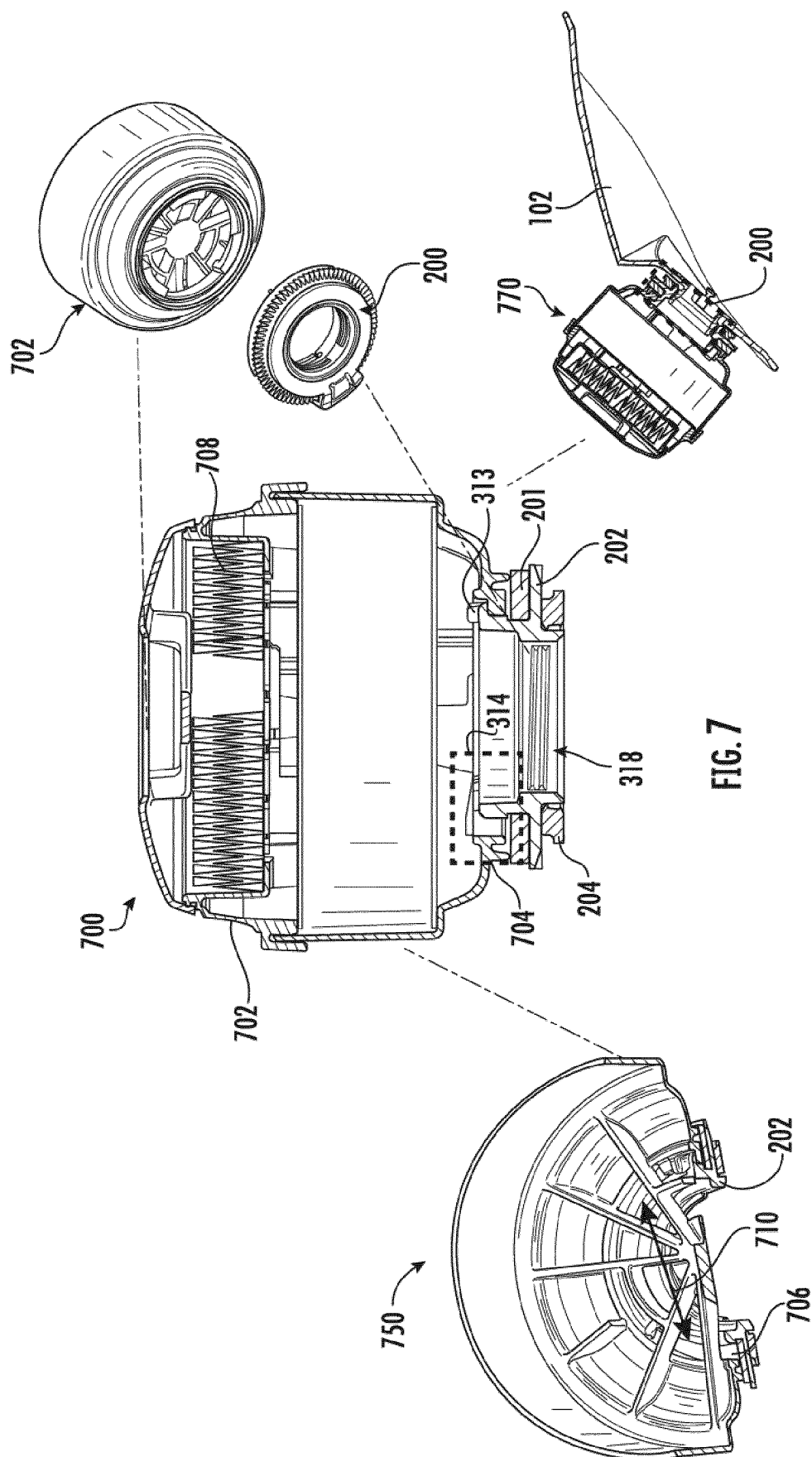


FIG. 6B

FIG. 6A



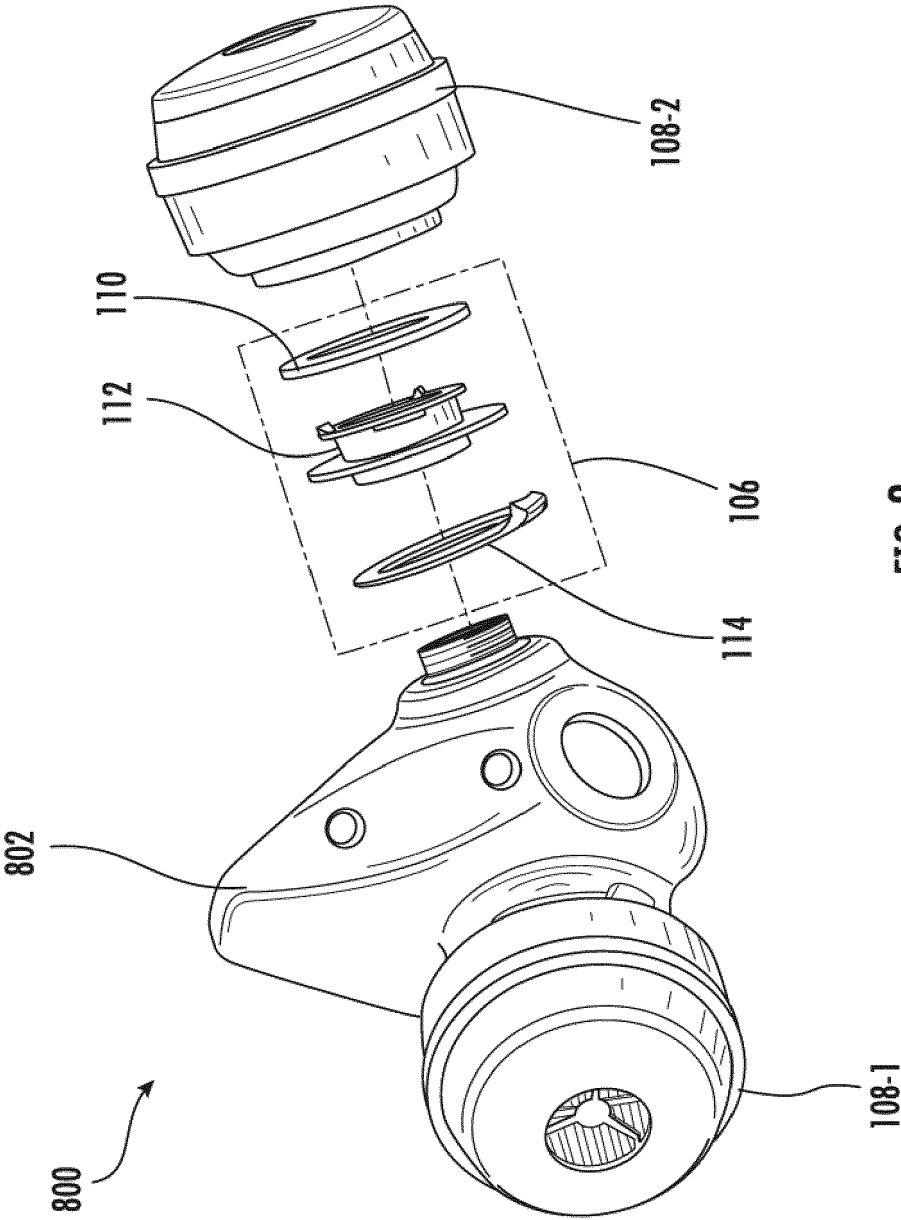


FIG. 8



EUROPEAN SEARCH REPORT

Application Number
EP 19 20 5218

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 1 685 877 A1 (ULTRA ELECTRONICS AUDIOPACK IN [US]) 2 August 2006 (2006-08-02) * paragraph [0042]; figures *	1-15	INV. A62B9/04 A62B18/08
A	FR 2 537 695 A1 (COMMEINHES PROTECTION [FR]) 15 June 1984 (1984-06-15) * abstract; figures *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			A62B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 26 February 2020	Examiner Vervenne, Koen
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82