

FORM 2

THE PATENTS ACT, 1970

(39 of 1970) & The Patents Rules 2003

COMPLETE SPECIFICATION

(SECTION 10 and Rule 13)

1. Title of the invention:

AN APPARATUS AND METHOD FOR MOUNTING AND
REMOVING A COMPONENT TO AND FROM A TANK

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Complete Specification:

The following specification describes and ascertains the nature of this invention and the manner in which it is to be performed.

Field of the invention:

[0001] The present invention relates to an apparatus and method for mounting and removing a component from and to a tank, respectively.

5 **Background of the invention:**

[0002] In high density traffic locations with uneven road surfaces, there are high chances of vibrations, and hence the mounting of different components in a vehicle is of paramount importance. Once such component is a supply module which is mounted to a tank of the vehicle by clamping, which needs to withstand such high
10 vibrational (gravitational) forces. Also, the tank of the vehicle needs to be assembled with supply module by high mounting/demounting forces by a service person so that the supply module clamps does not disengage from the tank during vibration. However, with the service person (user) assembly techniques, generating such high mounting forces by human hand is difficult. Hence, a need for an
15 apparatus for assembling and disassembling supply module with respect to the tank is required. These supply modules are serviceable or replaceable.

[0003] A patent literature US20040025316 discloses a fuel sending unit lock ring tool. A device and method for installing and removing fuel sending closure system
20 lock rings for retaining a module reservoir assembly includes a drive connection feature and a plurality of legs having feet that engage the lock ring to rotate it.

Brief description of the accompanying drawings:

[0004] An embodiment of the disclosure is described with reference to the
25 following accompanying drawings,

[0005] Fig. 1 illustrates an apparatus to mount a component to a tank, according to an embodiment of the present invention;

[0006] Fig. 2 illustrates a first member of the apparatus, according to an embodiment of the present invention;

30 [0007] Fig. 3 illustrates a second member of the apparatus, according to an embodiment of the present invention;

- [0008] Fig. 4 illustrates different view of the apparatus, according to an embodiment of the present invention;
- [0009] Fig. 5 illustrates the apparatus and the component aligned to be mounted, according to an embodiment of the present invention;
- 5 [0010] Fig. 6 illustrates the apparatus holding the component, according to an embodiment of the present invention;
- [0011] Fig. 7 illustrates the apparatus holding the component to the tank, according to an embodiment of the present invention;
- [0012] Fig. 8 illustrates the mounting of the component to the tank, according to an
10 embodiment of the present invention;
- [0013] Fig. 9 illustrates the section view of the mounting of the component, according to an embodiment of the present invention;
- [0014] Fig. 10 illustrates locking the component to the tank, according to an embodiment of the present invention, and
- 15 [0015] Fig. 11 illustrates a method of mounting and removing the component to and from the tank, according to the present invention.

Detailed description of the embodiments:

- [0016] Fig. 1 illustrates an apparatus to mount a component to a tank, according to
20 an embodiment of the present invention. The tank 102 comprises an interface defining an opening 104 to which the component 108 is to be mounted. The component 108 comprises a mount ring 116. The apparatus 100 comprises a first member 110 adapted to hold the component 108 in a manner that the component 108 rests over the first member 110. The component 108 is placed over the first
25 member 110 before mounting. A second member 120 movably coupled with the first member 110, and adapted to clamp the component 108 through the first member 110 in pressing manner against the interface 106. The clamping is performed during mounting. The component 108 may be mounted to the tank 102 by axial and rotational movement of the first member 110 through the second
30 member 120. The tank 102 is part of a vehicle which is adapted to store any one of a fuel, Diesel Exhaust Fluid (DEF), etc. Alternatively, the tank 102 is for a house,

building adapted to store water. The component 108 is a supply module or a pump to circulate a fluid between the tank 102 and a target such as a fuel injector for an engine or a dosing injector for an exhaust path. The interface 106 comprises plurality of tabs 112. Similarly, the component 108 comprises plurality of claw parts 118. The claw parts 118 are adapted to engage with the tabs 112. Further, the mount ring 116 comprises mount holes 114 to enable mounting of the component 108 to the tank 102.

[0017] Fig. 2 illustrates a first member of the apparatus, according to an embodiment of the present invention. The first member 110 comprises a first plate 202 fixed with at least three first arms 204. The at least three first arms 204 are either welded to the first plate 202 or is integrally formed as one piece with the first plate 202. At least two legs 206 extends perpendicularly from the first plate 202. Further, a pin 208 is fixed to a free end of each of the three first arms 204, each of the pin 208 passes through and held perpendicular to the free end of respective first arms 204. The three first arms 204 are equidistant from each other and are in the same plane as that of the first plate 202. The two legs 206 are parallel to each other. The two legs 206 comprises a circular groove on the surfaces facing each other. The circular grove enables the fitting of a screw 314 with respect to the second member 120, as shown in Fig. 3. The Fig. 2 shows a top and a bottom view of the first member 110.

[0018] Fig. 3 illustrates a second member of the apparatus, according to an embodiment of the present invention. The second member 120 comprises a second plate 302 fixed with at least three second arms 304. The at least three second arms 304 are either welded to the second plate 302 or are integrally formed as one piece with the second plate 302. The second member 120 further comprises at least two slits 306 to receive the two legs 206 from the first member 110. Further, a clamping arm 310 adapted to be pivoted at free end of each of the three second arms 304. The second member 120 further comprises a slot 308 at the free ends of each of the three second arms 304 to receive respective pins 208 from the first plate 202. The three

second arms 304 are equidistant from each other and are in the same plane as that of the second plate 302. The clamping arms 310 are pivoted to the respective second arm 304 through a mount pin.

5 [0019] The second plate 302 comprises a bore (not shown) between the at least two slits 306 for insertion of the screw 314. The bore is not visible due to the inserted screw 314. The screw 314 comprises threads which engages with the threads of the bore.

10 [0020] In accordance to another embodiment, at least three third arms 312 are fixed to the second plate 302, and the slots 308 are provided to a free end of the at least three third arms 312, whereas the clamping arms 310 are provided to the at least three second arms 304. The three third arms 312 are equidistant from each other and are provided in the same plane as that of the second plate 302. At least one slot
15 308 is provided with a stopper 316. The stopper 316 extends out from an edge of the slot 308. The stopper 316 is provided to allow rotation of the first member 110 in only one direction during locking or mounting. The pins 208 in engagement with the stopper 316 enables the unidirectional rotation. In the subsequent figures, only one pin 208, one first arm 204, one second arm 304 and one third arm 312 are
20 numbered to avoid complexity.

[0021] Fig. 4 illustrates different view of the apparatus, according to an embodiment of the present invention. A top view and a bottom view of the apparatus 100 is shown in the Fig. 4. The pin 208 of the first member 110 is aligned
25 to the slot 308 of the second member 120. Further, the legs 206 of the first member 110 are fixed to the slits 306 of the second member 120. The slits 306 are so made to allow predetermined movement of the legs 206 within.

[0022] Fig. 5 illustrates the apparatus and the component aligned to be mounted,
30 according to an embodiment of the present invention. The dashed lines shows the pins 208 are held in alignment with the mount holes 114 of the mount ring 116. The

number of pins 208 are same as number of mount holes 114 to provide stability in operation. However, unequal number of pins 208 to the number of mount holes 114 is also possible.

5 [0023] Fig. 6 illustrates the apparatus holding the component, according to an embodiment of the present invention. The pins 208 are shown inserted inside the mount holes 114, as shown with dashed circles 602. The component 108 rests on the apparatus 100 before mounting. The component 108 is now ready to be mounted to the tank 102.

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[0024] Fig. 7 illustrates the apparatus holding the component to the tank, according to an embodiment of the present invention. The component 108 shown in Fig. 6 is now moved up against a bottom of the tank 102. The mount ring 116 makes contact with the interface 106 of the tank 102. Once in contact, the apparatus 100 is clamped to the interface 106 of the tank 102 while holding the component 108 in engagement with the opening 104 of the tank 102. The clamping is done by means of the clamping arms 310. The clamping arms 310 shown in dotted line represents unclamped position and the one in solid lines represents clamped position. The apparatus 100 is suitable for those components 108 which are mounted to a bottom of the tank 102, i.e. the opening 104 of the tank 102 faces the ground. However, the apparatus 100 is applicable for side mounted or top mounted tanks 102 as well.

[0025] Fig. 8 illustrates the mounting of the component to the tank, according to an embodiment of the present invention. Once the component 108 is clamped to the interface 106 of the tank 102, a first tool 802 such as Allen key or other similar tightening tool is used to rotate the screw 314 and apply torque in locking direction. The Fig. 8 illustrates the first tool 802 in dashed lines representing a first position before axial tightening, and the first tool 802 with solid lines representing second position after axial tightening.

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[0026] Fig. 9 illustrates the section view of the mounting of the component, according to an embodiment of the present invention. A first section view 910 illustrates the component 108 before axial tightening, and a second section view 920 illustrates the component 108 after the axial tightening. In both the views, two
5 O-rings are shown, one is radial ring 902 and other is axial ring 904. In the first section view 910, both the O-rings are in relaxed state, however after the component 108 is moved axially by the rotation of the first tool 802, the component 108 moves up while compressing both the O-rings. The axial movement or tightening provides a tight seals to prevent any leakage from inside of the tank 102 to outside or from
10 outside to the inside of the tank 102. The rotation of the first tool 802 is adapted to rotate a threaded screw 314 which is fit to the bore. The screw 314 forces the component 108, which is held through the pins 208, to move against the second member 120. Since, the second member 120 is fixed to the interface 106 through the clamping arms 310, the component 108 moves axially towards the tank 102 with
15 support from the second member 120. At the end of the axial movement, the pins 208 come out of the slot 308 as seen in the second section view 920. Once the pins 208 are out of the slot 308, the first member 110 is ready for the rotation in locking direction.

[0027] Fig. 10 illustrates locking the component to the tank, according to an embodiment of the present invention. Once the component 108 is tightened with the first tool 802, a second tool 1002 is used to rotate the first member 110 within the space available in the slits 306. A first view 1010 illustrates that the axial movement is completed, and the first member 110 and the second member 120 are
20 aligned but are in unlocked condition/state. The second view 1020 illustrates the locked position where the claw parts 118 of the component 108 engages with the tabs 112 of the interface 106. The second tool 1002 is adapted to engage with the legs 206 and rotate the first member 110. Since the pins 208 are inserted inside the mount holes 114, the rotation of the first member 110 also rotates the component
25 108, and thus brings the claw parts 118 over the tabs 112. The component 108 is
30

now locked or mounted to the tank 102. A third tool is also possible to be used which is enabled with features to engage with the screw 314 and the legs 206.

[0028] According to an embodiment of the present invention, an apparatus 100 to
5 remove the component 108 from the tank 102 is provided. The tank 102 comprises the opening 104 fixed with the interface 106 to which the component 108 is mounted, and the component 108 comprises a mount ring 116. The apparatus 100 comprises the first plate 202 fixed with at least three first arms 204, at least two legs
206 extending from the first plate 202, and the pins 208 fixed to the free end of each
10 of the three first arms 204. Each of the pins 208 passes through and held perpendicular to the free end of respective first arms 204. The pins 208 are adapted to fit to the mount ring 116. The first member 110 as described in Fig. 2, is used as the apparatus 100, i.e. the first member 110, standalone, is used to remove the component 108 from the tank 102.

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[0029] Fig. 11 illustrates a method of mounting and removing the component to and from the tank, according to the present invention. At first, the method for mounting the component 108 to the tank 102 is explained. A first step 1102 comprises coupling the first member 110 with the second member 120 and forming
20 an assembly. The step 1102 is shown by Fig. 4. A step 1104 comprises positioning the component 108 on the assembly and clamping the assembly to the interface 106 of the tank 102. The step 1104 is shown in Fig. 5 through Fig. 7. A step 1106 comprises moving the first member 110 in an axial direction by rotating the screw 314 in the second member 120 and tightening the component 108 to the interface
25 106 of the tank 102. The step 1106 is represented by Fig. 8 through Fig. 9. A step 1108 comprises rotating and locking the component 108 to the interface 106 of the tank 102. The step 1108 is represented by Fig. 10. A step 1110 comprises removing the assembly after mounting the component 108 from the tank 102.

30 [0030] According to the present invention, a method for removing the component 108 from the tank 102 is provided. A step 1112 comprises positioning the apparatus

100 to the mount ring 116 of the component 108. The pins 208 of the apparatus 100 is positioned to the respective mount holes 114 of the component 108. A next step 1114 comprises applying a axial force to the component 108 through the apparatus 100. The axial force is applied manually by a service personnel in an attempt to
5 partially loosen the clamping force. A next step 1116 comprises rotating the apparatus 100 in unlocking direction. The rotation is performed by the second tool 1002. A next step 1118 comprises removing the apparatus 100 with the component 108 resting over the apparatus 100.

10 [0031] According to the present invention, an end user such as service personnel at vehicle service stations, the mounting or removing the components 108 to the tank 102 reduces human fatigue, reduces the servicing time and improves the customer satisfaction. Also, once the axial force has been applied through the apparatus 100, the pins 208 comes out of the slots 308, ensuring safety of the clamping and
15 prevents accidental rotation of the first member 110 by the service personnel. The apparatus 100 provides two plate assembly (detachable type) which provides dual function comprising axial movement to provide higher mounting forces by threaded mechanism, and rotational movement to provide higher torque for mounting/demounting of the component 108.

20

[0032] It should be understood that embodiments explained in the description above are only illustrative and do not limit the scope of this invention. Many such embodiments and other modifications and changes in the embodiment explained in the description are envisaged. The scope of the invention is only limited by the
25 scope of the claims.

We claim:

1. An apparatus (100) to mount a component (108) to a tank (102), said tank (102) comprises an interface defining an opening (104) fixed with an interface (106) to which said component (108) is to be mounted, and said
5 component (108) comprises a mount ring (116), said apparatus (100) comprises:
a first member (110) adapted to hold said component (108) in manner that said component (108) rests over said first member (110),
and
10 a second member (120) movably coupled with said first member (110), said second member (120) adapted to clamp said component (108) through said first member (110) in pressing manner against said interface (106), said component (108) mounted to said tank (102) by axial and rotational movement of said first member (110) through
15 said second member (120).
2. The apparatus (100) as claimed in claim 1, wherein said first member (110) comprises,
a first plate (202) fixed with at least three first arms (204);
20 at least two legs (206) extends perpendicularly from said first plate (202), and
a pin (208) fixed to a free end of each of said three first arms (204), each of said pin (208) passes through and held in perpendicular to said free end of respective first arms (204).
25
3. The apparatus (100) as claimed in claim 1, wherein said second member (120) comprises,
a second plate (302) fixed with at least three second arms (304);
at least two slits (306) in said second plate (302) to receive two legs
30 (206) from said first member (110);

a clamping arm (310) adapted to be pivoted at free end of each of said three second arms (304), and
a slot (308) at said free ends of each of said three second arms (304) to receive a respective pins (208) from said first plate (202).

5

4. The apparatus (100) as claimed in claim 3, wherein said second plate (302) comprises a bore between said at least two slits (306) for insertion of a screw (314).

10

5. The apparatus (100) as claimed in claim 3, further comprises said second plate (302) fixed with at least three third arms (312), wherein said slots (308) are provided to a free end of said at least three third arms (312), and said clamping arms (310) are pivoted at said free ends of said at least three second arms (304).

15

6. The apparatus (100) as claimed in claim 3, wherein at least one of said slot (308) is provided with a stopper (316), said stopper (316) extends out from an edge of said slot (308).

20

7. The apparatus (100) as claimed in claim 1, wherein said component (108) is a pump to supply any one of a Diesel Exhaust Fluid (DEF) and a fuel.

25

8. An apparatus (100) to remove a component (108) from a tank (102), said tank (102) comprises an opening (104) fixed with an interface (106) to which said component (108) is mounted, and said component (108) comprises a mount ring (116), said apparatus (100) comprises:

a first plate (202) fixed with at least three first arms (204);
at least two legs (206) extending from said first plate (202),
and

30

a pin (208) fixed to a free end of each of said three first arms (204), each of said pin (208) passes through and held in

perpendicular to said free end of respective first arms (204),
and each of said pins (208) adapted to engage with said
mount ring (116) for removal of said component (108).

- 5 9. A method for mounting said component (108) to said tank (102) according
to claim 1, said method comprising the steps of:

coupling said first member (110) with said second member (120)
and forming an assembly;
positioning said component (108) on said assembly and clamping
10 said assembly to said interface (106) of said tank (102);
moving said first member (110) in an axial direction by rotating a
screw (314) in said second member (120) and tightening said
component (108) to said interface (106) of said tank (102);
rotating and locking said component (108) to said interface (106) of
15 said tank (102), and
removing said assembly after mounting said component (108).

10. A method for removing said component (108) from said tank (102)
according to claim 8, said method comprising the steps of:

20 positioning said apparatus (100) to said mount ring (116) of said
component (108);
applying an axial force to said component (108) through said
apparatus (100);
rotating said apparatus (100) in unlocking direction, and
25 removing said apparatus (100) with said component (108) resting
over said apparatus (100).

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Prakash BALEKUNDRI

On-behalf of the Applicants (IN/PA-1935)

Abstract

Title: An apparatus and method for mounting and removing a component to and from a tank.

The tank 102 comprises an opening 104 fixed with an interface 106 to which the component 108 is to be mounted. The component 108 comprises a mount ring 116. The apparatus 100 comprises a first member 110 adapted to hold the component 108 in a manner that the component 108 rests over the first member 110. The component 108 is placed over the first member 110 before mounting. A second member 120 movably coupled with the first member 110, and adapted to clamp the component 108 through the first member 110 in pressing manner against the interface 106. The clamping is performed during mounting. The component 108 mounted to the tank 102 by axial and rotational movement of the first member 110 through the second member 120.

(Figure 1)

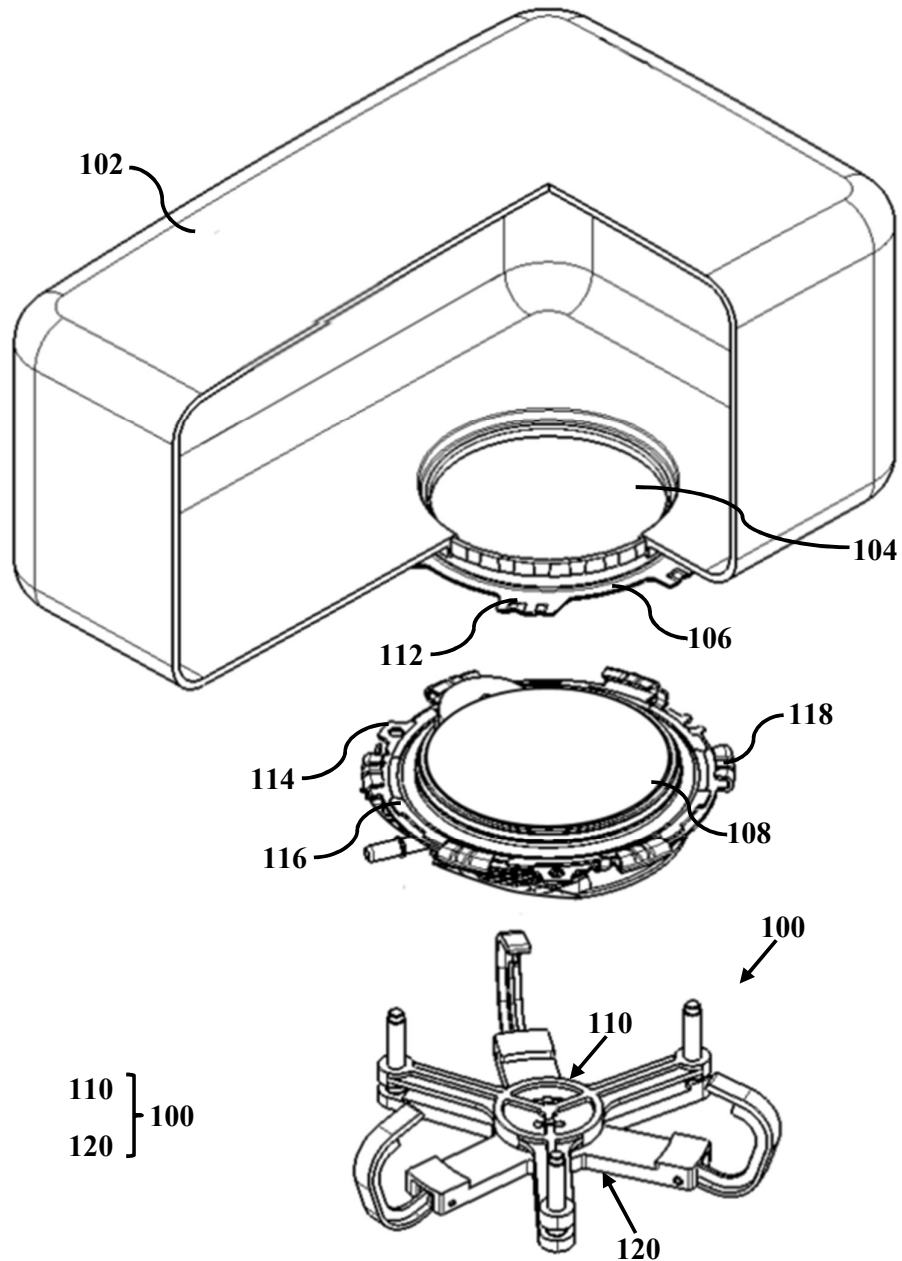


FIG. 1

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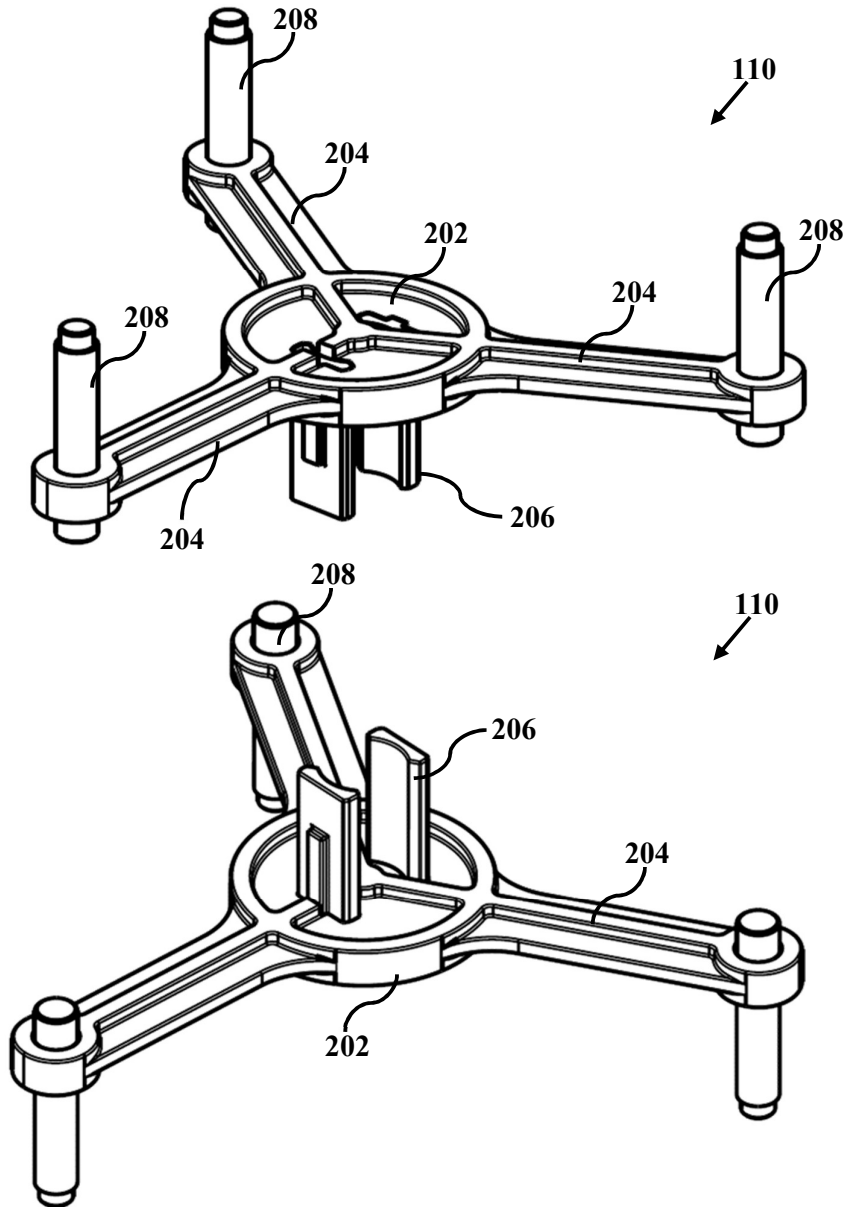


FIG. 2

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120
↙

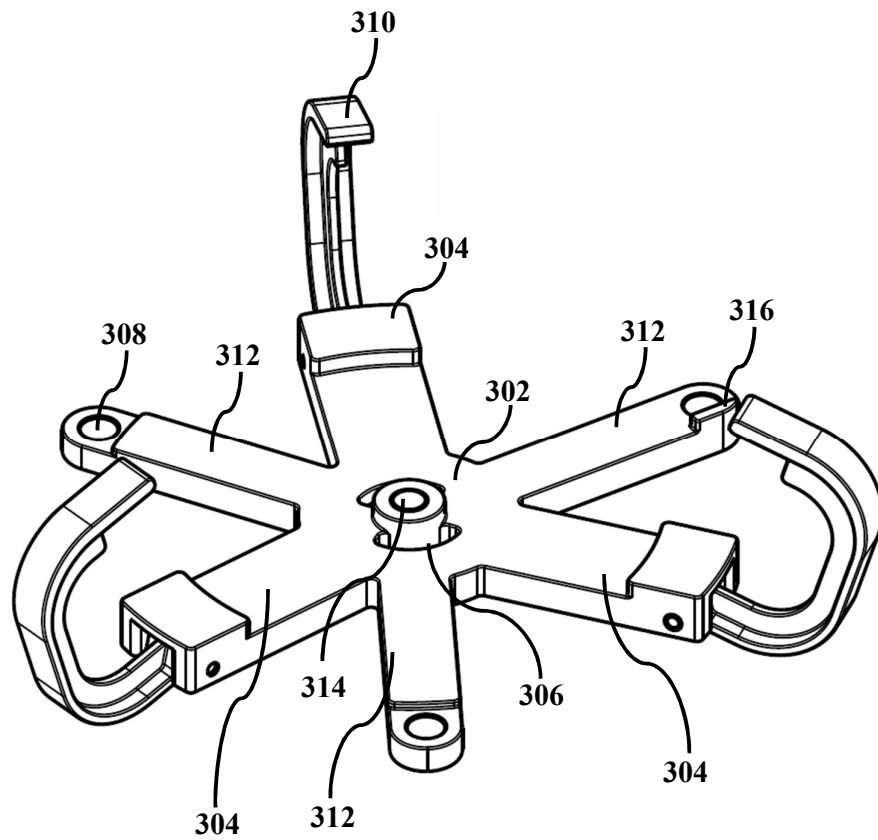


FIG. 3

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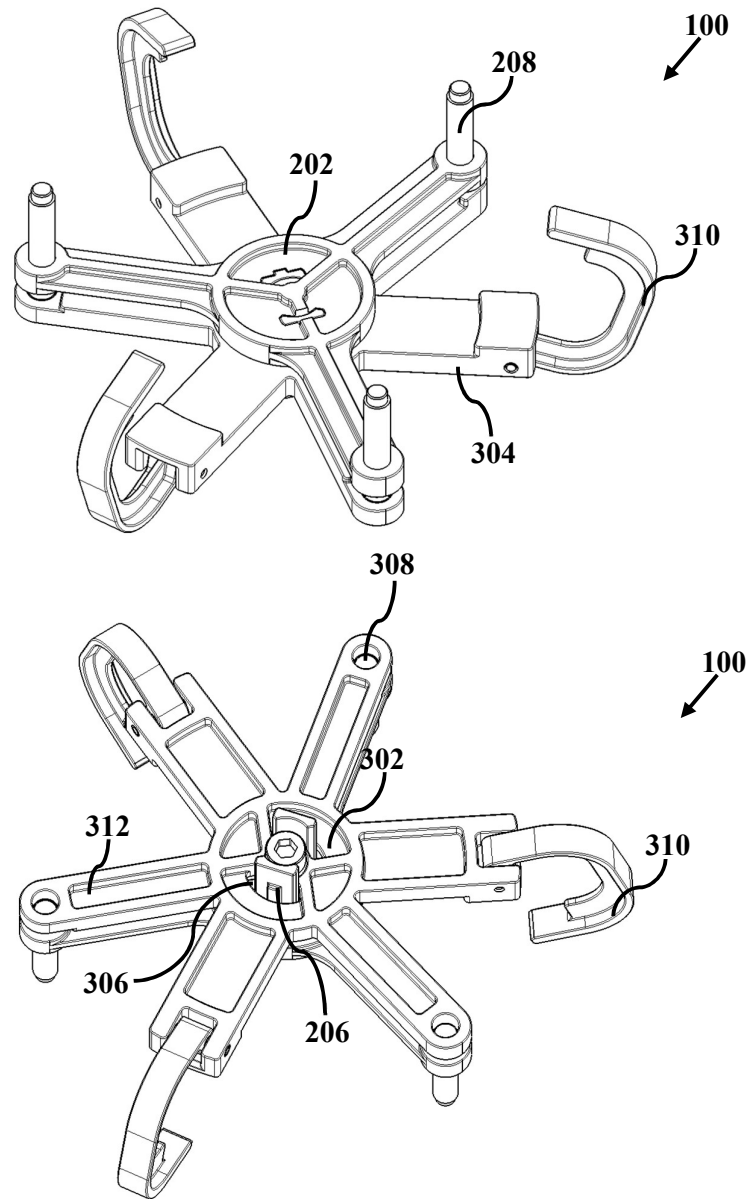


FIG. 4

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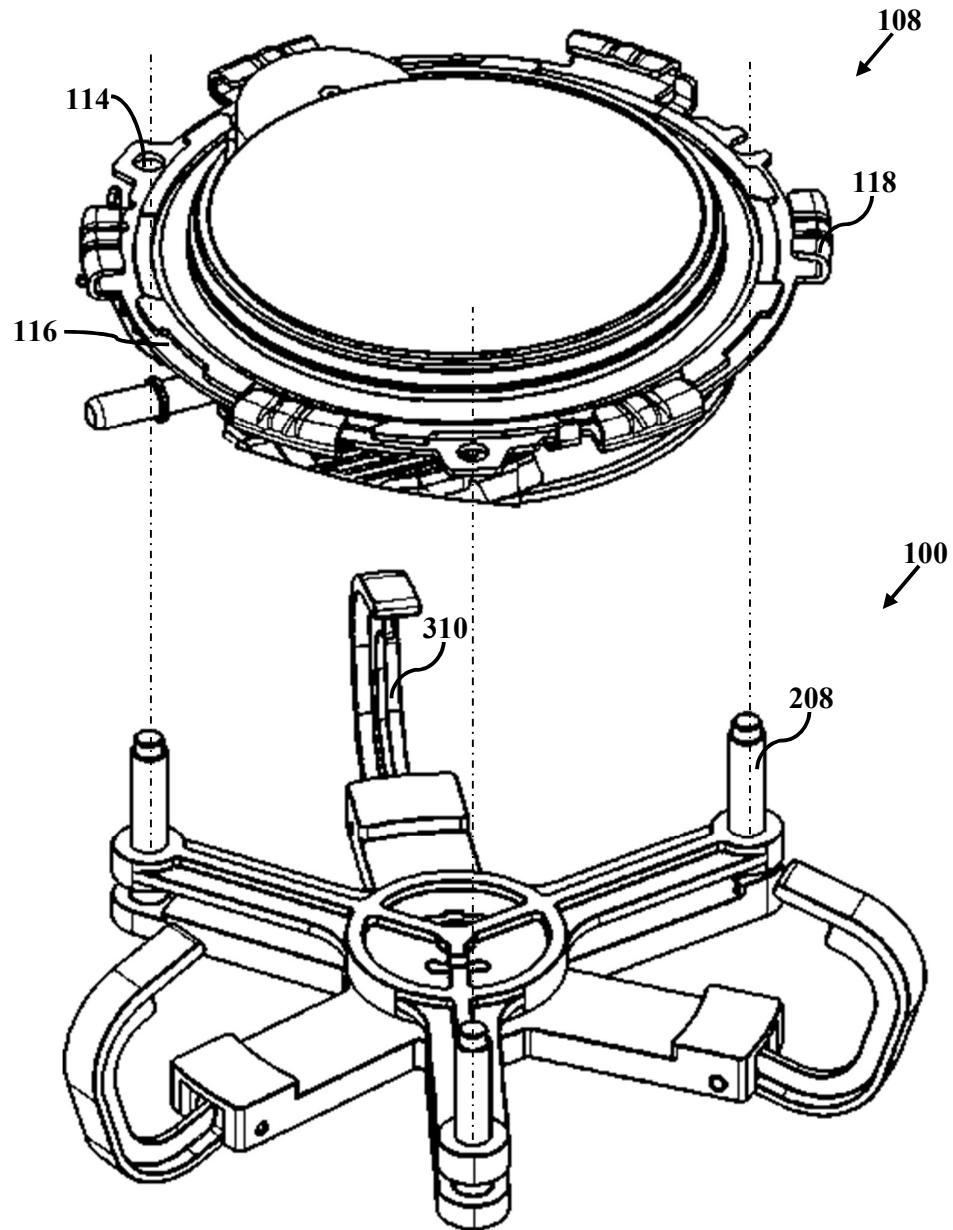


FIG. 5

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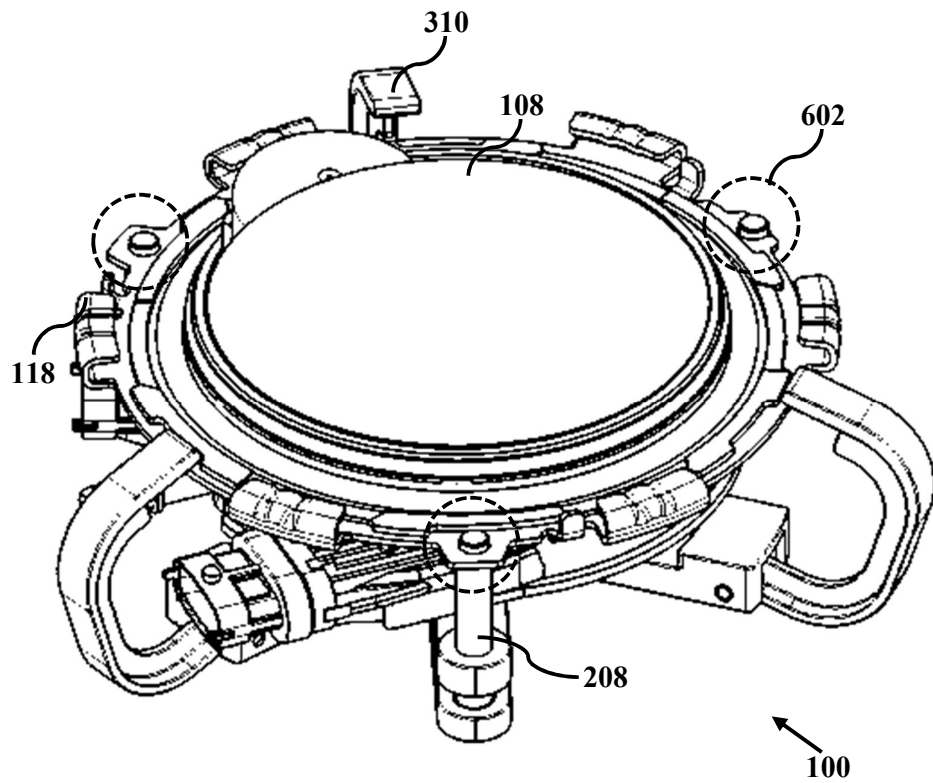


FIG. 6

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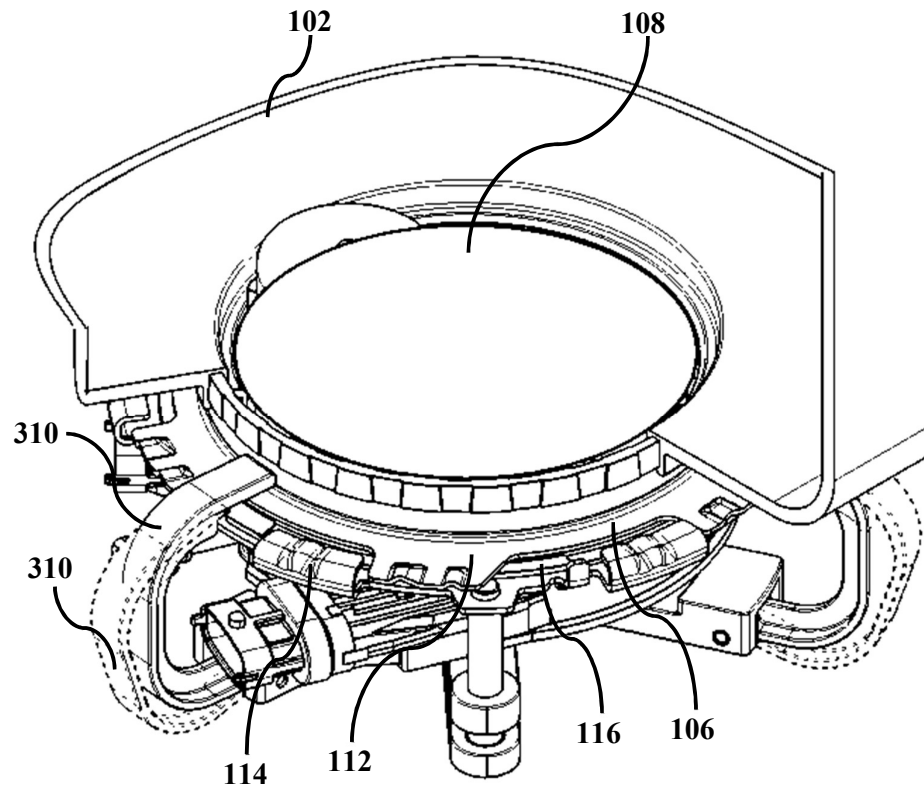


FIG. 7

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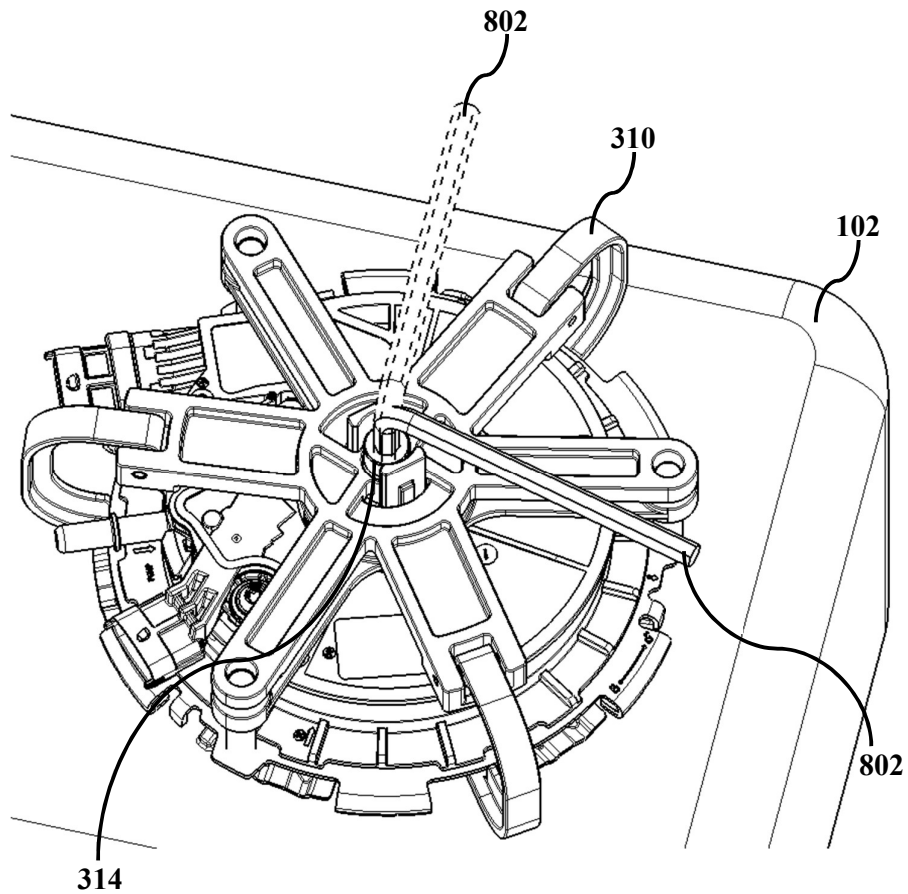


FIG. 8

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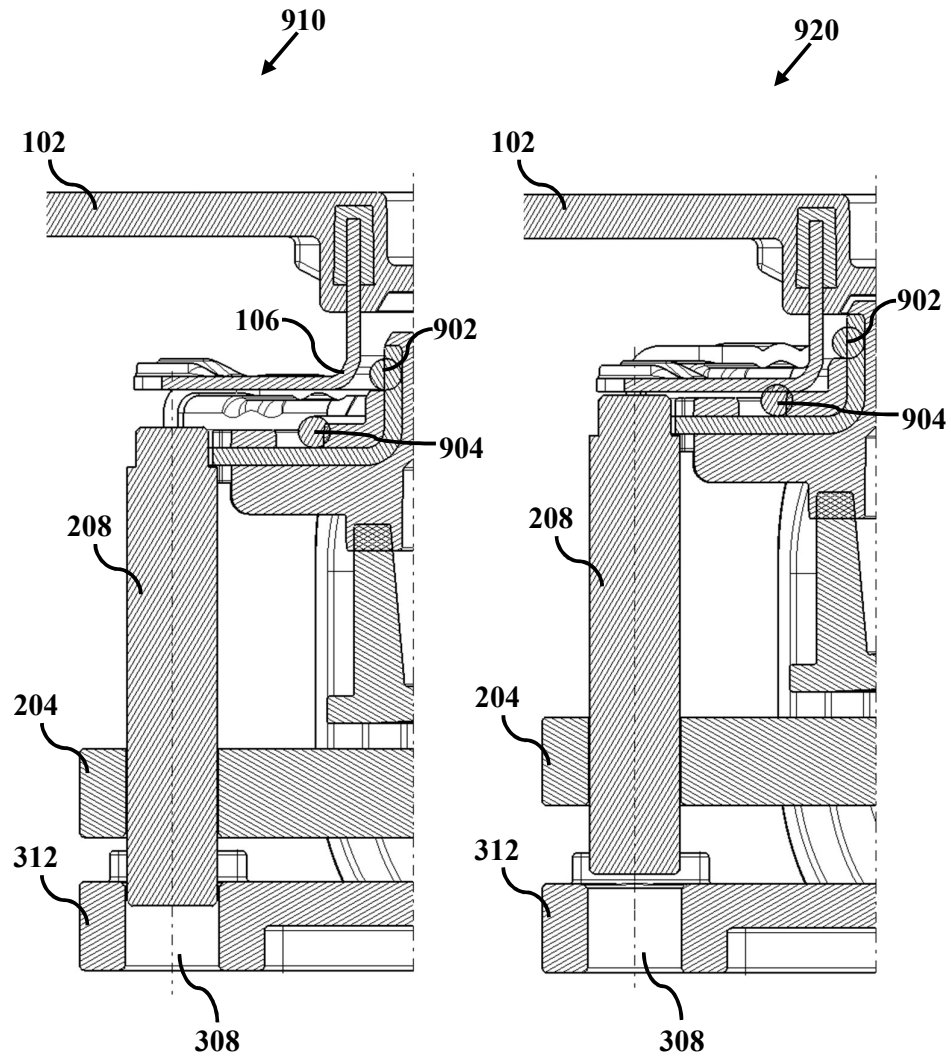


FIG. 9

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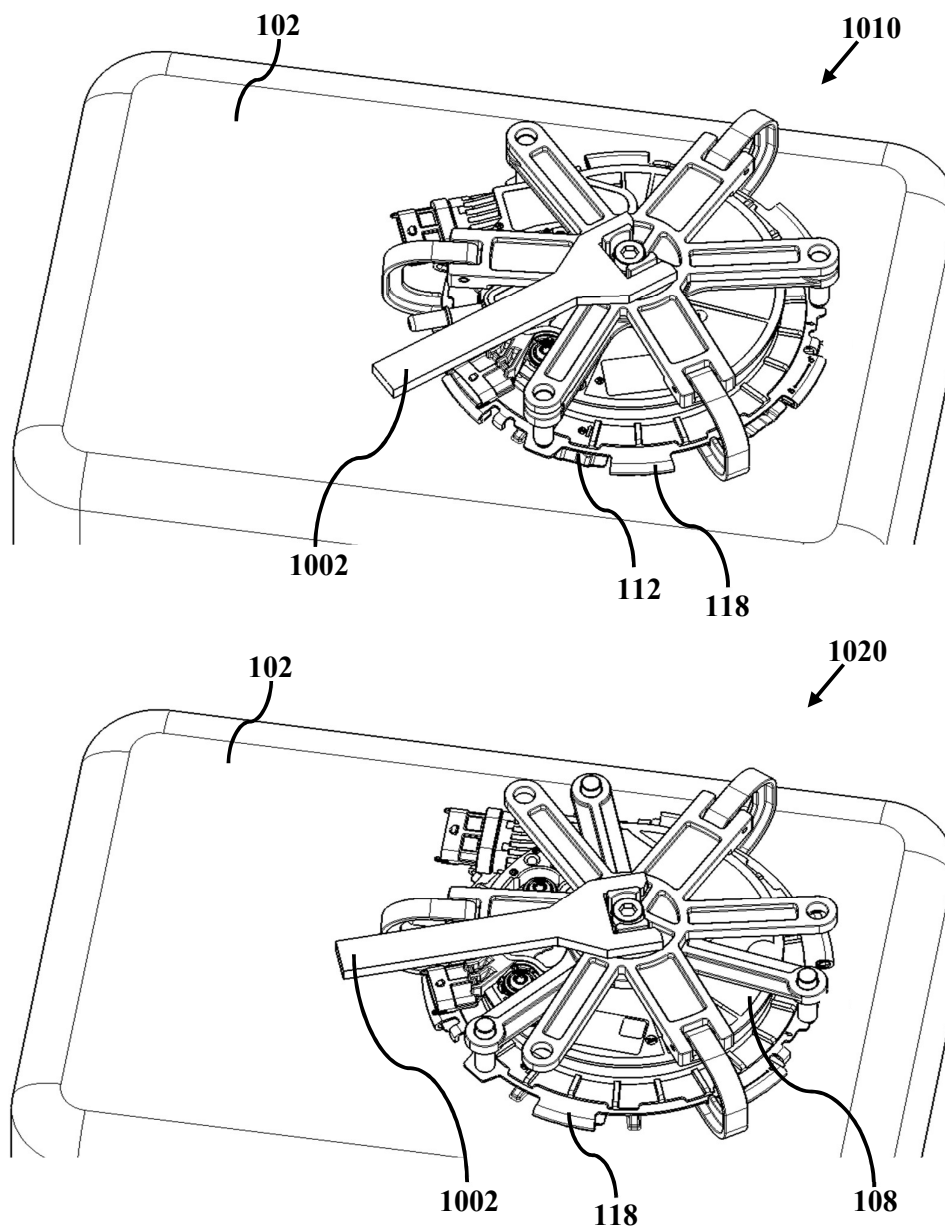


FIG. 10

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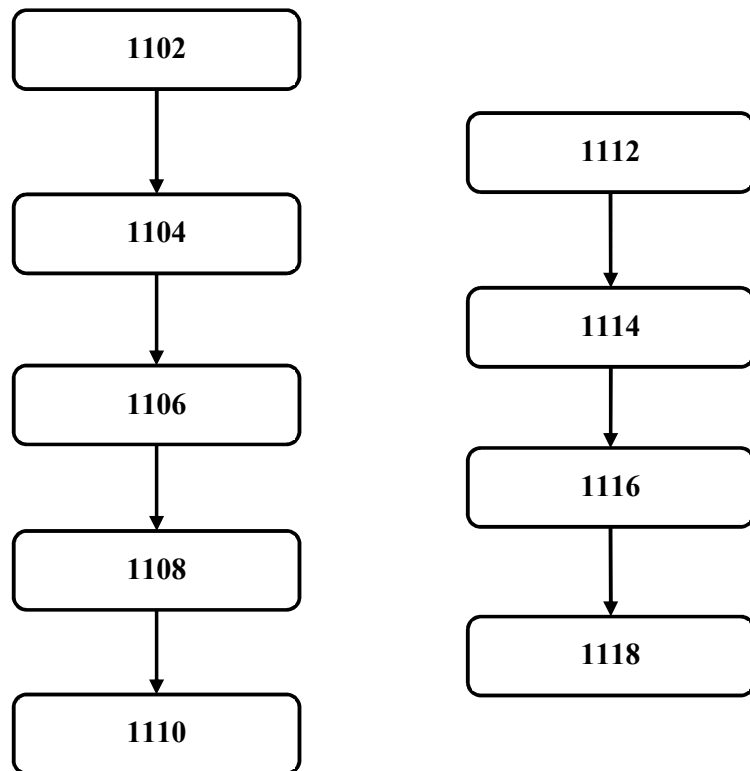


FIG. 11

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