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(54) **Safety drum with lid assembly**

(57) The drum assembly (100) comprises a drum (102) and a lid assembly (120) removably mounted to the drum. The drum can include a rim (104) defining an opening (106) for access to an interior storage area of the drum. The lid assembly (120) can include a band (122) for mounting the lid assembly to the drum, a cover (126) pivotally mounted to the band (122) via a hinge (124), and a rotary latch mechanism (128) for securing the cover in a closed position. The cover is movable between the closed position wherein the lid covers the opening and an open position in which the lid is pivoted away from the opening to allow access to the interior storage area. The rotary latch mechanism (128) can include a retention bar (142) mounted to one of the band (122) and the cover (126) and a rotary latch (140) mounted to the other of the band and the cover. The rotary latch (140) is configured to receive the retention bar (142) when the cover is closed to thereby secure the cover closed over the opening of the drum. The latch includes a trigger (200) that is moveable between a locked position in which the latch is locked and a released position in which the latch is unlocked.

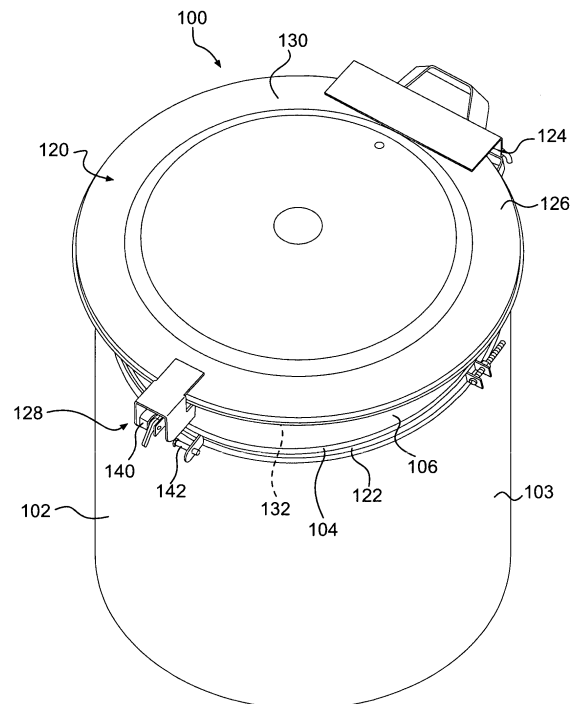


FIG. 1

Description

FIELD OF THE INVENTION

[0001] The present invention relates generally to drums, and more particularly to a drum with a lid and a rotary latch.

BACKGROUND OF THE INVENTION

[0002] Drums with lids have been used for many years. A typical drum with a lid has operated in two states, attached to the rim of the drum or fully removed from the drum. The lids are therefore often lost or not readily at hand when the user wishes to close the drum. Accordingly, utilizing drums with such lids can be a time-consuming activity for a user. The lid can not be opened and securely closed quickly.

[0003] Another limitation of previous drum covers is their failure to comply with particular federal regulations involving emissions of volatile organic compounds (VOCs). Specifically, drums used in the U.S. aerospace industry are required to comply with 60 Fed. Reg. 45956, which sets limits for VOCs from chemical solvents and waste produced in aerospace facilities.

SUMMARY OF THE INVENTION

[0004] The drum assembly can comprise a drum and a lid assembly removably mounted thereto. The drum can include a generally cylindrical sidewall and a rim defining an opening accessible to an internal storage area. The lid assembly can include a band encircling the sidewall of the drum to mount the lid assembly to the drum, a cover pivotally mounted to the band *via* a hinge. The lid is movable between a first position wherein the lid covers the opening of the drum and a second position wherein the cover is pivoted away from the opening to allow access to the internal storage area of the drum. The lid assembly can include a latch mechanism to secure the cover relative to the band. The latch mechanism can include a retention bar mounted to the band and a rotary latch attached to the cover. The rotary latch is configured to receive the retention bar when the cover is closed to thereby secure the cover closed over the opening of the drum. The rotary latch can include a trigger that is moveable between a locked position in which the latch is locked and a released position in which the latch is unlocked.

[0005] In another embodiment, a lid assembly for a drum can include a band configured to wrap around an external surface of a sidewall of a drum proximate an opening of the drum through which an internal storage area is accessible. A cover is provided that can be pivotally attached to the band *via* a hinge. The lid is movable between a first position wherein the lid covers the opening of the drum and a second position wherein the cover is pivoted away from the opening to allow access to the

internal storage area of the drum. The lid assembly can include a latch mechanism to secure the cover relative to the band. The latch mechanism can include a retention bar mounted to the band and a rotary latch attached to the cover. The rotary latch is configured to receive the retention bar when the cover is closed to thereby secure the cover closed over the opening of the drum. The rotary latch can include a trigger that is moveable between a locked position in which the latch is locked and a released position in which the latch is unlocked.

[0006] In yet another embodiment, the cover can have a gasket disposed around a perimeter of an inner surface of the cover. The gasket can be configured to compressibly engage the rim of the drum to form a seal therebetween to thereby substantially prevent vapor release from the drum. A pressure relief valve can be provided in the cover to allow pressure buildup in the drum to be released once the pressure reaches a predetermined level at a predetermined temperature.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIGURE 1 is a top perspective view of an embodiment of a drum assembly according to the present invention.

[0008] FIG. 2 is a side perspective view of the drum assembly of FIG. 1.

[0009] FIG. 3 is a side elevational view of drum assembly of FIG. 1.

[0010] FIG. 4 is front elevational view of the drum assembly of FIG. 1.

[0011] FIG. 5 is a rear elevational view of the drum assembly of FIG. 1.

[0012] FIG. 6 is a top plan view of the drum assembly of FIG. 1.

[0013] FIG. 7 is a bottom plan view of the drum assembly of FIG. 1.

[0014] FIG. 8 is a cross-sectional view taken along line 8-8 of FIG. 4.

[0015] FIG. 9 is a fragmentary perspective view of the drum assembly of FIG. 1, illustrating a lid assembly mounted to a drum thereof with a cover thereof being in an intermediate open position.

[0016] FIG. 10 is a fragmentary side elevation view of the drum of FIG. 1, with the cover in a fully open position.

[0017] FIG. 11 is a fragmentary front elevation view of the drum of FIG. 1, with the cover in the fully open position shown in FIG. 10.

[0018] FIG. 12 is a fragmentary view as in FIG. 10 with the cover in an intermediate position between the fully open position and a closed position.

[0019] FIG. 13 is a fragmentary front elevational view of the drum assembly of FIG. 1 with the cover in the intermediate position shown in FIG. 12.

[0020] FIG. 14 is a fragmentary view as in FIG. 10 with the cover in the closed position and a latch in a locked position.

[0021] FIG. 15 is a fragmentary front elevational view

of the drum assembly of FIG. 1 with the cover and the latch in the positions shown in FIG. 14.

[0022] FIG. 16 is a fragmentary view as in FIG. 10 with the cover in the closed position and the latch in a released position.

[0023] FIG. 17 is a fragmentary front elevational view of the drum assembly of FIG. 1 with the cover and the latch in the positions shown in FIG. 16.

[0024] FIG. 18 is a cross-sectional view taken along line 18-18 of FIG. 13.

[0025] FIG. 19 is a cross-sectional view taken along line 19-19 of FIG. 15.

[0026] FIG. 20 is a cross-sectional view taken along line 20-20 of FIG. 17.

[0027] FIG. 21 is an enlarged, detail view taken from FIG. 18.

[0028] FIG. 22 is an enlarged, detail view taken from FIG. 19.

[0029] FIG. 23 is an enlarged, detail view taken from FIG. 20.

[0030] FIG. 24 is a perspective view of an embodiment of a pressure release valve suitable for use with the present invention.

[0031] FIG. 25 is a view, in section, of the pressure relief valve of FIG. 23 mounted in the cover of the drum assembly of FIG. 1.

[0032] FIG. 26 is a rear elevational view of a lid assembly of the drum assembly of FIG. 1.

[0033] FIG. 27 is a top plan view of the lid assembly of FIG. 26 with a lid and an upper piece of a hinge removed for illustrative purposes.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0034] Referring to FIG. 1, an embodiment of a drum assembly 100 according to the present invention can include a drum 102 and a lid assembly 120 removably mounted to the drum 102 to selectively cover the drum. In some embodiments, the lid assembly can be locked in a closed position. In some embodiments, the lid assembly 120 can substantially prevent vapor from releasing from the drum 102 when the lid assembly 120 is in the closed position.

[0035] Referring to FIGS. 1 and 2, the drum 102 can be generally cylindrical. The drum 102 can include a sidewall 103, the sidewall having a rim 104 which defines an opening 106 (see FIG. 9 also) through which an interior storage area 107 (FIG. 8) is accessible, and a bottom 108. Referring to FIG. 3, the rim 104 of the drum 102 can project from an external surface of the sidewall 103 of the drum 102 to create an annular upper rib 110. The drum 102 can include an annular lower rib 112 disposed below the rim 104 with a channel 114 defined between the upper rib 110 and the lower rib 112 on the outside surface of the drum sidewall 103. The drum 102 can be made of steel. The drum can be any suitable size. In some embodiments, the drum can be a 30-gallon capac-

ity drum or a 55-gallon capacity drum, for example. A 55-gallon drum commercially available from Justrite Manufacturing Co. LLC of DesPlaines, Illinois as model number 26054 is particularly suitable for use with the present invention.

[0036] Referring to FIG. 3, the lid assembly 120 can include a band 122 to removably mount the lid assembly 120 to the drum 102 and a cover 126 to selectively close the drum 102. The cover 126 can be pivotally mounted to the band 122 via a hinge 124. A rotary latch mechanism 128 can be provided to retain the cover 126 in a closed position such that the cover 126 is constrained from moving relative to the band 122.

[0037] Referring to FIG. 3, the band 122 can encircle the outside surface 103 of the drum 102. The band 122 can be disposed within the channel 114 between the upper and lower ribs 110, 112 of the sidewall 103. The band 122 can include a handle piece 156 mounted thereto. The handle 156 is a generally U-shaped piece that can be configured to allow a user to conveniently grip the handle 156 to facilitate transport of the drum. In addition, the handle 156 can be used as a stop to limit the pivotal movement of the cover 126. The handle 156 defines the fully open position of the cover 126, as shown in FIG. 10, and can be angled upward as it extends from the perimeter of the band 122 for that purpose. The handle piece 156 can be mounted to the hinge 124.

[0038] Referring to FIG. 2, the band 122 can be a split ring band that includes a gap 184 defined by a pair of tabs 186, 188. The tabs 186, 188 of the split ring band 122 are joined across the gap 184 by a nut 190 and a screw 192. The nut 190 and the screw 192, which can be threadably engaged by operation of a screwdriver and a wrench, for example, are configured to adjust the size of the gap 184, and thereby the circumference of the band 122. A washer can also be interposed between the nut 190 and the tab 188 to enhance the connection between the tabs 186, 188. Accordingly, the band 122 can be tightened around the drum 102 in order to secure the lid assembly 120 to the drum 102. Likewise, the band 122 can be loosened to remove the lid assembly 120 from the drum 102. The removable nature of the lid assembly 120 permits a user to attach the lid assembly 120 to different drums and account for variations in drum size. The lid assembly 120 can also be used with different drums having a wide variety of rims.

[0039] Referring to FIG. 8, the cover 126 can include an outer surface 130 and an inner surface 132 (FIG. 8). The cover 126 can be sized to substantially correspond with the opening 106 of the drum 102. The cover 126 is pivotally movable between a first position, as shown in FIG. 8, wherein the cover 126 is in a closed position such that it covers the opening 106 of the drum 102 and a second position, as shown in FIG. 10, wherein the cover 126 is in a fully-opened position such that the opening 106 of the drum 102 is accessible for ready disposal of items in the drum 102.

[0040] Referring to FIG. 8, the cover 126 can include

an annular gasket 180 disposed on the lower surface 132 of the cover 126 proximate an outer edge 182 of the cover 126. When the cover is in the closed position, the gasket 180 can be aligned with the rim 104 of the drum 102 such that the gasket 180 is disposed between the cover 126 and the rim 104. The gasket 180 can create a seal between the drum 102 and the cover 126 when the cover 126 is closed and the latch mechanism 128 is locked.

[0041] The gasket 180 can be made from any suitable material, such as a material that is compressible relative to the rim of the drum. In some embodiments the gasket can be made from rubber while the lid assembly 120 and the drum 102 can be steel. In yet other embodiments, the gasket can be L-200 charcoal Minicel, die cut with slm-360 pressure-sensitive adhesive having mylar on one side. The gasket can be secured to the cover via the pressure-sensitive adhesive, for example. Accordingly, the gasket 180 can be deformed between the cover 126 and drum 102 to create a particularly effective seal. Because the cover 126 is secured to the drum 102 by a press fit *via* the gasket 180, the cover 126 can securely close on any rim that the gasket 180 can be pressed against to create a seal. Accordingly, the lid assembly 120 is extremely versatile.

[0042] When the drum assembly 102 is used in an aerospace facility to contain chemical solvents and waste products, a seal created between the lid assembly 102 and the drum 102 by the gasket 180 can allow the drum assembly to meet the requirements set by 60 Fed. Reg. 45956 in regards to VOCs emissions. The gasket 180 can form a seal between the cover 126 and the drum 102 that substantially prevents vapor from being released from the interior storage area of the drum 102.

[0043] Referring to FIGS. 9 and 24, the drum assembly 100 can include a pressure relief valve 240 configured to open when the pressure inside the closed drum assembly 100 reaches a predetermined pressure and to close when the pressure inside the closed drum assembly 100 falls below the predetermined pressure. Referring to FIG. 25, the pressure relief valve 240 is disposed within an opening 242 in the cover 126 that extends from the outer surface 130 to the inner surface 132 thereof. When the pressure inside the closed drum assembly 100 reaches the predetermined pressure, between 3 and 5 psi, for example, a valve channel 244 in the valve 240 will be forced open such that the pressurized gases inside the drum can be released through the channel 244 to reduce the pressure inside the drum assembly 100. When the pressure falls below the predetermined pressure, the valve channel 244 can close.

[0044] Referring to FIGS. 3 and 5, the hinge 124 includes an upper portion 150 and a lower piece 152 which are pivotally mounted to each other *via* a hinge pin 154 and a cotter pin 158. The upper portion 150 is mounted to the cover 126 while the lower piece 152 is mounted to the band 122. Referring to FIG. 6, both the upper portion 150 and the lower piece 152 include hollow knuckles 160, 162 which alternately align with each other to define a

hinge pin channel 168 in which the hinge pin 154 is disposed. The upper portion 150 and the lower piece 152 of the hinge 124 can pivot with respect to each other along a longitudinal axis 164 defined by the hinge pin 154. Referring to FIG. 5, the hinge pin 154 includes a first distal end 170 that is bent at a right angle and a second distal end 172 with a through hole that receives the cotter pin 158. The bent portion 174 of the first distal end 170 and the cotter pin 158 are located on opposite sides of the hinge pin channel 168 such that the hinge pin 154 is retained within the hinge pin channel 168.

[0045] Once the cotter pin 158 is removed from the hinge pin 154, the hinge pin 154 can be pulled out of the hinge pin channel 168 by pulling the first distal end 170 away from the hinge plates such that the second distal end 172 travels through the channel 168. Once the hinge pin 154 is removed, the upper portion 150 and the lower piece 152 of the hinge 124 can disengage.

[0046] Referring to FIG. 1, the rotary latch mechanism 128 can include a rotary latch 140 and a retention bar 142 for latching the drum 102 closed. The rotary latch 140 can be mounted to the cover 126 *via* a latch mounting 202. The retention bar 142 can be mounted to a flange extending from the band 122. In some embodiments, the rotary latch mechanism 128 can be, for example, a rotary latch commercially available from Southco®, Inc. of Concordville, Pennsylvania, and marketed as the R4 Mini Rotary Latch.

[0047] Referring to FIG. 9, the rotary latch 140 can be disposed at the front 194 of the cover 126 opposite the hinge 124. The retention bar 142 can be mounted to a flange 197 extending from the band 122 at the front 196 of the drum assembly 100. The retention bar 140 can be aligned with an axis 198 of movement of the rotary latch 140, as shown in FIG. 11. The rotary latch 140 is configured to receive the retention bar 142 when the cover 126 is closed to thereby secure the cover 126 closed over the opening 106, as shown in FIG. 15. The latch 140 can include a trigger 200 that is moveable between a locked position, as shown in FIG. 14, in which the latch 140 is locked and a released position in which the latch 140 is unlocked, as shown in FIG. 16. When the trigger 200 is in the locked position, the cover 126 is prevented from opening by the engagement between the rotary latch 140 and the retention bar 142, as shown in FIG. 19.

[0048] Referring to FIG. 9, the latch mounting 202 can include a top wall 204, a first sidewall 206, and a second sidewall 208. The top wall 204 of the latch mounting 202 can be attached the outer surface 130 of the cover 126 and extend past the edge 182 of the cover 126. The first and second sidewalls 206, 208 can be in spaced relationship to each other and depend from the top wall 204 such that they extend below the cover 126. The walls 202, 204, 206 of the latch mounting 202 form a protective housing within which the rotary latch 140 is disposed. The latch mounting 202 protects the latch 140 from impact by foreign objects that could damage the latch or unintentionally unlock the latch 140. The rotary latch 140

can be mounted to the inside surface 212 of first sidewall 206 such that the latch 140 is disposed below the cover 126 and exterior to the outer edge 182 of the cover 126. Referring to FIG. 8, the configuration of the latch mounting 202 can help facilitate the proper positioning of the rotary latch 140 to retentively receive the retention bar 142 when the cover 126 is closed.

[0049] Referring to FIG. 21, the cover 126 is in an intermediate position between the closed position and the fully open position. The latch 140 is located generally above the retention bar 142 and the trigger 200 is in the open position. The rotary latch 140 includes the rotatable trigger 200, a pivotally movable cam 220, and a spring 222 that are disposed within a housing 224. The spring 222 can be operably arranged with the trigger 200 and the cam 220 to bias them toward a ready position, as shown in FIG. 21. The housing 224 can be mounted to the inside surface 212 of first sidewall 206 of the latch mounting 202 via first and second bolts 226, 228, as shown in FIG. 9. Referring back to FIG. 21, when the cover 126 and the latch 140 are open, the cam 220 is in the ready position in which a slot 230 of the cam 220 is open to the area below the latch 140 such that the slot 230 can accept the retention bar 42 therein once the cover is closed.

[0050] Referring to FIG. 22, the cover 126 is in the closed position. The retention bar 142 is disposed within the slot 230 of the cam 220. The cam 220 has rotated up into the housing 224 of the latch 140 from its ready position to a locked position. The retention bar 142 is thereby trapped inside the rotary latch 140. When the cam 220 is rotated to its locked position, the spring 222 is activated, which in turn urges the trigger into its locked position. When the trigger 200 and the cam 220 are in their locked positions, a respective cam surface 235, 237 of the trigger 200 and the cam 220 are in abutting engagement with each other such that the cam 220 is prevented from rotating from its locked position toward the ready position. The retention bar 142 is thereby retained within the rotary latch 140 to prevent the cover 126 from moving from the closed position. The cover 126 is now locked closed over the drum opening 106. When the rotary latch 140 is locked, the gasket 180 can be compressed between the cover 126 and the rim 104 of the drum 102 to form a seal therebetween. The cover 126 cannot be opened until the trigger 200 is moved to the released position.

[0051] Referring to FIG. 23, the cover 126 is in the closed position, and the trigger 200 is in the released position. When the trigger 200 is moved to the released position, the trigger 200 disengages from the cam 220. The cover 126 can be moved from the closed position toward the fully open position by applying sufficient lifting force to move the cover 126. Once the cover moves a sufficient amount, the cam will begin to rotate toward its ready position with the spring 222 urging the cam thereto such that the rotary latch can move relative to the retention bar 142 and return to the position shown in FIG. 21. The cover 126 can closed and opened repeatedly in this

fashion.

[0052] All references, including publications, patent applications, and patents, cited herein are hereby incorporated by reference to the same extent as if each reference were individually and specifically indicated to be incorporated by reference and were set forth in its entirety herein.

[0053] The use of the terms "a" and "an" and "the" and similar referents in the context of describing the invention (especially in the context of the following claims) are to be construed to cover both the singular and the plural, unless otherwise indicated herein or clearly contradicted by context. The terms "comprising," "having," "including," and "containing" are to be construed as open-ended terms (i.e., meaning "including, but not limited to,") unless otherwise noted. Recitation of ranges of values herein are merely intended to serve as a shorthand method of referring individually to each separate value falling within the range, unless otherwise indicated herein, and each separate value is incorporated into the specification as if it were individually recited herein. All methods described herein can be performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context. The use of any and all examples, or exemplary language (e.g., "such as") provided herein, is intended merely to better illuminate the invention and does not pose a limitation on the scope of the invention unless otherwise claimed. No language in the specification should be construed as indicating any non-claimed element as essential to the practice of the invention.

[0054] Preferred embodiments of this invention are described herein, including the best mode known to the inventors for carrying out the invention. Variations of those preferred embodiments can become apparent to those of ordinary skill in the art upon reading the foregoing description. The inventors expect skilled artisans to employ such variations as appropriate, and the inventors intend for the invention to be practiced otherwise than as specifically described herein. Accordingly, this invention includes all modifications and equivalents of the subject matter recited in the claims appended hereto as permitted by applicable law. Moreover, any combination of the above-described elements in all possible variations thereof is encompassed by the invention unless otherwise indicated herein or otherwise clearly contradicted by context.

Claims

1. A drum assembly comprising;

a drum, the drum including a sidewall and a bottom, the sidewall with a rim defining an opening to an interior storage area;
a band removably mounted to the drum;
a lid movably attached to the band, the lid being movable between a closed position wherein the

- lid covers the opening of the drum and an open position wherein the lid is disposed away from the opening such that the interior storage area of the drum is at least partially accessible;
 a retention bar mounted to one of the band and the lid; and
 a rotary latch attached to the other of the band and the lid, the rotary latch configured to receive the retention bar when the lid is in the closed position, the rotary latch movable between a locked position wherein the rotary latch is retentively engaged with the retention bar and a released position wherein the rotary latch is movable with respect to the retention bar. 5 10 15
2. The drum of claim 1 wherein the band comprises a split ring having a pair of ends, a nut and a screw, the nut and the screw threadedly engaged with each other to connect the ends of the split ring. 20
3. The drum assembly of claim 1 or 2, wherein the lid is movably mounted to the band *via* a hinge. 25
4. The drum assembly of any one of the previous claims, further comprising a gasket attached to an inner surface the lid, the gasket providing a seal between the rim of the drum and the lid when the lid is in the closed position. 30
5. The drum of claim 4, wherein the lid includes a pressure relief valve configured to open when the pressure in the storage area of the drum reaches a predetermined level and to close when the pressure in the storage area of the drum falls below the predetermined level. 35
6. The drum assembly of any one of the previous claims, wherein the rotary latch includes a rotatable trigger that is moveable between a locked position in which the latch is locked and a released position in which the latch is unlocked. 40
7. The drum assembly of claim 6, wherein the rotary latch automatically engages the retention bar when the cover is moved to the closed position without manual operation of the trigger. 45
8. A lid assembly for a drum, the lid assembly comprising; 50
- a band;
 a lid movably attached to the band, the lid being movable between a first position and a second position;
 a retention bar mounted to one of the band and the lid; and
 a rotary latch attached to the other of the band and the lid, the rotary latch configured to receive 55

the retention bar when the lid is in the first position, the rotary latch movable between a locked position wherein the rotary latch is retentively engaged with the retention bar and a released position wherein the rotary latch is movable with respect to the retention bar.

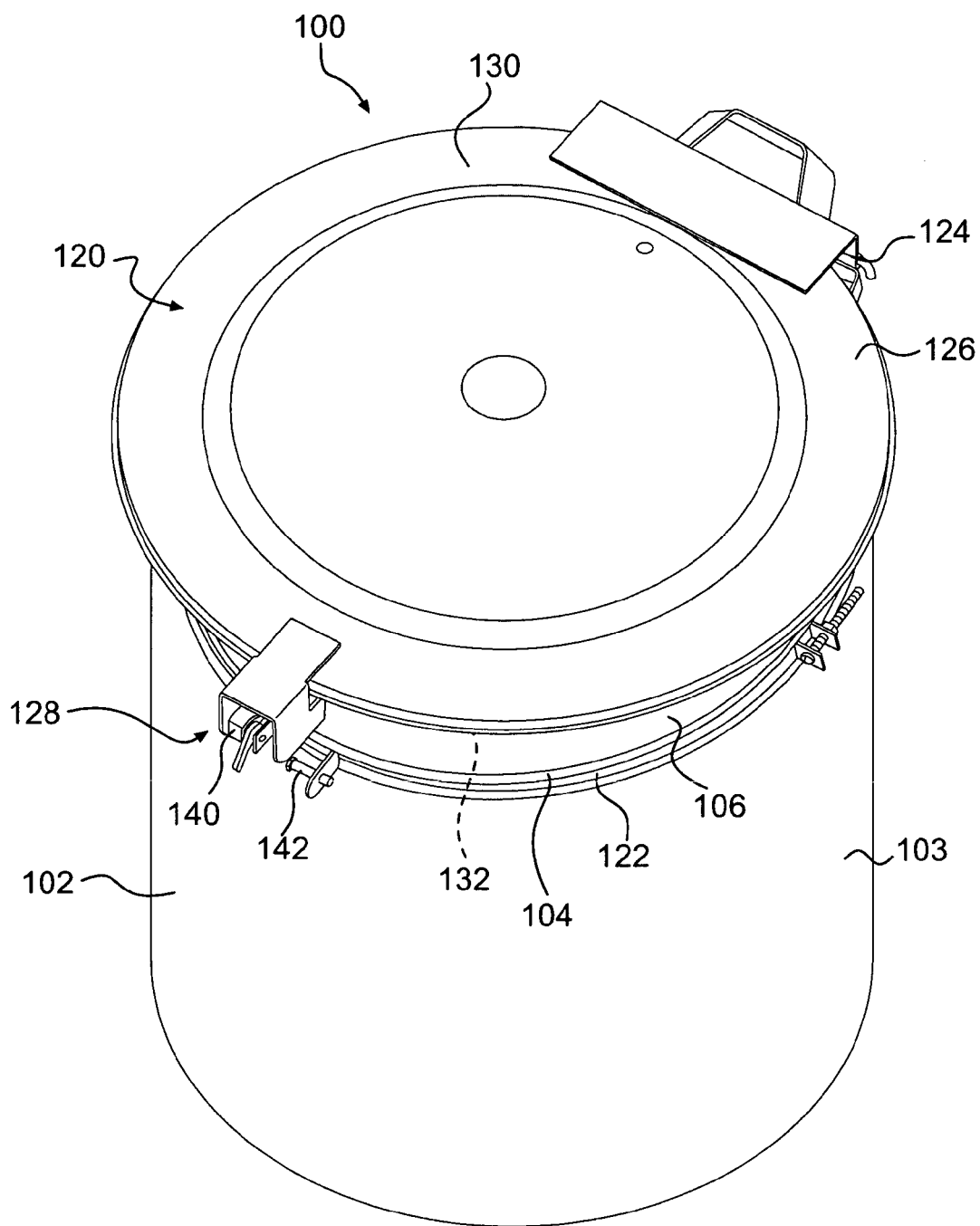


FIG. 1

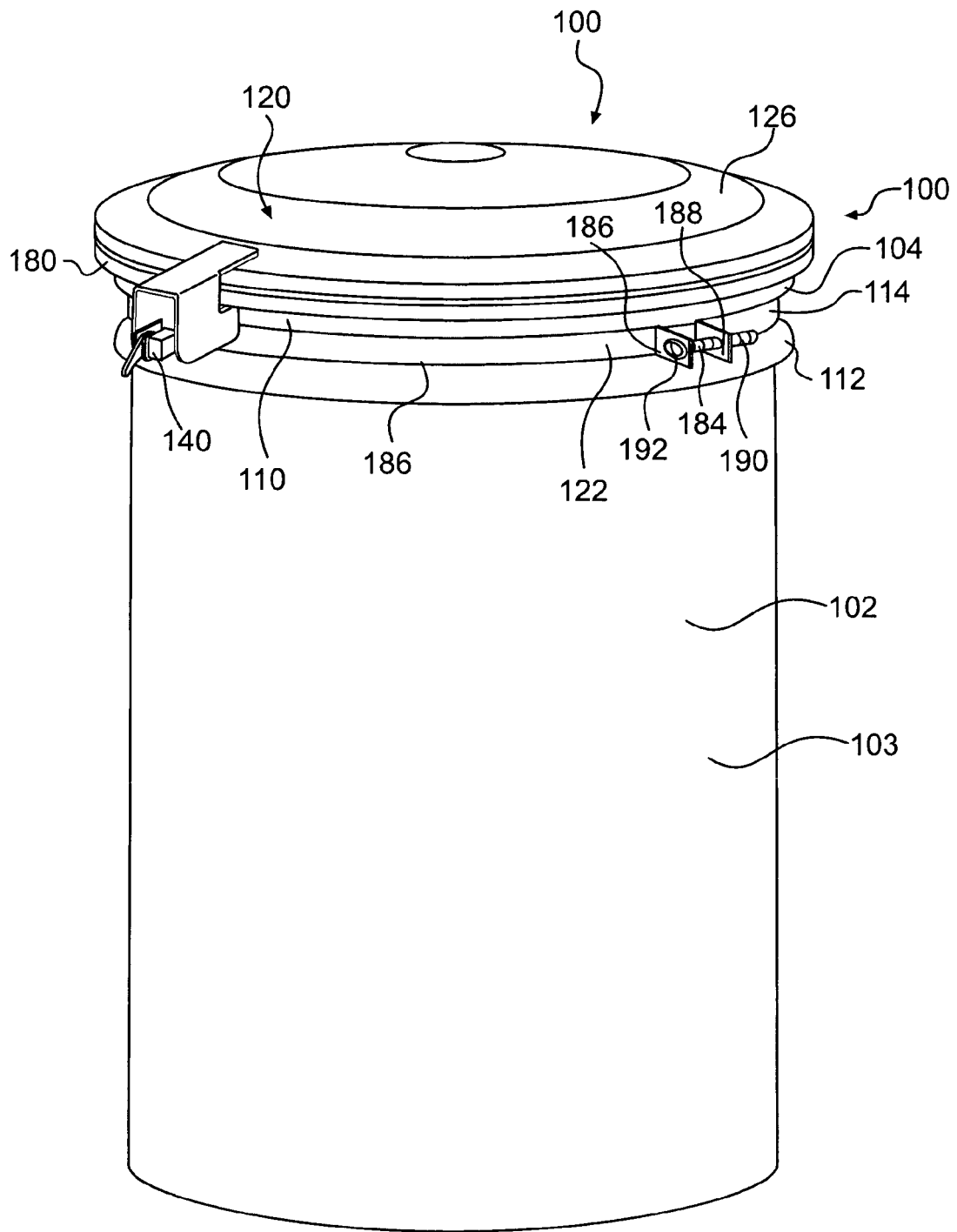


FIG. 2

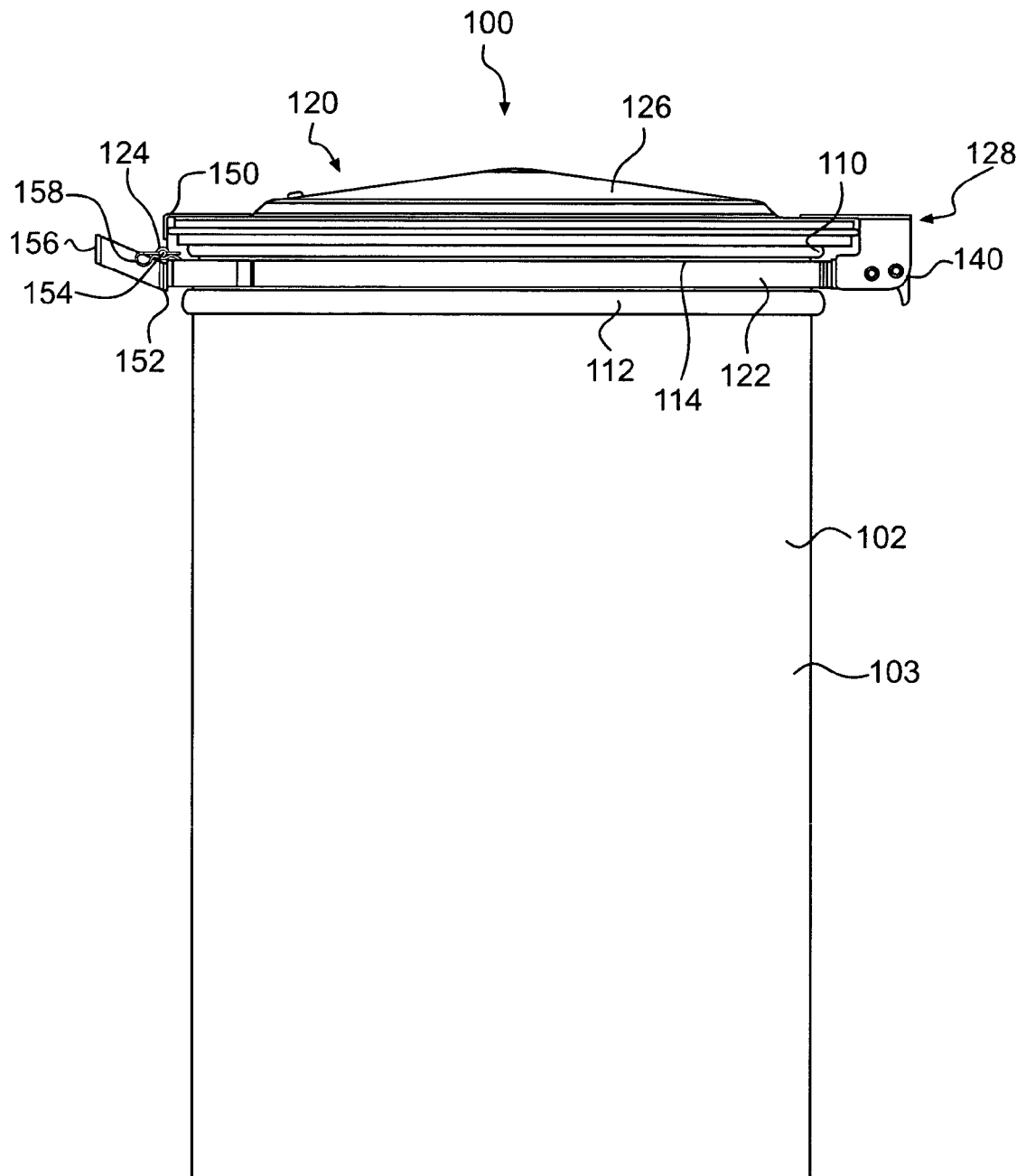


FIG. 3

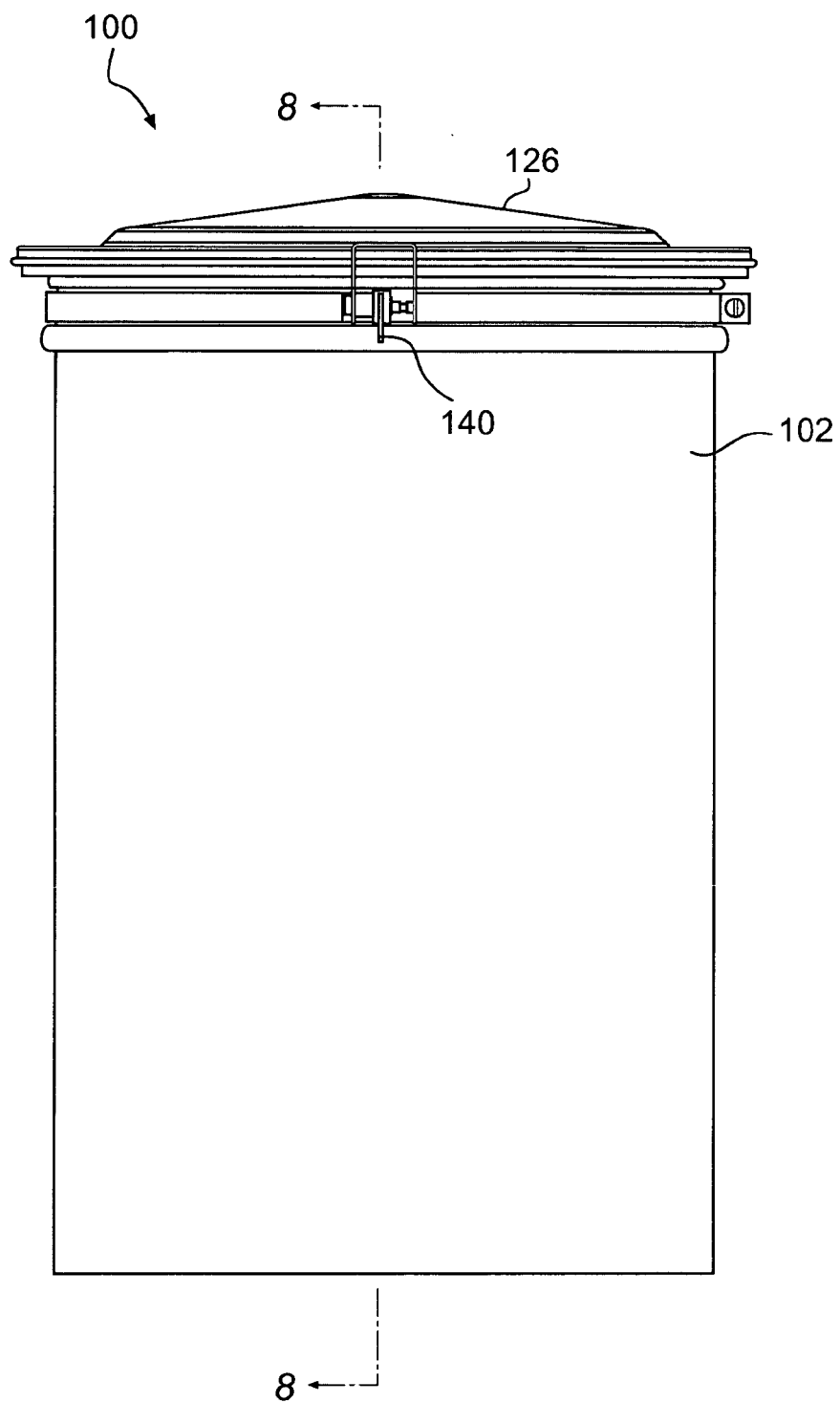


FIG. 4

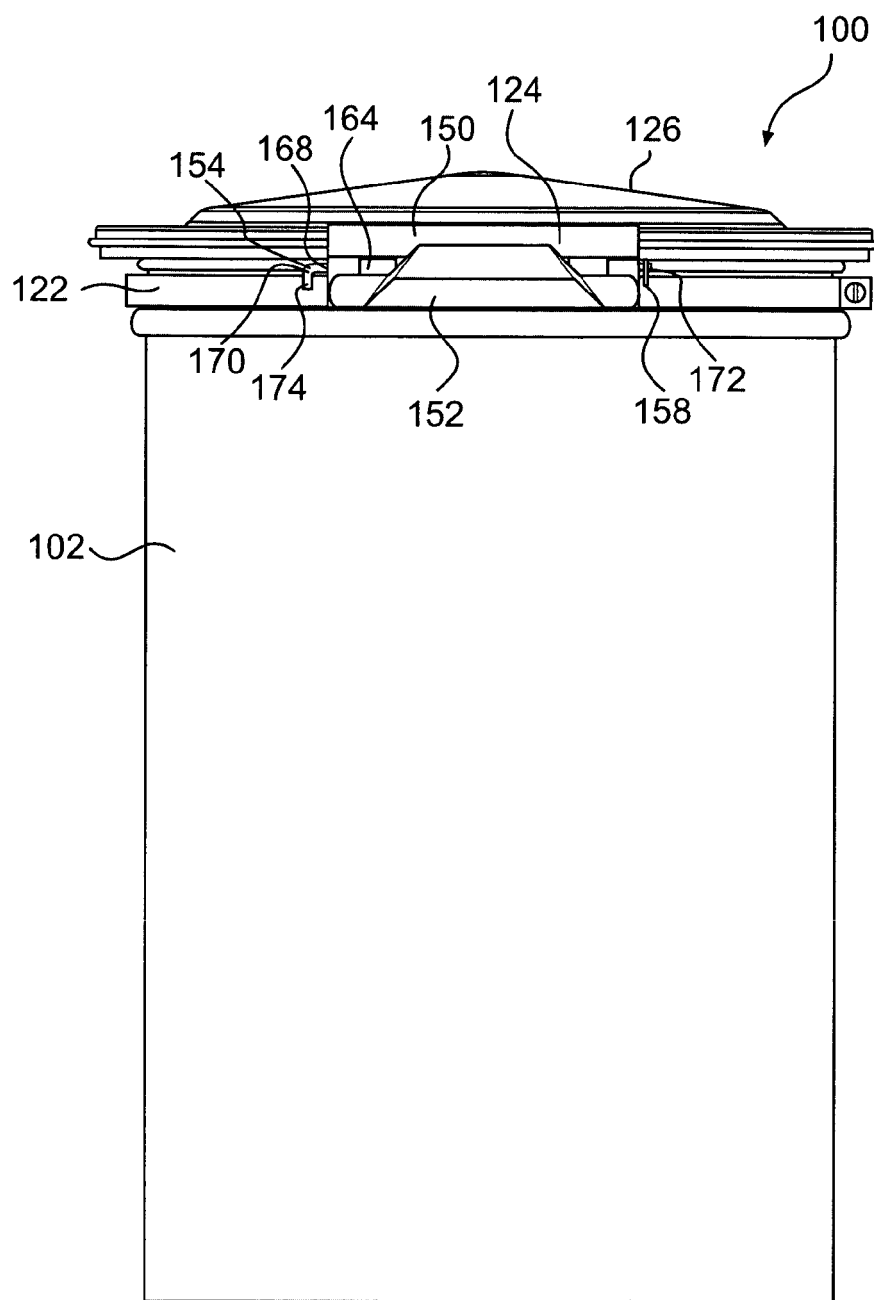


FIG. 5

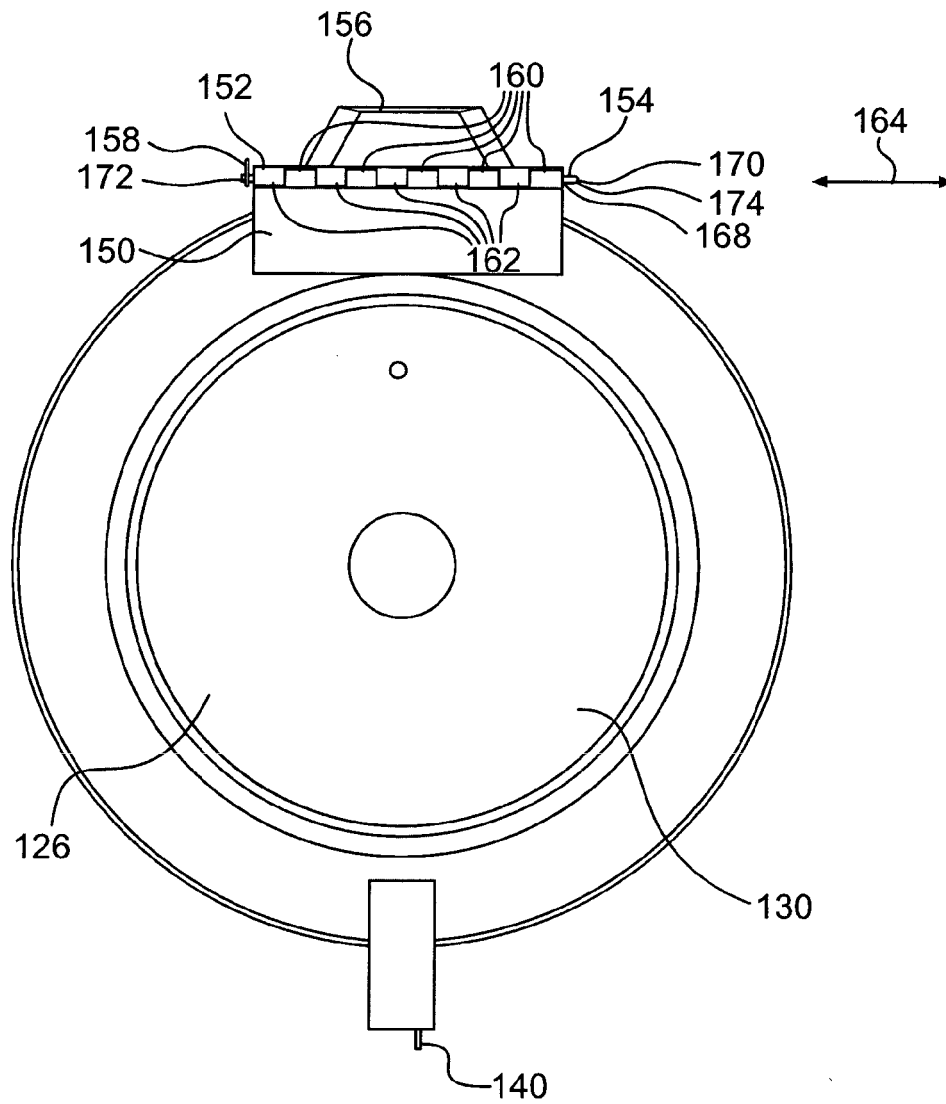


FIG. 6

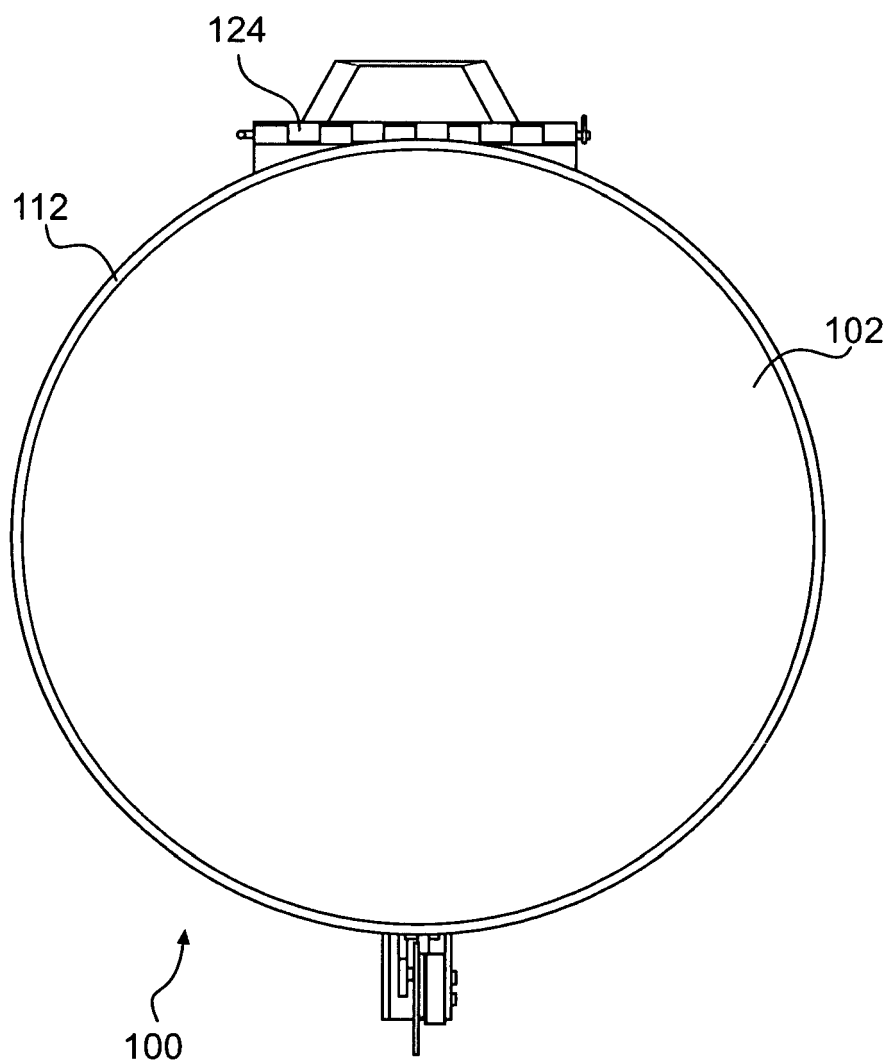


FIG. 7

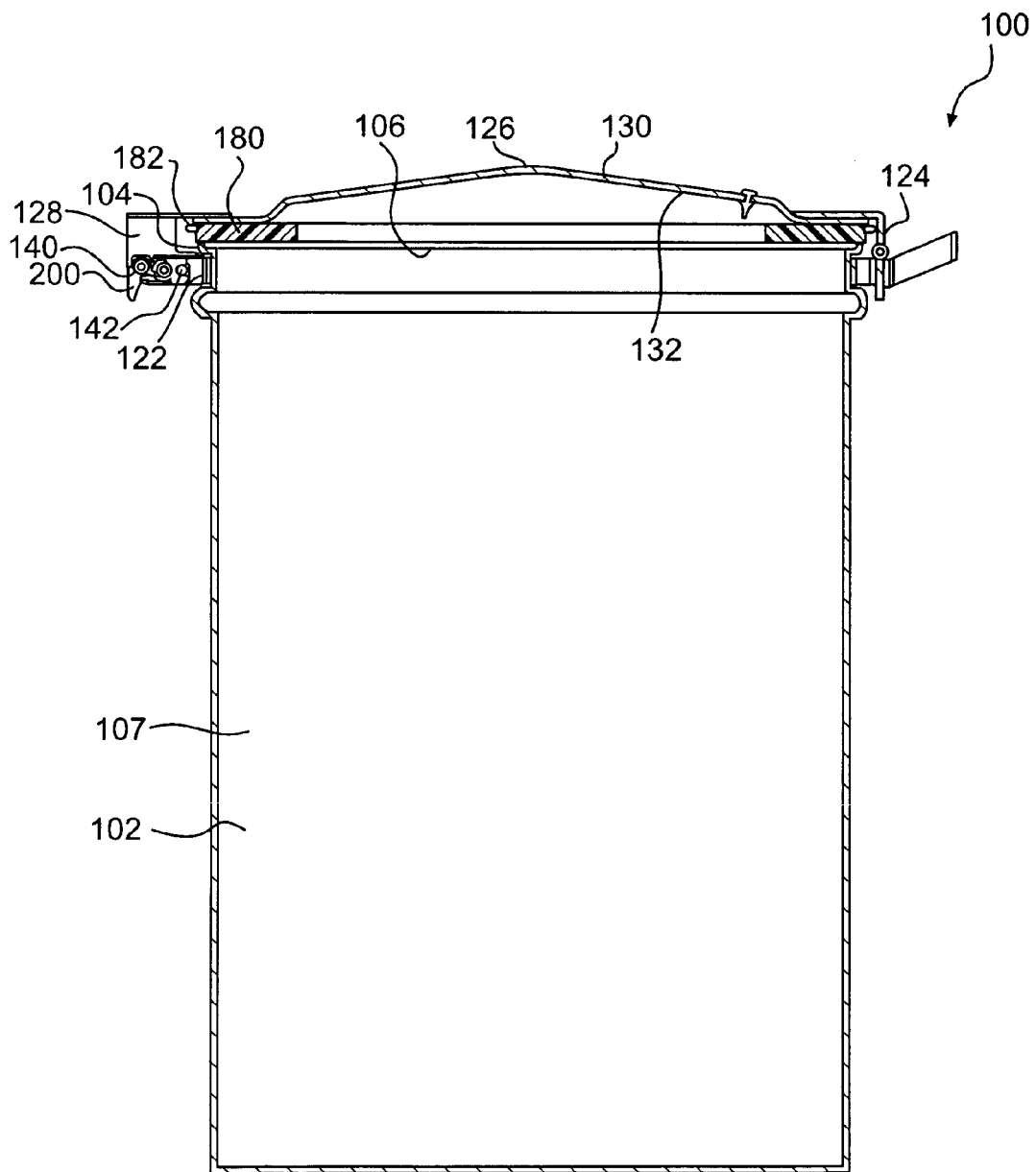


FIG. 8

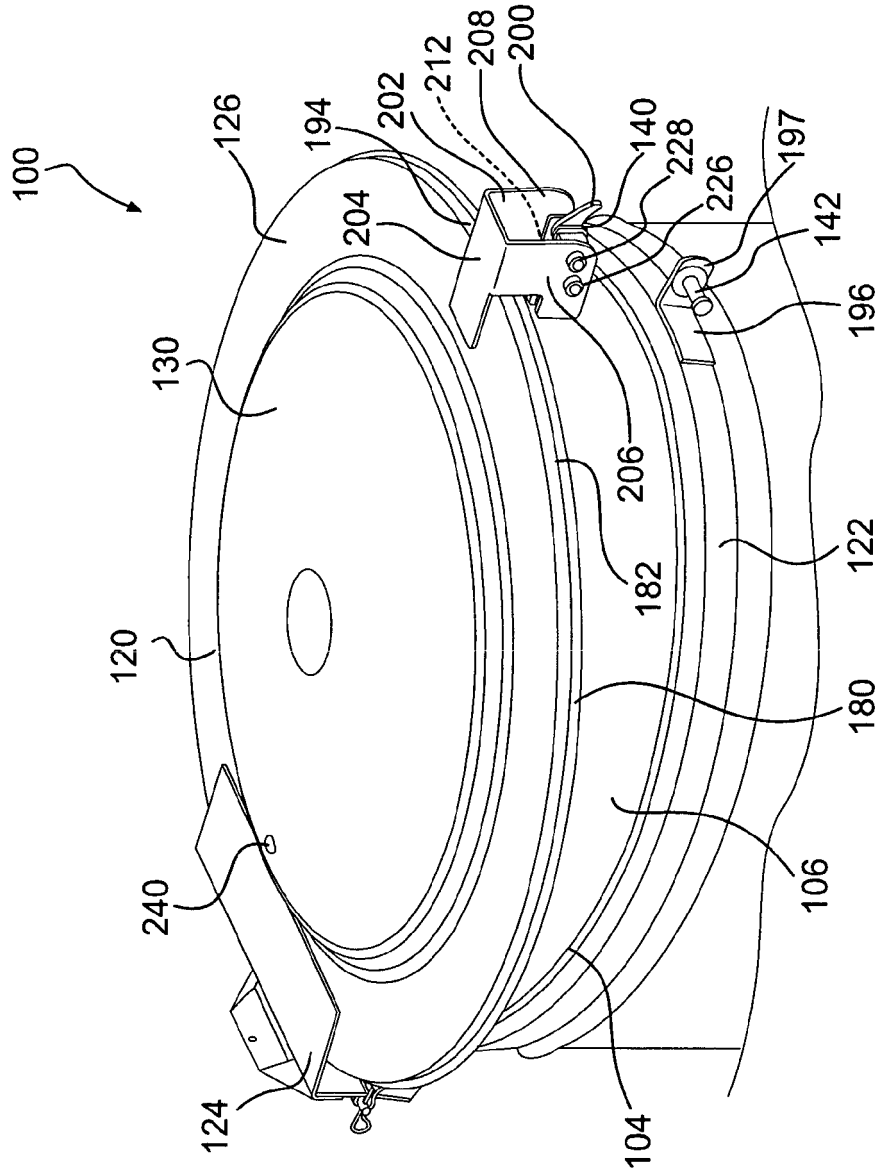


FIG. 9

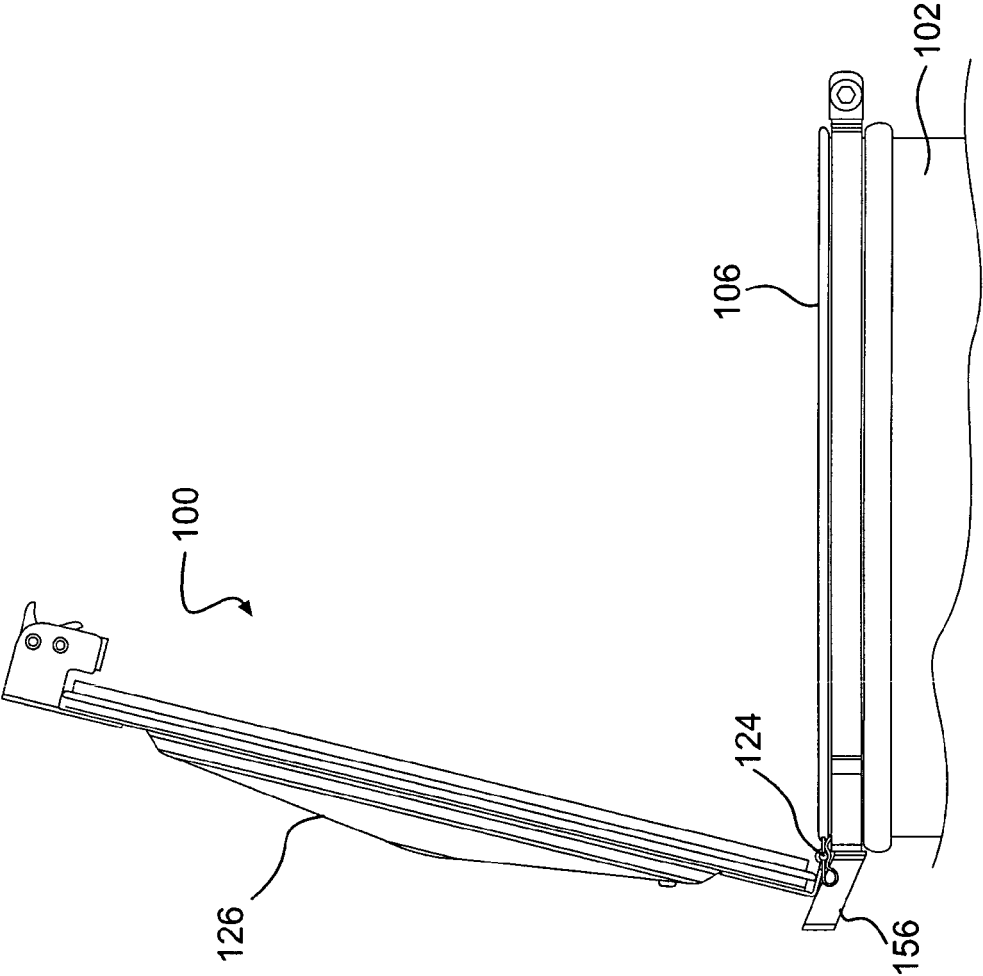


FIG. 10

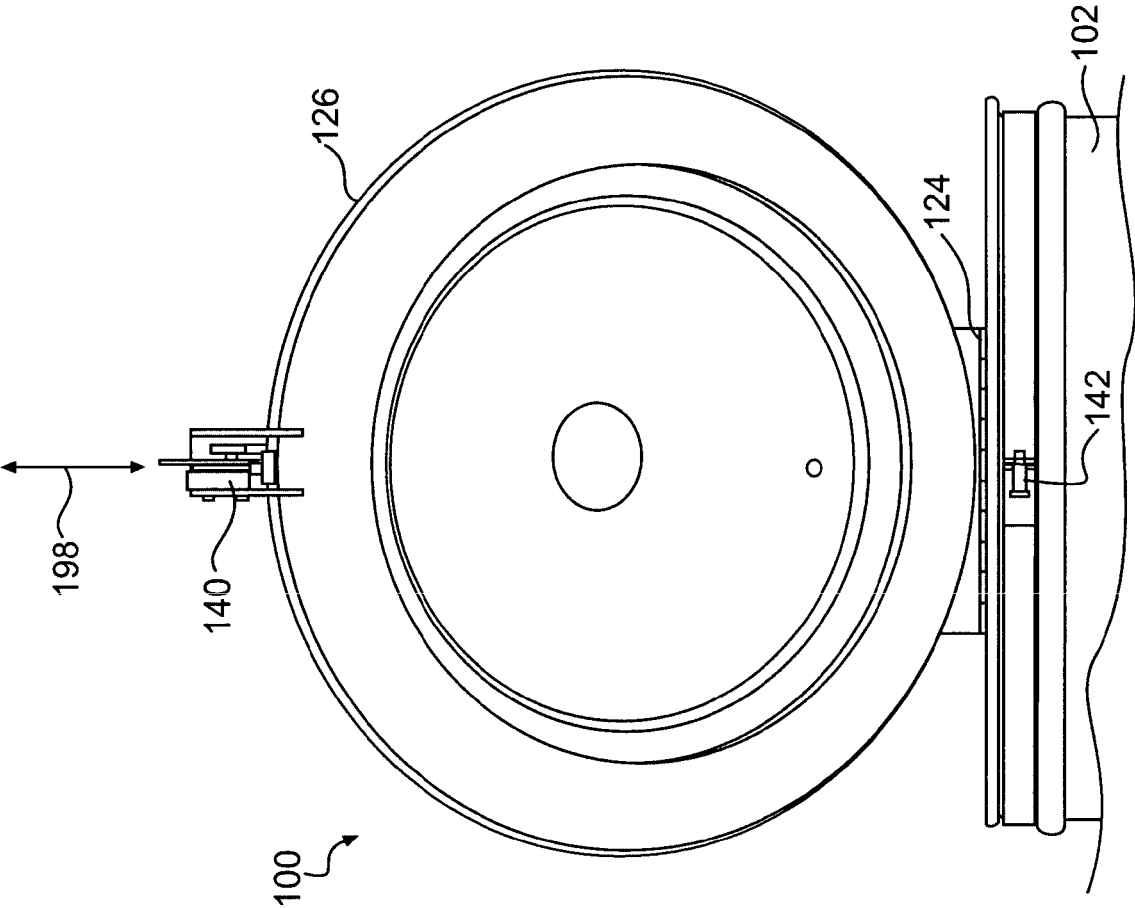


FIG. 11

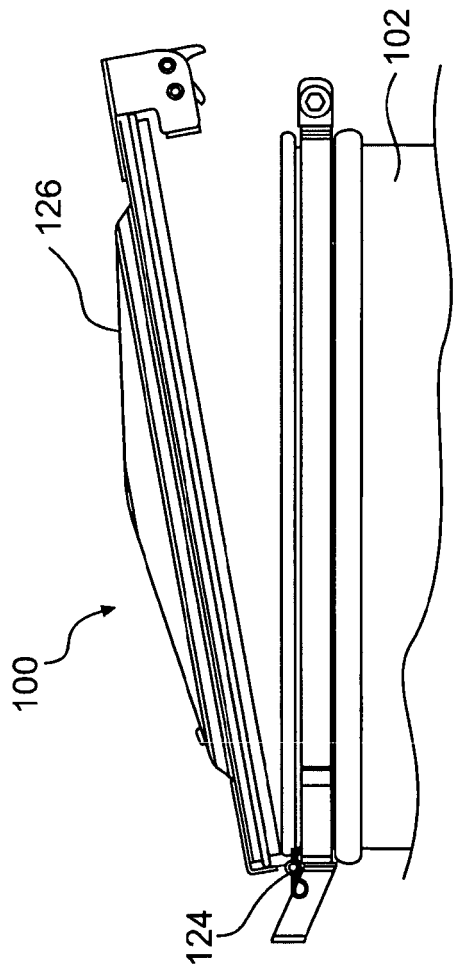


FIG. 12

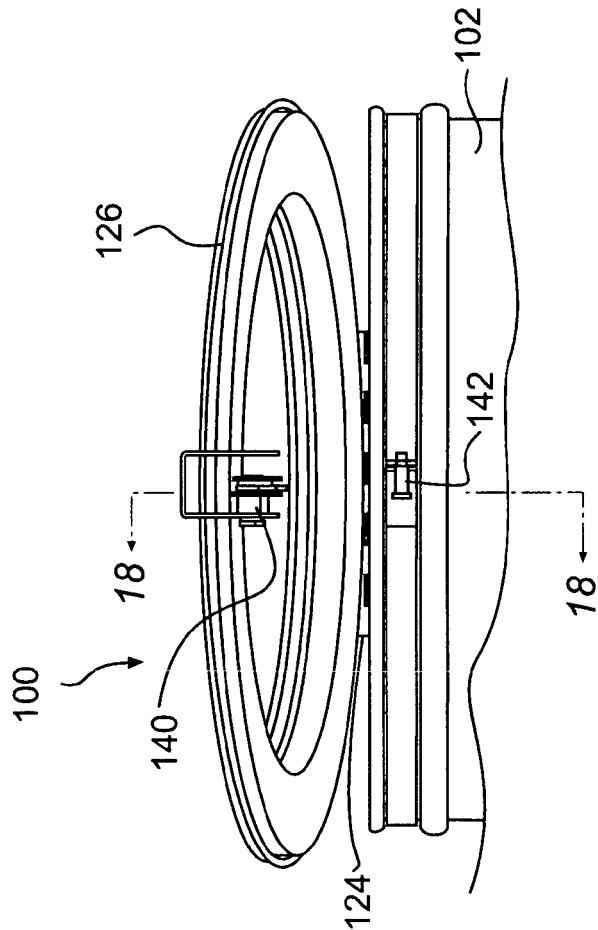


FIG. 13

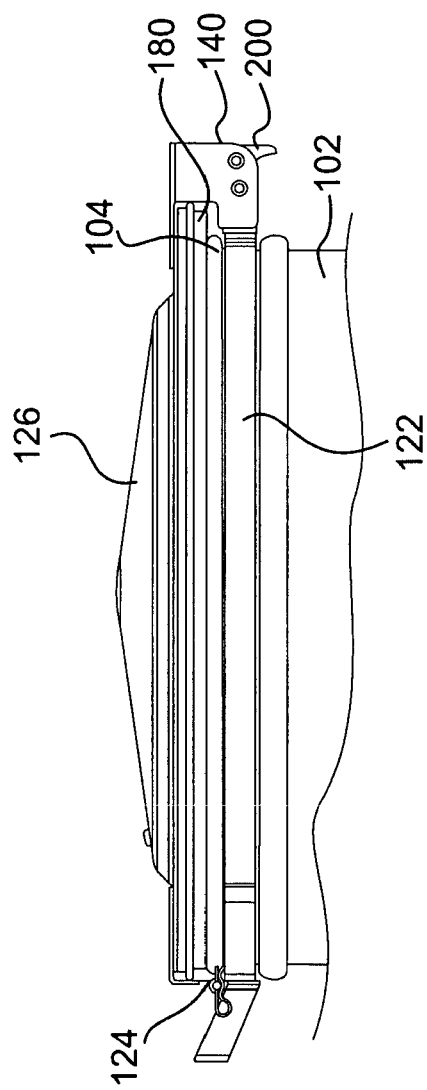


FIG. 14

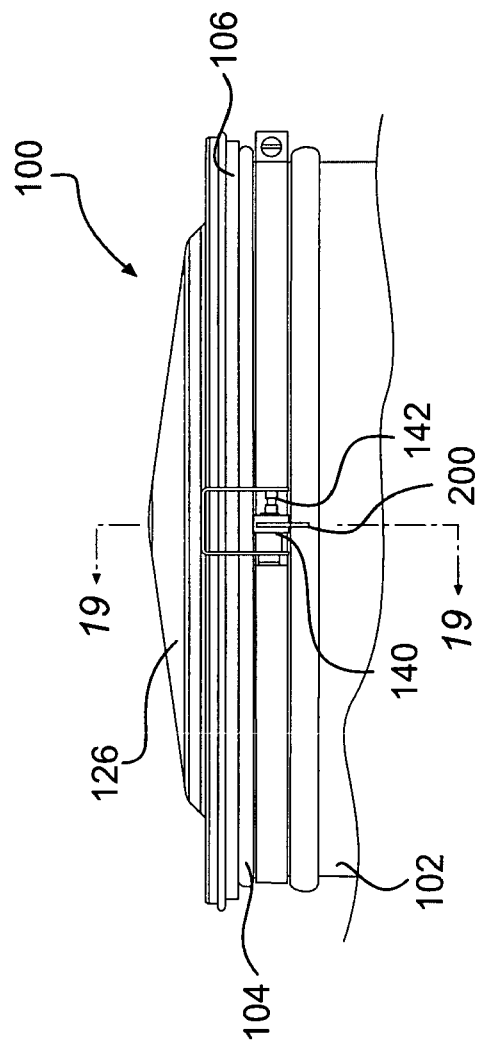


FIG. 15

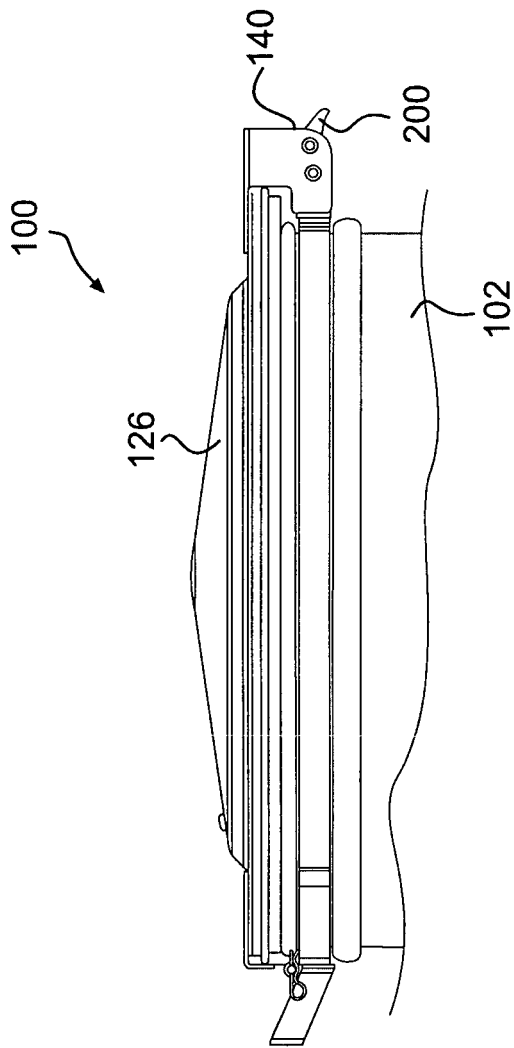


FIG. 16

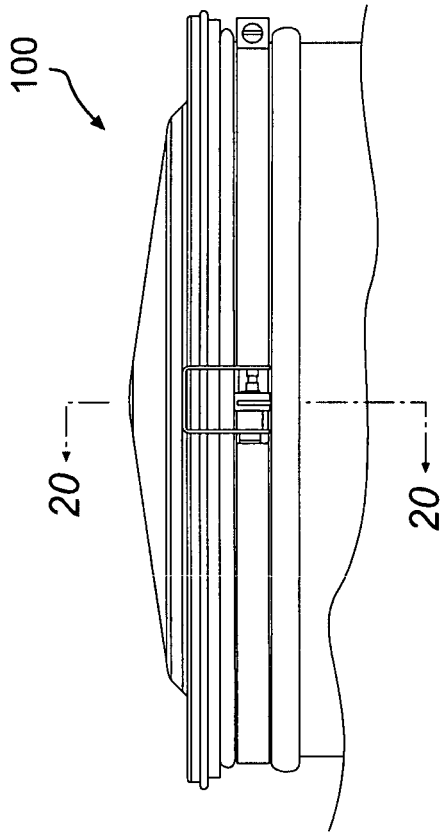


FIG. 17

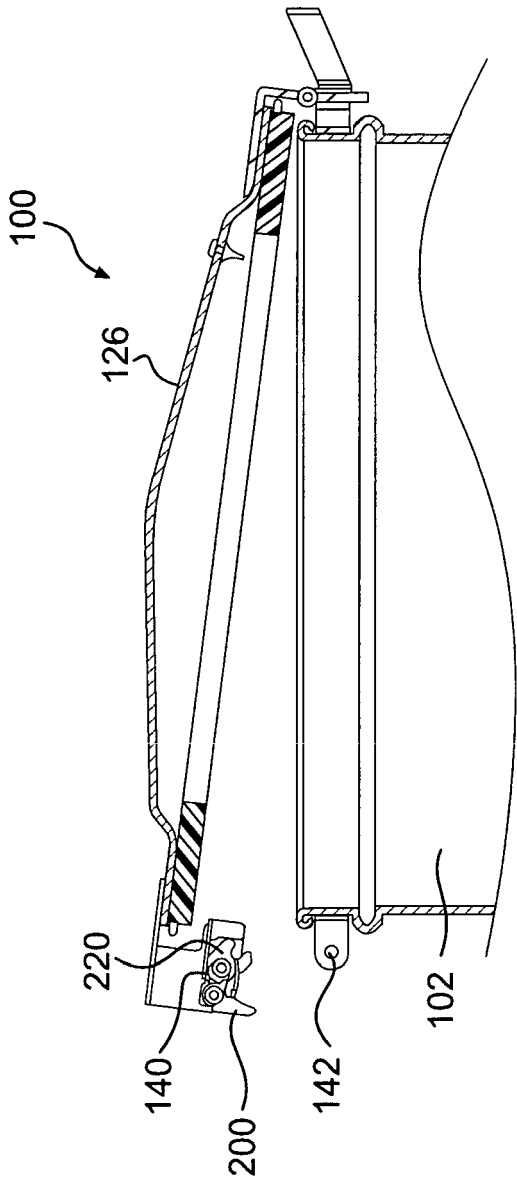


FIG. 18

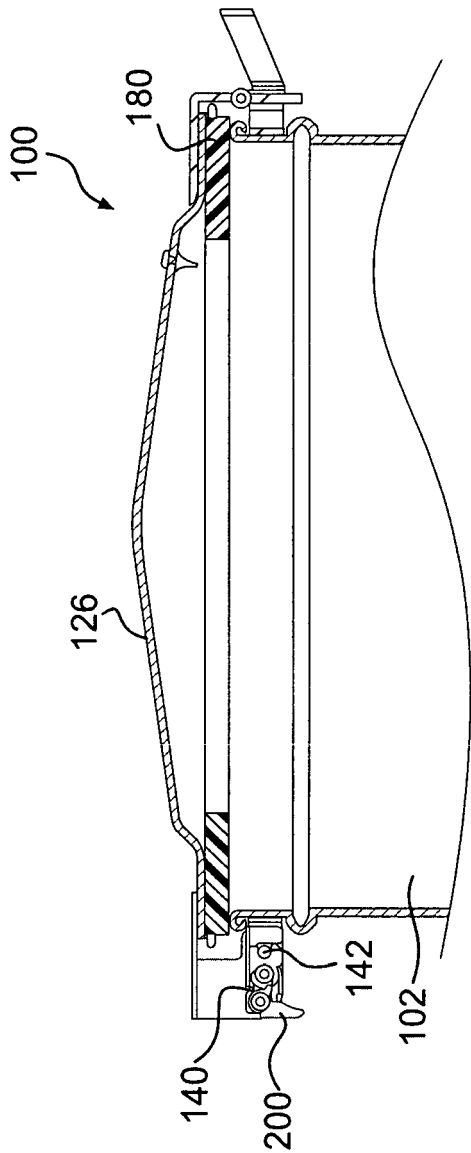


FIG. 19

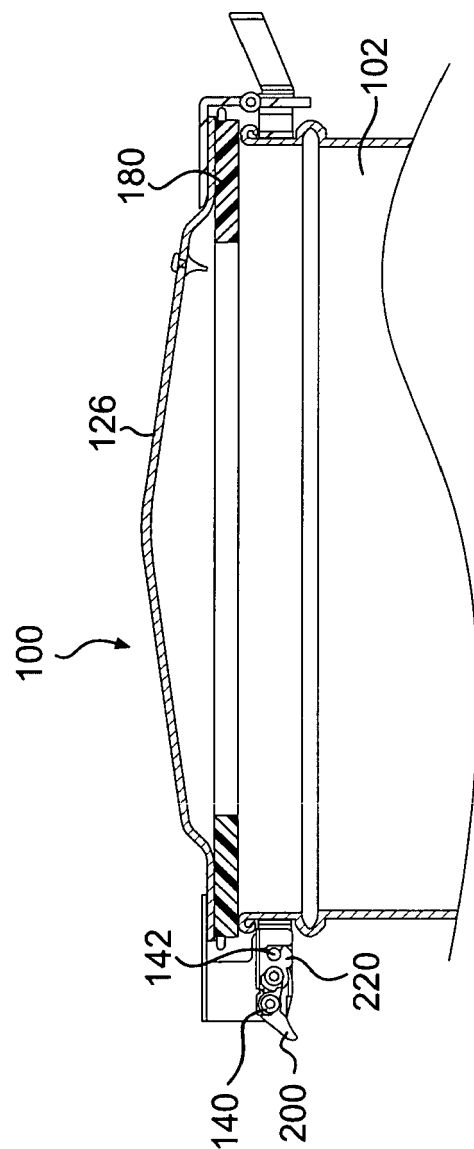


FIG. 20

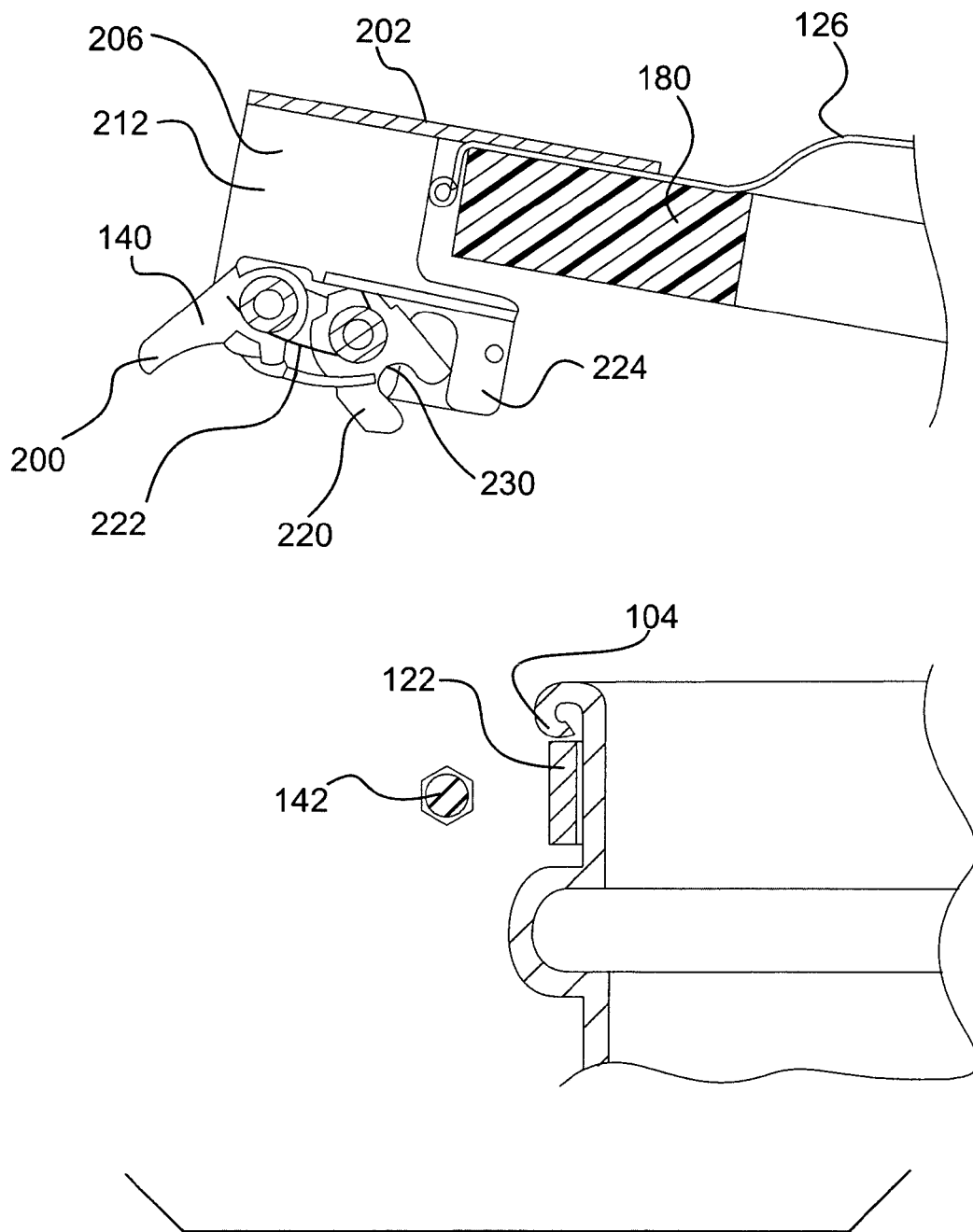


FIG. 21

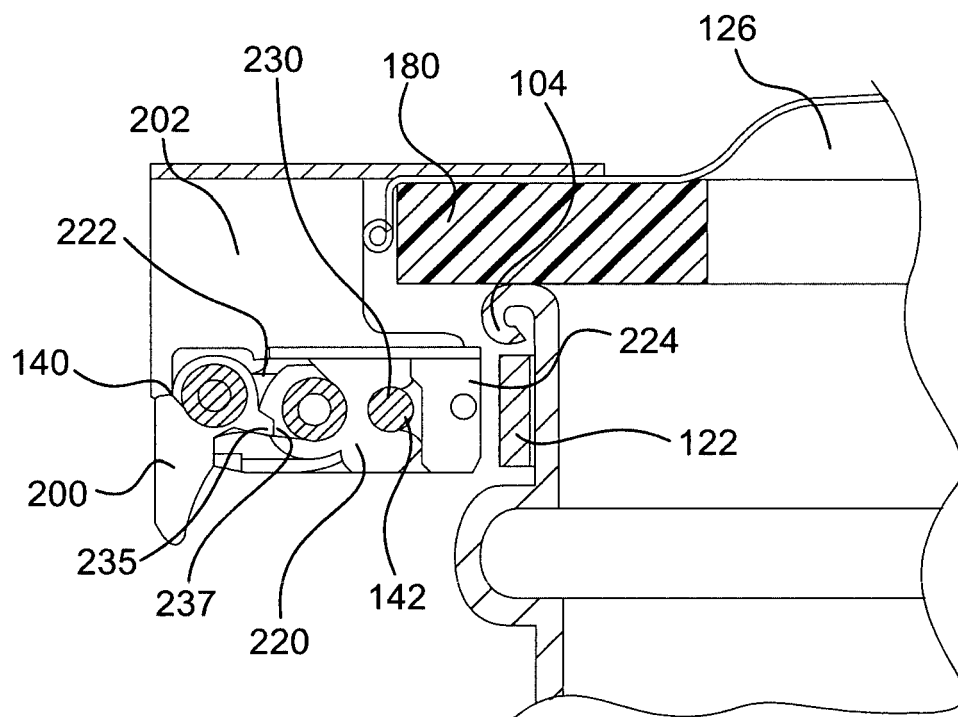


FIG. 22

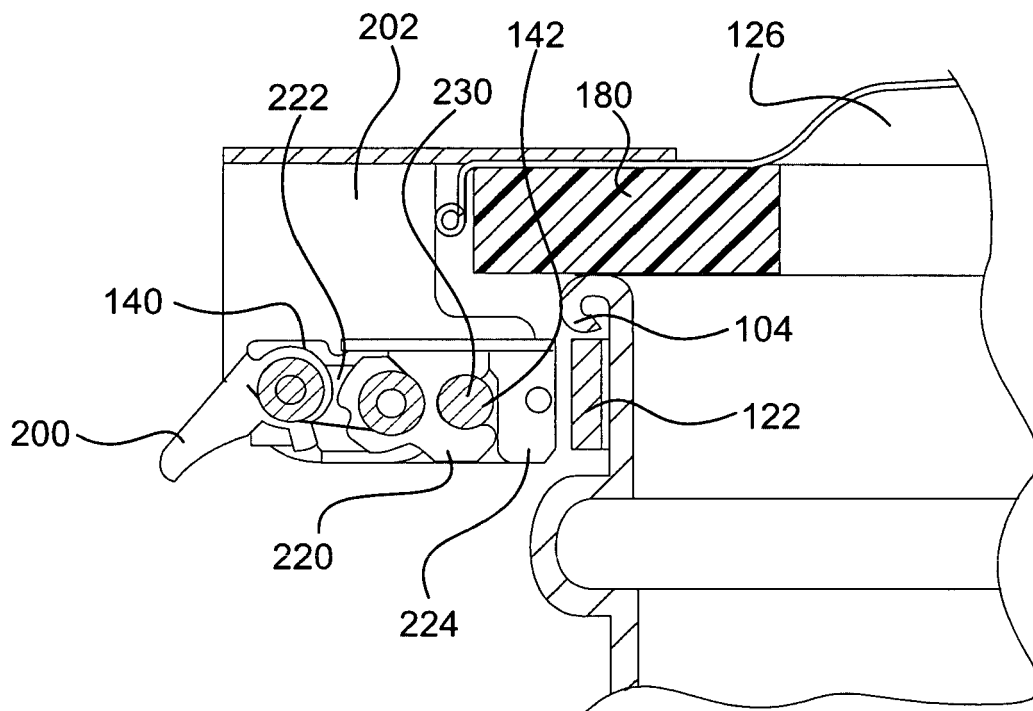


FIG. 23

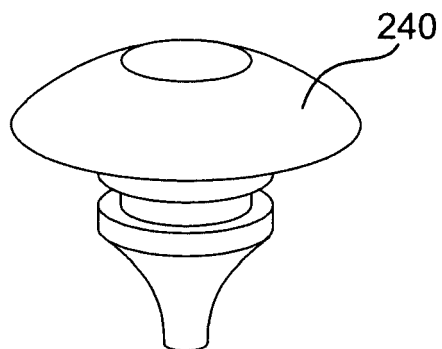


FIG. 24

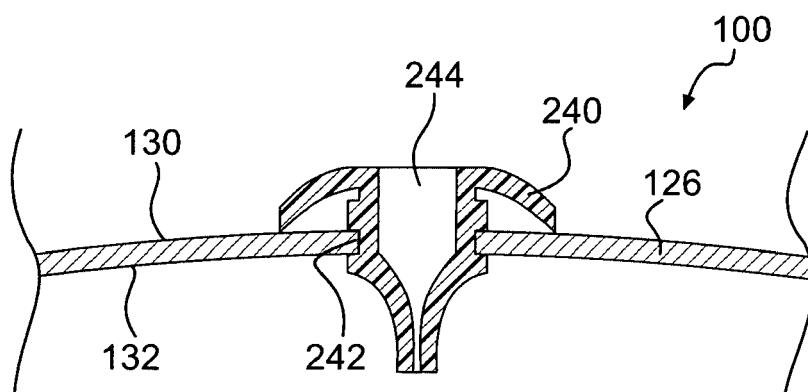


FIG. 25

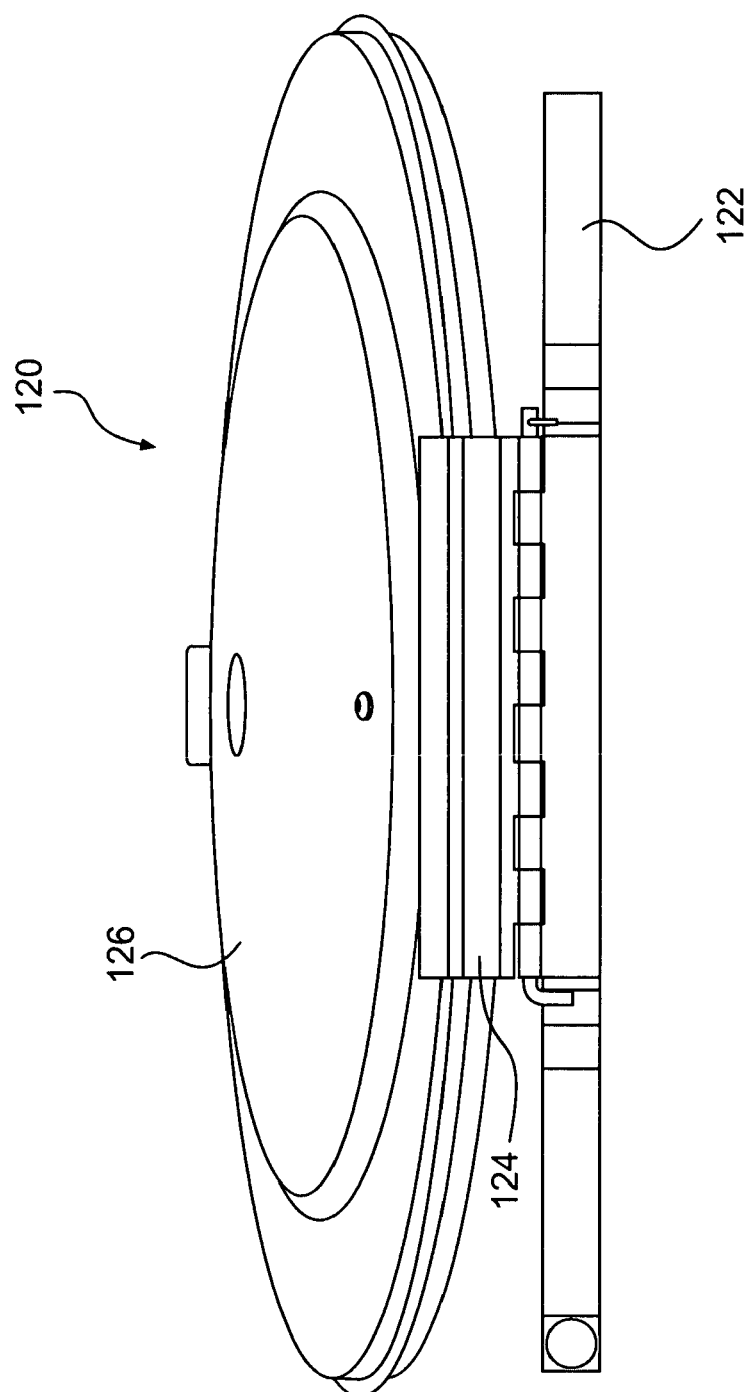


FIG. 26

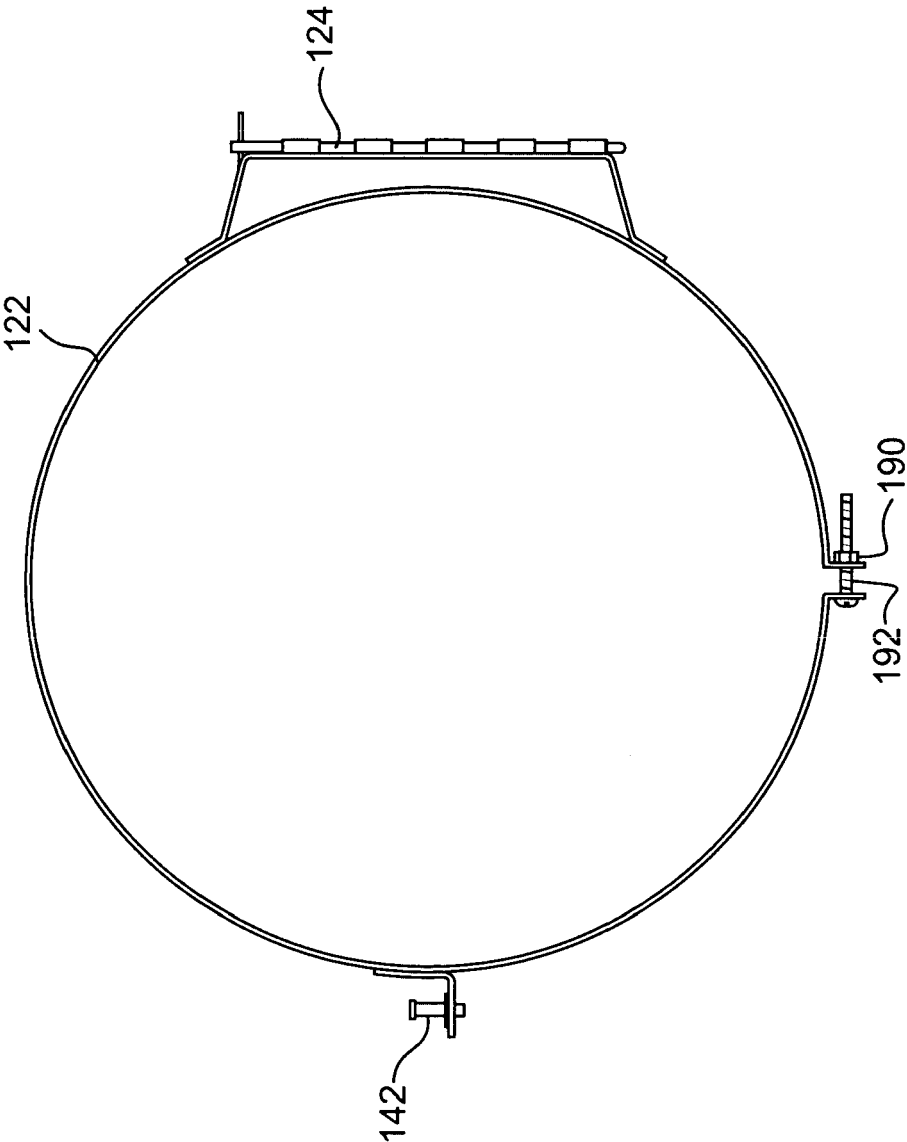


FIG. 27