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(54) Title: AN ARRANGEMENT FOR MANAGING HEAT DISSIPATION FROM SURFACE OF AN OBJECT

(57) Abstract: According to an embodiment, an arrangement 100 for managing heat dissipation from a surface 102 of an object 104 is disclosed. The heat dissipation from the surface 102 of the object 104 is managed by controlling the volume of a coolant surrounding the surface 102 of the object 104. The arrangement 100 for managing heat dissipation includes a fixed enclosure 106. The enclosure 106 substantially surrounds the object 104 and defines a coolant flow path 108 between the surface 102 of the object 104 and the enclosure 106. The arrangement 100 further includes a plurality of flaps 118 hinged to the enclosure 106. The arrangement 100 for heat dissipation further includes a means for selectively operating one or more flaps 118, such that the volume of the coolant in the coolant flow path 108 is controlled by operating the one or more flaps 118.

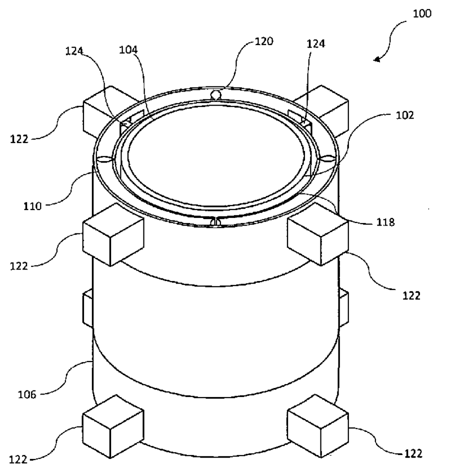

Figure 1

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<u>FORM 2</u>

THE PATENTS ACT 1970

(39 OF 1970)

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The Patent Rules, 2003

Complete Specification

(See Section 10 and Rule 13)

1. TITLE OF THE INVENTION

An Arrangement for Managing Heat Dissipation from Surface of an Object

2. APPLICANT(S)

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3. PREAMBLE TO THE DESCRIPTION

COMPLETE

The following specification particularly describes the invention and the manner in which it is performed.

FIELD OF INVENTION

The invention generally relates to a field of heat transfer system, and more particularly relates to an arrangement for transferring heat from a surface of an object to a coolant.

BACKGROUND

A typical heat dissipation system, such as a liquid cooling system, includes a liquid coolant for cooling one or more components of a mechanical system. The liquid coolant is circulated around the component from which the heat is to be dissipated. The coolant then absorbs the heat from the component and lowers the temperature of the component. The typical liquid cooling systems cools the components, however, there is no arrangement for controlling the flow of coolant to effectively cool the surface of the components.

Generally, in the internal combustion engines, to cool the engine cylinders, a liquid coolant is circulated in a coolant jacket surrounding the cylinders. Conventional systems for cylinder cooling direct coolant flow longitudinally past the cylinders from one end of the bank to the other. The cylinders are cooled by the passing coolant in contact with the cylinder walls. Increasing temperatures of the coolant from the inlet end to the outlet end of the jacket tend to cool the cylinders unevenly and may allow steam pockets to form near the outlet end at high engine loads. The conventional liquid coolant systems lack an arrangement to direct the flow of coolant based on the temperature of the surface of the cylinder.

Hence, there is a need for an improved arrangement for effectively dissipating heat from the surface of the components.

SUMMARY OF THE INVENTION

According to an embodiment of the invention, an arrangement for managing heat dissipation from a surface of an object is disclosed. The heat dissipation from the surface of the object is managed by controlling the volume of a coolant surrounding the surface of the object. The arrangement for managing heat dissipation includes a fixed enclosure. The enclosure substantially surrounds the object and defines a coolant flow path between the surface of the object and the enclosure. The arrangement further includes a plurality of flaps hinged to the enclosure. The arrangement for heat dissipation further includes a means for selectively operating one or more flaps, such that the volume of the coolant in the coolant flow path is controlled by operating the one or more flaps.

BRIEF DESCRIPTION OF DRAWINGS

Other objects, features, and advantages of the invention will be apparent from the following description when read with reference to the accompanying drawings. In the drawings wherein, like reference numerals denote corresponding parts throughout the several views.

Figure 1 illustrates an isometric view of an arrangement for heat dissipation according to an embodiment of the invention;

Figure 2 illustrates a side cross-sectional view of the arrangement for heat dissipation according to an embodiment of the invention;

Figure 3 illustrates a side view of an arrangement for heat dissipation of an engine cylinder according to an embodiment of the invention;

Figure 4 illustrates a front cross-sectional view of the arrangement for heat dissipation of the engine cylinder having upper flaps in an engaged state according to an embodiment of the invention; and

Figure 5 illustrates a front cross-sectional view of the arrangement for heat dissipation of the engine cylinder having lower flaps in an engaged state according to an embodiment of the invention.

DETAILED DESCRIPTION OF DRAWINGS

The following description with reference to the accompanying drawings is provided to assist in a comprehensive understanding of exemplary embodiments. It includes various specific details to assist in that understanding but these are to be regarded as merely exemplary. Accordingly, those of ordinary skilled in the art will recognize that various changes and modifications of the embodiments described herein can be made without departing from the scope and spirit of the invention. In addition, descriptions of well-known functions and constructions are omitted for clarity and conciseness.

Figure 1 and Figure 2 illustrates an isometric view and a side cross-sectional view respectively of an arrangement 100 for managing heat dissipation from a surface 102 of an object 104 according to an embodiment of the invention. The arrangement 100 for managing heat dissipation may be employed in mechanical systems such as, but not limited to, internal combustion engines. The arrangement 100 may be used to effectively dissipate heat from the surface 102 of the object 104, resulting in effective cooling of the object 104. For the purpose of illustration, the object 104 may be a component of the mechanical system such as, but not limited to, a cylinder of the internal combustion engine. It will be apparent to a person skilled in the art, that the shape of the object 104 may not be limited to a cylindrical shape and may vary depending on the mechanical system. The surface 102 of the object 104 from where the heat is dissipated is the outer surface area of the object 104.

The arrangement 100 may manage heat dissipation from the surface 102 of the object 104 by controlling the volume of a coolant (not shown in figure) surrounding the surface 102 of the object 104. In other words, the arrangement 100 may reduce the volume of the coolant flow at the surface 102 where less cooling is required and may increase the volume of the coolant flow at the surface 102 where more cooling is required. For the purpose of illustration, if the top surface 102a of the object 104 requires less cooling, the volume of the coolant surrounding the top surface 102a may be reduced. Similarly, if the bottom surface 102b of the object requires less cooling, the volume of the coolant surrounding the bottom surface 102b may be reduced. It should be noted that the coolant surrounding the surface 102 of the object 104 may be flowing in contact with the surface 102 of the object 104 and may absorb the heat from the surface 102 of the object 104. As will be appreciated by those skilled in the art, the coolant may be a liquid coolant such as, but not limited to, water, propylene glycol, ethylene glycol or any other coolant known in the art.

The arrangement 100 for managing heat dissipation from the surface 102 of the object 104 may include a fixed enclosure 106. The enclosure 106 may substantially surround the surface 102 of the object 104. It should be noted that the shape of the enclosure 106 may depend on the shape of the object 104. For the purpose of illustration, for a cylindrical object 104, the shape of the enclosure 106 may be substantially cylindrical. According to an embodiment, for an object 104 such as an engine cylinder, the enclosure 106 may be a coolant jacket. The coolant jacket may be a liquid coolant jacket or an oil coolant jacket. The enclosure 106 may surround the object 104 in such a manner that a coolant flow path 108 is defined between the surface 102 of the object 104 and the enclosure 106. The coolant may flow into the enclosure 106 through an inlet (not shown in figure) provided on the enclosure 106. On entering through the inlet, the coolant may flow in contact with the surface 102 of the object 104 in the coolant flow path 108. Once the coolant absorbs heat from the surface 102 of the object 104, the coolant may flow out of the enclosure 106 through an outlet (not shown in figure) provided on the enclosure 106. It should be noted that the coolant flow path 108 between the enclosure 106 and the surface 102 of the object 104 may be of uniform volume and the volume may be determined based on the mechanical system.

According to an embodiment, the enclosure 106 may have an outer wall 110 and an inner wall 112. The outer wall 110 may be the external wall of the enclosure 106. The inner wall 112 may be the internal wall of the enclosure 106. In other words, the enclosure 106 may be a double walled structure where the external wall is the outer wall 110 and the internal wall is the inner wall 112. It will be apparent to a person skilled in the art that the inner wall 112 may also surround the object 104. The inner wall 112 may have an upper end 114 and a lower end 116.

The arrangement 100 for managing heat dissipation from the surface 102 of the object 104 may include a plurality of flaps 118 hinged on the upper end 114 and the lower end 116 of the inner wall 112. The plurality of flaps 118 may be hinged in such a manner that each of the flaps 118 hinged on the upper end 114 have a swivelling motion with respect to the upper end 114 and each of the flaps 118 hinged on the lower end 116 have a swivelling motion with respect to the lower end 116. The plurality of flaps 116 hinged on the upper end 114 and the lower end 116 may be arranged in such a manner that each of the flap 116 on swivelling may contact the surface 102 of the object 104 at an unhinged end of the flap 118. The swivelling motion of the flaps 118 may enable each of the flap t118 o engage and disengage the surface 102 of the object 104. It will be apparent to a person skilled in the art that when the flaps 118 at the upper end 114 and the lower end 116 are in a disengaged state, the volume of coolant flow will be uniform and when the flaps 118 at the upper end 114 or the lower end 116 are in an engaged state, the volume of coolant flow will reduce at the end 114, 116 where the flaps 118 are engaged. As will be appreciated by those skilled in the art, the shape of the flaps 118 may vary depending on the shape of the object 104 as well as the shape of the enclosure 106. For the purpose of illustration, if the shape of the object 104 and the enclosure 106 is substantially cylindrical, the shape of the flaps 118 may be a curved trapezoidal shape. It should be noted that the shape of the flaps 118 may be such that the flaps 118 at the upper end 114 or the lower end 116 may reduce the volume of coolant flow in the engaged state. According to an embodiment, each of the adjacent flaps 118 may be connected to each other by a flexible material 120. The flexible material 120 may have the capacity to withstand high temperatures. The flexible material 120 may also be waterproof. According to an embodiment, the flexible material 120 may be silicon rubber. It should be noted that during the engaged state of the flaps 118, the flexible material 120 may get folded and the during the disengaged state of the flaps 118, the flexible material 120 may get unfolded.

The arrangement 100 for managing heat dissipation from the surface 102 of the object 104 may include a means for selectively operating one or more flaps 118. The means for selectively operating one or more flaps 118 may include one or more magnetic solenoids 122. The magnetic solenoids 122 may be connected to the flaps 118 through a pushrod 124. As will be appreciated by those skilled in the art, the means for selectively operating one or more flaps 118 may not be limited to magnetic solenoids 122, and other means of operating known in the art may also be included. The magnetic solenoid 122 may be used to engage and disengage each of the flap 118 independently. The flaps 118 at the upper end 114 and the lower end 116 of the inner wall 112 may be operated independently based on the cooling required at the top surface 102a and the bottom surface 102b of the object 104. According to an embodiment, the means for selectively operating one or more flaps may be configured to operate automatically when the temperature of the of the surface 102 reaches a predefined temperature. In other words, when the temperature of the top surface 102a or the bottom surface 102b is less than the predefined temperature, the flaps 118 at the upper end 114 or the lower end 116 is in the engaged state. Similarly, if the temperature of the top surface 102a and the bottom surface 102b is more than the predefined temperature, the flaps 118 at the upper end 114 or the lower end 116 is in the disengaged state.

Figure 3 and Figure 4 illustrates a side view and a front cross-sectional view of an arrangement 200 for managing heat dissipation from a surface 202 of an engine cylinder 204 according to another embodiment of the invention. The engine cylinder 204 may have a piston 206 reciprocating within the cylinder 204. According to an embodiment, the engine cylinder 204 may be a two-stroke internal combustion engine cylinder. According to another embodiment, the engine cylinder 204 may be a four-stroke internal combustion engine cylinder. The arrangement 200 for managing heat dissipation may include a coolant jacket 208 surrounding the engine cylinder 204. The coolant jacket 208 may define a coolant flow path 210 between the coolant jacket 208 and the engine cylinder 204. The coolant jacket 208 may have an outer wall 212 and an inner wall 214. The inner wall 214 may have a plurality of flaps 216 hinged on an upper end 218 and a lower end 220 of the inner wall 214. The plurality of flaps 216 may be arranged on the upper end 218 and the lower end 220 in such a manner that the flaps 216 form a cylindrical arrangement at the upper end 218 and the lower end 220 of the inner wall 214. Each of the flaps 216 may have a curved trapezoidal shape and each of the adjacent flaps 216 may be connected to each other by a flexible material (not shown in figure). The flexible material may have a capability to withstand high temperatures. The flexible material may further be made of a waterproof material. According to an embodiment, the flexible material may be a silicon rubber. The arrangement 200 for managing heat dissipation from the surface 202 of the engine cylinder 204 may further include a means for selectively operating one or more flaps 216. Each of the flaps 216 may be engaged and disengaged to the surface 202 of the cylinder 204 by the means for selectively operating the flaps 216. The means for selectively operating the flaps 216 may include one or more magnetic solenoids 222. The magnetic solenoids 122 may be connected to the flaps 216 through a push rod 224. The plurality of flaps 216 hinged on the upper end 218 or the lower end 220 of the inner wall 214 may be operated to reduce the volume of coolant flow through the coolant flow path 210. It will be apparent to a person skilled in the art, that the surface 202 of the engine cylinder 204 close to the Top Dead Centre (TDC) and the Bottom Dead Centre (BDC) may undergo different temperatures. The plurality of flaps on the upper end 218 and the lower end 220 may be operated accordingly to enable variable cooling to the surface 202 of the cylinder 204. Referring to figure 4, the flaps 216 hinged on the upper end 218 of the inner wall 214 are in the engaged state and the flaps 216 hinged on the lower end 220 of the inner wall 214 are in the disengaged state. In other words, the volume of the coolant flowing close to TDC of the cylinder 204 may be reduced due to low temperature of a top surface 202a of the cylinder 204, and the volume of the coolant flowing close to BDC may be more due to high temperature of a bottom surface 202b of the cylinder 204. Figure 5 illustrates a front cross-sectional view of the arrangement 200 for managing heat dissipation from the surface 202 of the engine cylinder 204 according to another embodiment of the invention. Referring to figure 5, the flaps 206 hinged on the upper end 218 of the inner wall 214 are in the disengaged state and the flaps 216 hinged on the lower end 220 of the inner wall 214 are in the engaged state. In other words, the volume of the coolant flowing close to TDC of the cylinder 204 may be more due to high temperature of the top surface 202a of the cylinder 204, and the volume of the coolant flowing close to BDC may be reduced due to low temperature of the bottom surface 202b of the cylinder 204. The independent engagement and disengagement of the plurality of flaps 216 at the upper end 218 and the lower end 220 of the inner wall 214 may enable achievement of variable cooling of the engine cylinder 204.

It is understood that the above description is intended to be illustrative, and not restrictive. It is intended to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as defined in the appended claims. Many other embodiments will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled. In the appended claims, the terms “including” and “in which” are used as the plain-English equivalents of the respective terms “comprising” and “wherein,” respectively.

We claim:

1. An arrangement 100 for managing heat dissipation from a surface 102 of an object 104 by controlling the volume of a coolant surrounding the surface 102, the arrangement 100 comprising:

    a fixed enclosure 106 substantially surrounding the surface 102 and defining a coolant flow path 108 between the surface 102 and the enclosure 106;

    a plurality of flaps 118 hinged to the enclosure 106; and

    a means for selectively operating one or more flaps 118, such that the volume of the coolant in the coolant flow path 108 is controlled by operating one or more flaps 118.

2. The arrangement 100 for managing heat dissipation as claimed in claim 1, wherein the object 104 is a cylinder.

3. The arrangement 100 for managing heat dissipation as claimed in claim 1, wherein the enclosure 106 in a coolant jacket.

4. The arrangement 100 for managing heat dissipation as claimed in claim 1, wherein the enclosure 106 has an outer wall 110 and an inner wall 112.

5. The arrangement 100 for managing heat dissipation as claimed in claim 4, wherein the plurality of flaps118 are hinged at an upper end 114 and a lower end 116 of the inner wall 112.

6. The arrangement 100 for managing heat dissipation as claimed in claim 5, wherein the plurality of flaps 118 are arranged to form a cylindrical arrangement at the upper end 114 and the lower end 116 of the inner wall 112.

7. The arrangement 100 for managing heat dissipation as claimed in claim 1, wherein the means for selectively operating one or more flaps 118 includes at least one magnetic solenoid 122.

8. The arrangement 100 for managing heat dissipation as claimed in claim 1, wherein the adjacent flaps 118 in the plurality of flaps 118 are connected to each other by a flexible material 120.

9. The arrangement 100 for managing heat dissipation as claimed in claim 8, wherein the flexible material 120 is a silicon rubber.

Dated this 6th day of August 2019

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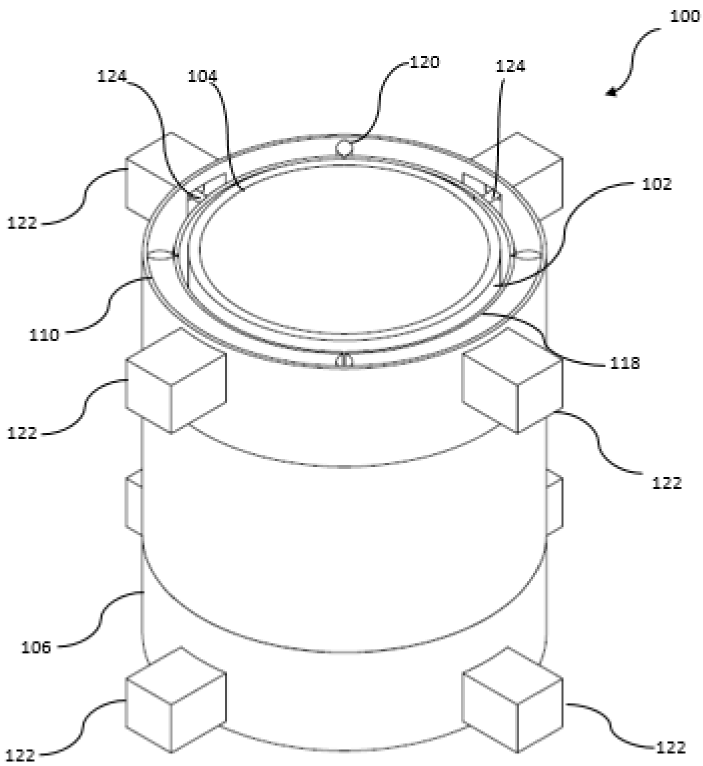
ABSTRACT

<u>An arrangement for managing heat dissipation from surface of an object</u>

According to an embodiment, an arrangement 100 for managing heat dissipation from a surface 102 of an object 104 is disclosed. The heat dissipation from the surface 102 of the object 104 is managed by controlling the volume of a coolant surrounding the surface 102 of the object 104. The arrangement 100 for managing heat dissipation includes a fixed enclosure 106. The enclosure 106 substantially surrounds the object 104 and defines a coolant flow path 108 between the surface 102 of the object 104 and the enclosure 106. The arrangement 100 further includes a plurality of flaps 118 hinged to the enclosure 106. The arrangement 100 for heat dissipation further includes a means for selectively operating one or more flaps 118, such that the volume of the coolant in the coolant flow path 108 is controlled by operating the one or more flaps 118.



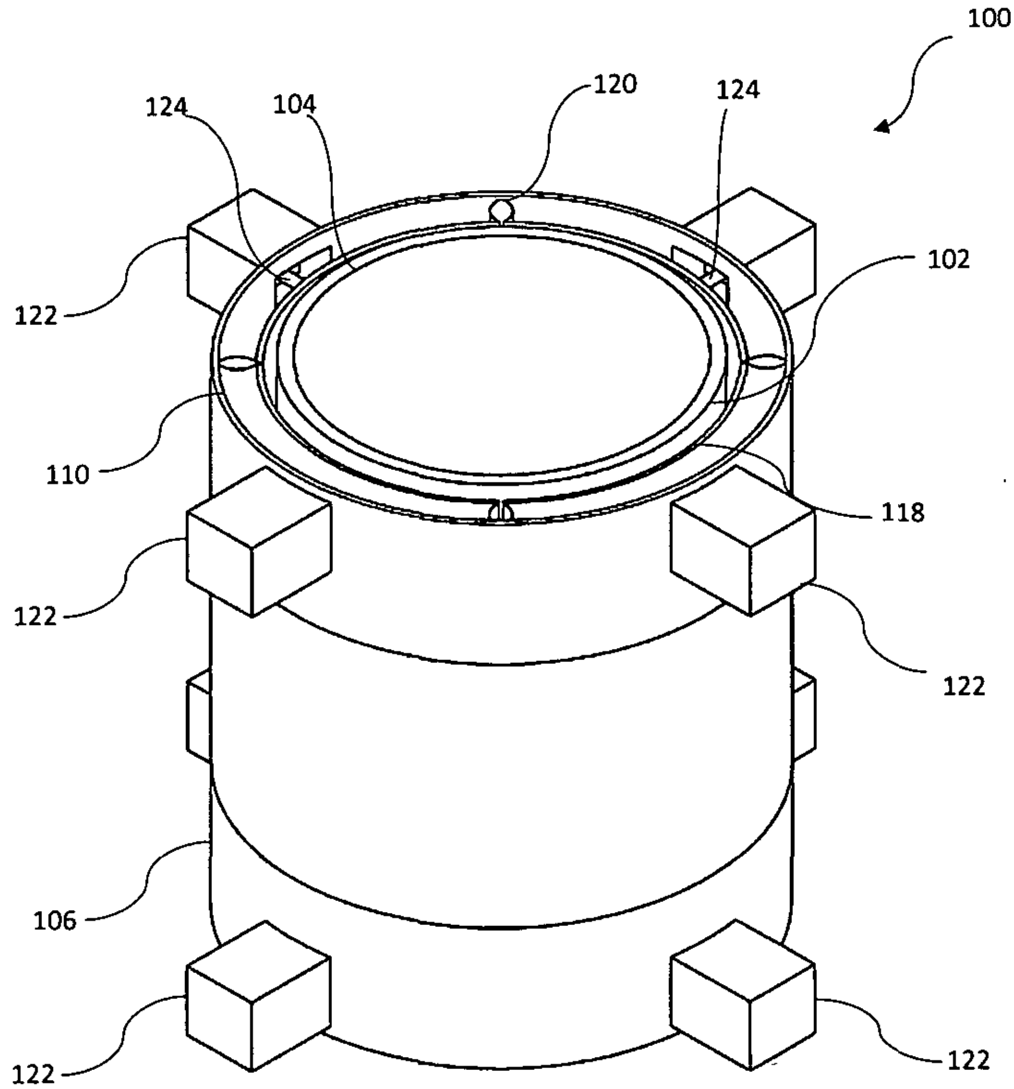


Figure 1

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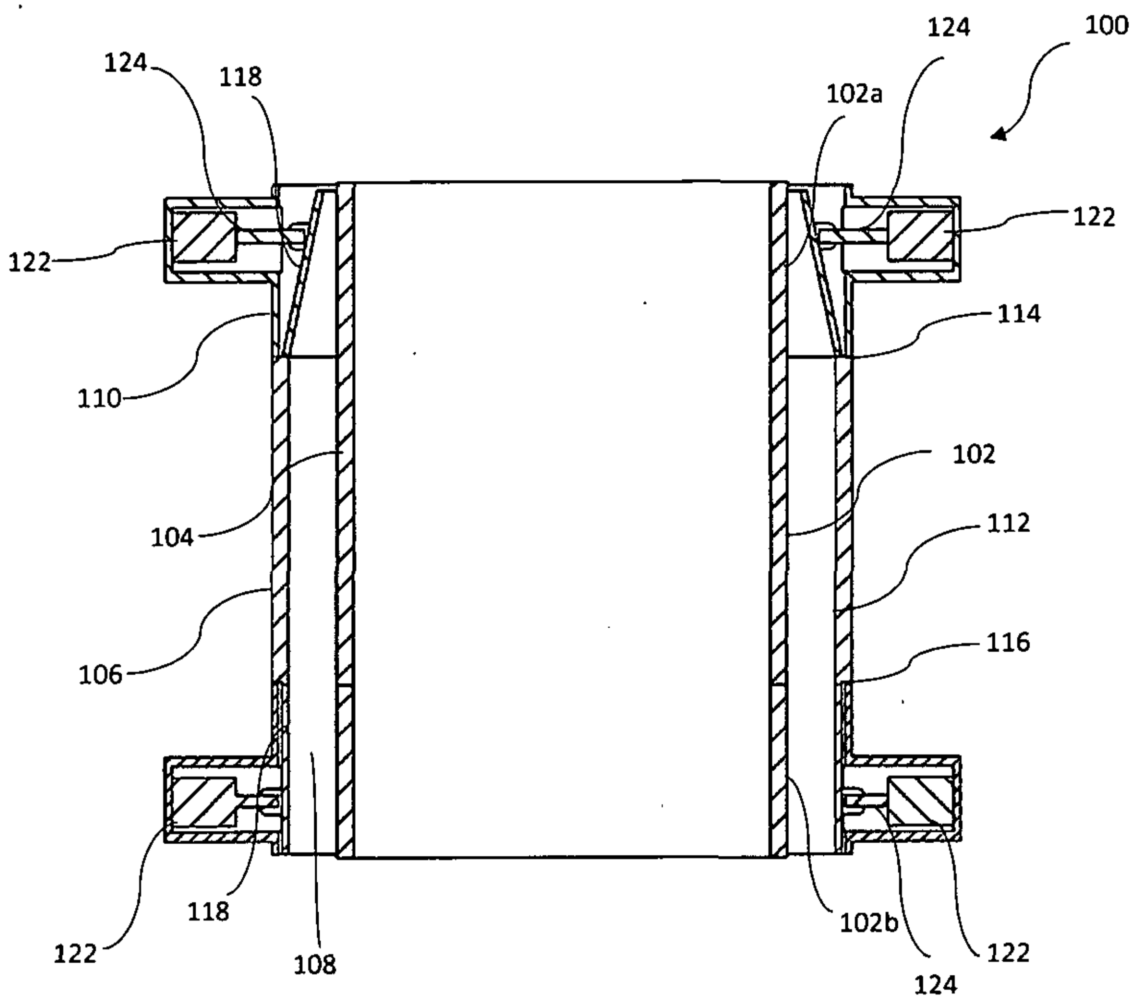

Figure 2

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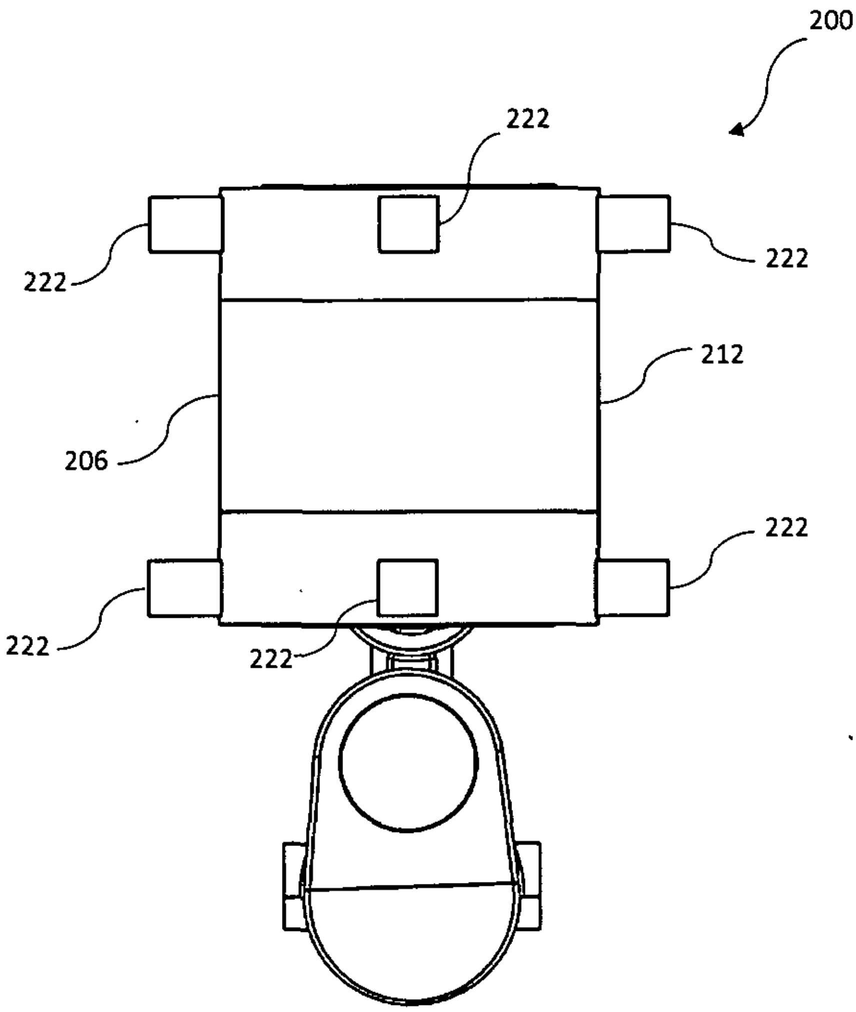

Figure 3

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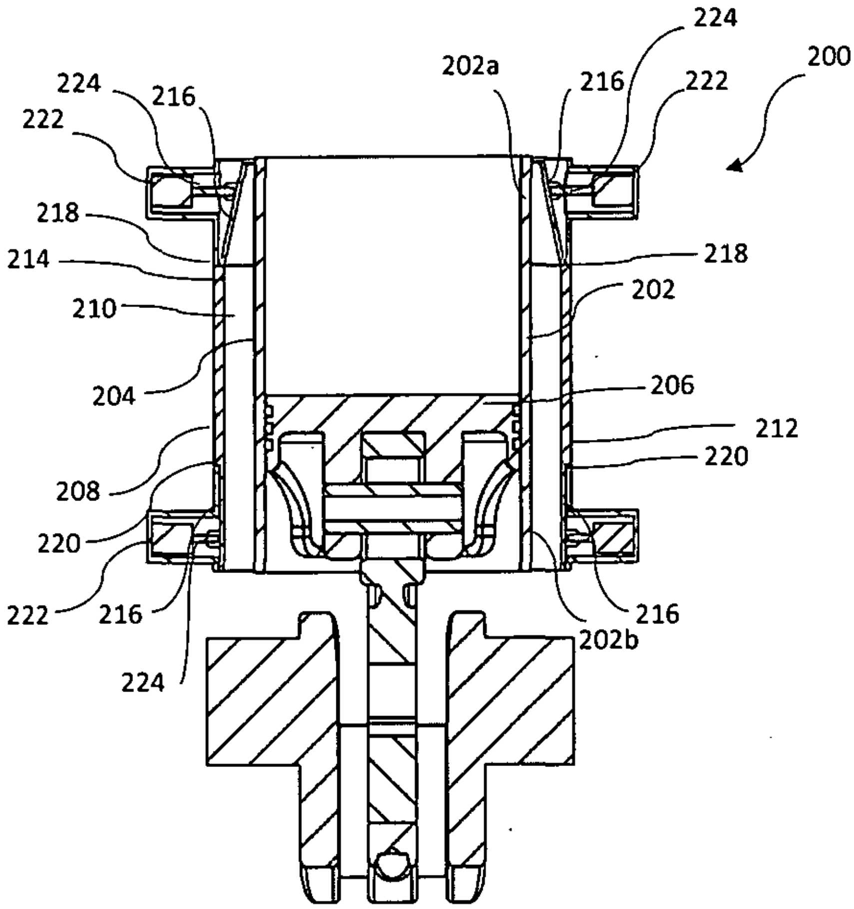

Figure 4

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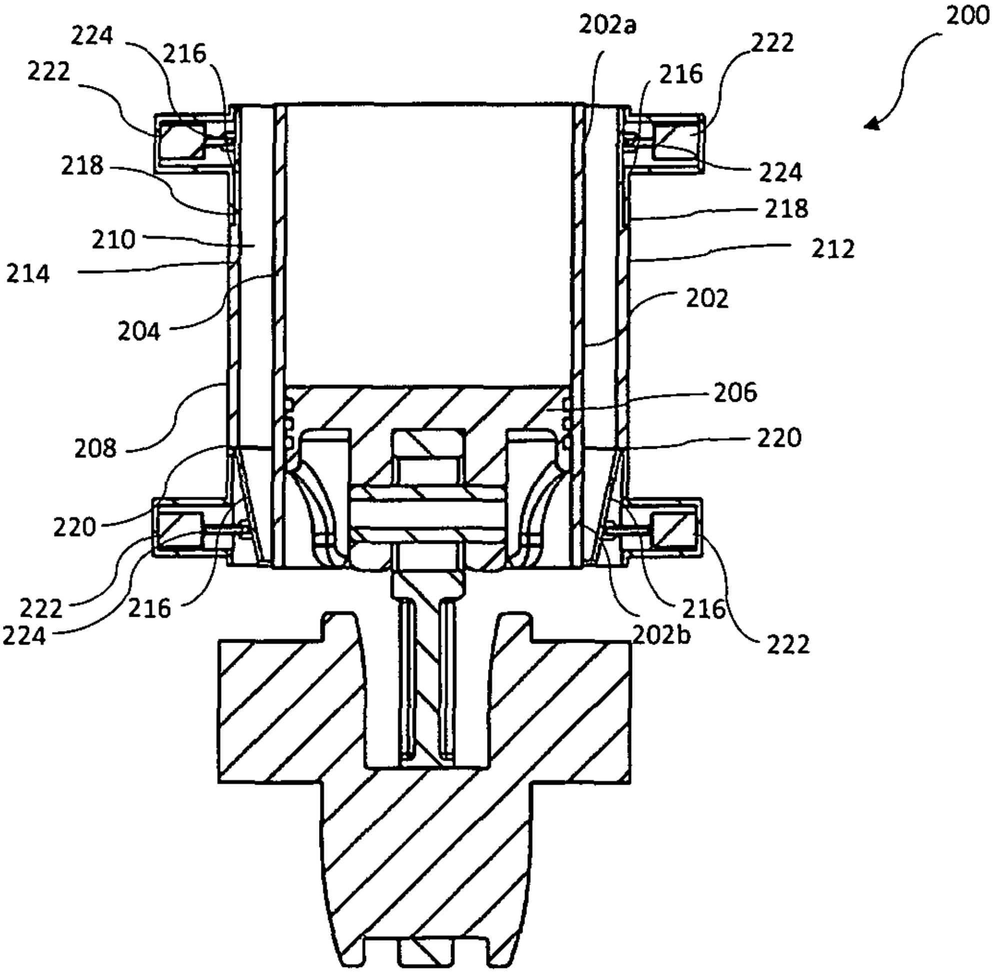

Figure 5

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