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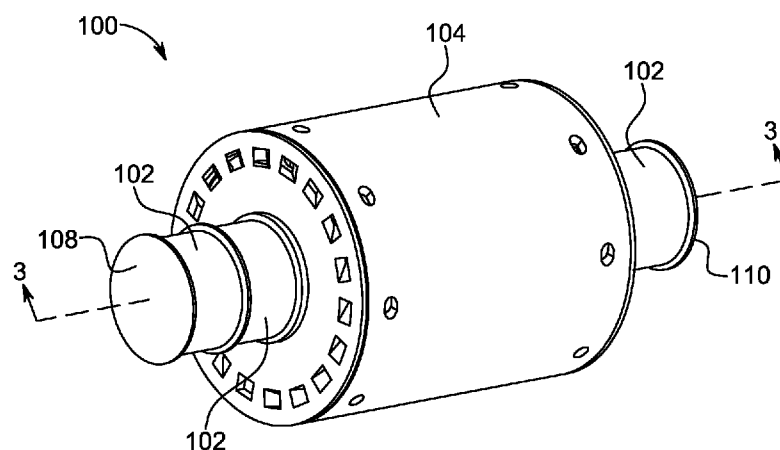


FIG. 2

(57) Abstract: A motor for use with an elevator system may include a housing, a motor shaft surrounded by the housing and having at least a first end extending outward from the housing, a motor body arranged around a central portion of the motor shaft and positioned within the housing, at least one sheave positioned at the first end of the motor shaft and rotatable with the motor shaft, and a braking system positioned at a first end of the housing. The braking system may include a brake rotor connected to and rotatable with the motor shaft and closing an axial opening at the first end of the housing, a brake shoe positioned at the first end of the housing, and a brake actuator configured to selectively move the brake shoe between a brake position in which the brake shoe is in contact with the brake rotor to resist rotation of the motor shaft and a rotation position in which the brake shoe is free from contact with the brake rotor.

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COMPACT MOTOR ARRANGEMENT WITH INTEGRATED BRAKES AND SHAFT BEARINGS

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] This disclosure relates generally to a motor for use with an elevator system and, more particularly, to a motor having a compact structure with integrated brakes for use with an elevator system.

Description of Related Art

[0002] Typical elevator systems include a load bearing member, such as a rope or a belt, for supporting and moving an elevator car up and down within an elevator shaft. The load bearing member in most instances couples a counterweight to the elevator car. A motor unit is coupled to the load bearing member via a traction sheave to move the load bearing member and thereby move the elevator car through the elevator shaft. Many motor units of elevator systems are installed on the top of guide rails that guide the counterweight and elevator car. The motor unit in such an arrangement may include a motor shaft that has a first end extending from a first side of the motor housing and a second end extending from a second side of the motor housing. Traction sheaves are provided on the first end and the second end of the motor shaft. In such instances, the load bearing members are divided in two bundles on either side of the guide rail of the elevator car and are connected to traction sheaves of the first and second ends of the motor shaft.

[0003] Conventional motor units of this type include a motor shaft, at least one motor body, at least one mechanical brake, at least two bearings, and at least one traction sheave on each end of the motor shaft. The motor bodies, mechanical brakes, bearings, and traction sheaves are arranged adjacent to each other along the longitudinal direction of the motor shaft and are connected to the motor shaft. Accordingly, the motor shaft must have a length that is at least equal to the length of the combination of the various motor elements, mechanical brakes, bearings, and traction sheaves. As a result, the length of the motor shaft and, therefore, the overall length of the motor must be significantly longer than the length of the various motor elements because the motor shaft must be long enough to accommodate the brake, the bearings, and the traction sheaves. This situation is further aggravated by the fact that in many elevator system arrangements, with the motor unit installed on top of the guide rails as described above,

the ropes or belts are divided in two bundles in order to pass the car guide rail. In these arrangements, the width of the car guide rails needs to be added to the motor shaft length.

[0004] The increasing length of the motor shafts demands a more complex bearing system and a bigger shaft diameter. Accordingly, the motor units are heavy and bulky as well as less economic. In addition, installing such motor units within the elevator shafts is difficult due to the large size of these units.

SUMMARY OF THE INVENTION

[0005] In view of the foregoing, a need exists for a more compact motor structure that includes a braking system and bearings incorporated therein. A further need exists for a ventilation system for such a compact motor that allows for a fast heat dissipation and prevents high peak temperatures.

[0006] In accordance with one aspect of the present disclosure, a motor for use with an elevator system may include a housing, a motor shaft surrounded by the housing and having at least a first end extending outward from the housing, a motor body arranged around a central portion of the motor shaft and positioned within the housing, at least one sheave positioned at the first end of the motor shaft and rotatable with the motor shaft, and a braking system positioned at a first end of the housing. The braking system may include a brake rotor connected to and rotatable with the motor shaft and closing an axial opening at the first end of the housing, a brake shoe positioned at the first end of the housing, and a brake actuator configured to selectively move the brake shoe between a brake position in which the brake shoe is in contact with the brake rotor to resist rotation of the motor shaft and a rotation position in which the brake shoe is free from contact with the brake rotor.

[0007] The motor may further comprise a bearing positioned at the first end of the housing in contact with the motor shaft and parallel to the brake actuator in a longitudinal direction of the motor shaft. The bearing and the brake actuator may be at least partially aligned in a radial direction of the motor shaft. A length of the brake actuator in the longitudinal direction of the motor shaft may be less than or equal to a length of the bearing in the longitudinal direction of the motor shaft. The motor may also further comprise a ventilation system configured to allow heat to dissipate from the housing. Such a ventilation system may include a plurality of openings formed around a circumference of the brake rotor, a plurality of openings formed around a circumference of the brake shoe, and a plurality of openings formed in the first end of the

housing and extending outwardly through the housing. The plurality of openings formed around the circumference of the brake shoe may be arranged to align with the plurality of openings formed in the first end of the housing. The motor shaft may further comprise a second end extending outside of the housing opposite to the first end of the motor shaft. At least one sheave may be positioned at the second end of the motor shaft and is rotatable with the motor shaft. A second braking system may be positioned at a second end of the housing. The second braking system may include a second brake rotor connected to and rotatable with the motor shaft and closing an axial opening at the second end of the housing, a second brake shoe positioned at the second end of the housing, and a second brake actuator configured to selectively move the second brake shoe between a brake position in which the second brake shoe is in contact with the second brake rotor to resist rotation of the motor shaft and a rotation position in which the second brake shoe is free from contact with the second brake rotor.

[0008] In accordance with another aspect of the present disclosure, an elevator system may include a car configured to moving up and down within an elevator shaft and a motor disposed in the elevator shaft to move the car up and down within the elevator shaft. The motor may include a housing, a motor shaft surrounded by the housing and having at least a first end extending outward from the housing, a motor body arranged around a central portion of the motor shaft and positioned within the housing, at least one sheave positioned at the first end of the motor shaft and rotatable with the motor shaft, and a braking system positioned at a first end of the housing. The braking system may include a brake rotor connected to and rotatable with the motor shaft and closing an axial opening at the first end of the housing, a brake shoe positioned at the first end of the housing, and a brake actuator configured to selectively move the brake shoe between a brake position in which the brake shoe is in contact with the brake rotor to resist rotation of the motor shaft and a rotation position in which the brake shoe is free from contact with the brake rotor.

[0009] Further aspects will now be described in the following numbered clauses.

[0010] Clause 1: A motor comprising: a housing; a motor shaft surrounded by the housing and having at least a first end extending outward from the housing; a motor body arranged around a central portion of the motor shaft and positioned within the housing; at least one sheave positioned at the first end of the motor shaft and rotatable with the motor shaft; and a braking system positioned at a first end of the housing, wherein the braking system comprises: a brake

rotor connected to and rotatable with the motor shaft and closing an axial opening at the first end of the housing; a brake shoe positioned at the first end of the housing; and a brake actuator configured to selectively move the brake shoe between a brake position in which the brake shoe is in contact with the brake rotor to resist rotation of the motor shaft and a rotation position in which the brake shoe is free from contact with the brake rotor.

[0011] Clause 2: The motor of Clause 1, further comprising a bearing positioned at the first end of the housing in contact with the motor shaft and parallel to the brake actuator in a longitudinal direction of the motor shaft, and/or wherein the bearing and the brake actuator are at least partially aligned in a radial direction of the motor shaft.

[0012] Clause 3: The motor of Clause 2, wherein a length of the brake actuator in the longitudinal direction of the motor shaft is less than or equal to a length of the bearing in the longitudinal direction of the motor shaft.

[0013] Clause 4: The motor of any of Clauses 1-3, further comprising a ventilation system configured to allow heat to dissipate from the housing.

[0014] Clause 5: The motor of Clause 4, wherein the ventilation system comprises: a plurality of openings formed around a circumference of the brake rotor; a plurality of openings formed around a circumference of the brake shoe; and a plurality of openings formed in the first end of the housing and extending outwardly through the housing.

[0015] Clause 6: The motor of Clause 5, wherein the plurality of openings formed around the circumference of the brake shoe is arranged to align with the plurality of openings formed in the first end of the housing.

[0016] Clause 7: The motor of any of Clauses 1-6, wherein the motor shaft further comprises a second end extending outside of the housing opposite to the first end of the motor shaft.

[0017] Clause 8: The motor of Clause 7, wherein at least one sheave is positioned at the second end of the motor shaft and is rotatable with the motor shaft.

[0018] Clause 9: The motor of Clause 7, wherein a second braking system is positioned at a second end of the housing.

[0019] Clause 10: The motor of Clause 9, wherein the second braking system comprises: a second brake rotor connected to and rotatable with the motor shaft and closing an axial opening at the second end of the housing; a second brake shoe positioned at the second end of the housing; and a second brake actuator configured to selectively move the second brake shoe

between a brake position in which the second brake shoe is in contact with the second brake rotor to resist rotation of the motor shaft and a rotation position in which the second brake shoe is free from contact with the second brake rotor.

[0020] Clause 11: An elevator system comprising: a car configured to move up and down within an elevator shaft; and a motor disposed in the elevator shaft to move the car up and down within the elevator shaft, the motor comprising: a housing; a motor shaft surrounded by the housing and having at least a first end extending outward from the housing; a motor body arranged around a central portion of the motor shaft and positioned within the housing; at least one sheave positioned at the first end of the motor shaft and rotatable with the motor shaft; and a braking system positioned at a first end of the housing, the braking system comprising: a brake rotor connected to and rotatable with the motor shaft and closing an axial opening at the first end of the housing; a brake shoe positioned at the first end of the housing; and a brake actuator configured to selectively move the brake shoe between a brake position in which the brake shoe is in contact with the brake rotor to resist rotation of the motor shaft and a rotation position in which the brake shoe is free from contact with the brake rotor.

[0021] Clause 12: The elevator system of Clause 11, wherein the motor further comprises a bearing positioned at the first end of the housing in contact with the motor shaft and parallel to the brake actuator in a longitudinal direction of the motor shaft, and/or wherein the bearing and the brake actuator are at least partially aligned in a radial direction of the motor shaft.

[0022] Clause 13: The elevator system of Clause 12, wherein a length of the brake actuator in the longitudinal direction of the motor shaft is less than or equal to a length of the bearing in the longitudinal direction of the motor shaft.

[0023] Clause 14: The elevator system of any of Clauses 11-13, wherein the motor further comprises a ventilation system configured to allow heat to dissipate from the housing.

[0024] Clause 15: The elevator system of Clause 14, wherein the ventilation system comprises: a plurality of openings formed around a circumference of the brake rotor; a plurality of openings formed around a circumference of the brake shoe; and a plurality of openings formed in the first end of the housing and extending outwardly through the housing.

[0025] Clause 16: The elevator system of Clause 15, wherein the plurality of openings formed around the circumference of the brake shoe is arranged to align with the plurality of openings formed in the first end of the housing.

[0026] Clause 17: The elevator system of any of Claims 11-16, wherein the motor shaft further comprises a second end extending outside of the housing opposite to the first end of the motor shaft.

[0027] Clause 18: The elevator system of Claim 17, wherein at least one sheave is positioned at the second end of the motor shaft and is rotatable with the motor shaft.

[0028] Clause 19: The elevator system of Claim 17, wherein a second braking system is positioned at a second end of the housing.

[0029] Clause 20: The elevator system of Claim 19, wherein the second braking system comprises: a second brake rotor connected to and rotatable with the motor shaft and closing an axial opening at the second end of the housing; a second brake shoe positioned at the second end of the housing; and a second brake actuator configured to selectively move the second brake shoe between a brake position in which the second brake shoe is in contact with the second brake rotor to resist rotation of the motor shaft and a rotation position in which the second brake shoe is free from contact with the second brake rotor.

[0030] These and other features and characteristics of the systems and/or devices of the present disclosure, as well as the methods of operation and functions of the related elements of structures and the combination of parts and economies of manufacture, will become more apparent upon consideration of the following description and the appended claims with reference to the accompanying drawings, all of which form a part of this specification, wherein like reference numerals designate corresponding parts in the various figures. It is to be expressly understood, however, that the drawings are for the purpose of illustration and description only and are not intended as a definition of the limits of the systems and/or devices of the present disclosure. As used in the specification and the claims, the singular form of “a”, “an”, and “the” include plural referents unless the context clearly dictates otherwise.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] FIG. 1 is a perspective view of an elevator system including a motor according to an aspect of the present disclosure;

[0032] FIG. 2 is a perspective view of a motor according to an aspect of the present disclosure;

[0033] FIG. 3 is a cross-sectional view of the motor taken along line 3--3 of FIG. 2;

[0034] FIG. 4 is an exploded perspective view of the motor of FIG. 2;

[0035] FIG. 5 is an exploded perspective view of a portion of the motor of FIG. 4;

[0036] FIG. 6 is a perspective view of a portion of a motor housing of the motor of FIG. 2; and

[0037] FIG. 7 is an exploded perspective view of a portion of the motor of FIG. 2 with the motor shaft removed.

DESCRIPTION OF THE INVENTION

[0038] For purposes of the description herein, the terms “upper”, “lower”, “right”, “left”, “vertical”, “horizontal”, “top”, “bottom”, “lateral”, “longitudinal”, and derivatives thereof shall relate to the disclosure as it is oriented in the drawing figures. It is to be understood, however, that the disclosure may assume alternative variations and step sequences, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings, and described in the following specification, are simply exemplary embodiments of the disclosure. Hence, specific dimensions and other physical characteristics related to the embodiments disclosed herein are not to be considered as limiting.

[0039] One aspect of the present disclosure is a compact motor structure for use with an elevator system that includes a braking system and bearings incorporated therein. The motor structure further includes a ventilation system for such a compact motor that allows for efficient and effective heat dissipation and prevents high peak temperatures to allow for such a compact motor structure.

[0040] With reference to FIG. 1, an elevator system 1 includes an elevator car 3 movable within an elevator shaft 5 using a plurality of load bearing members 7 that raise and/or lower the elevator car 3 within the elevator shaft 5. The elevator system 1 further includes a pair of car guide rails 9 and a pair of counterweight guide rails 11 for guiding the elevator car 3 and a counterweight 13, respectively, as the elevator car 3 and the counterweight 13 are raised and lowered within the elevator shaft 5.

[0041] A connecting beam 15 extends across the tops of the counterweight guide rails 11 for mounting a motor 100 thereto. The motor 100 is provided to lift and lower the elevator car 3 up and down within the elevator shaft 5. The motor 100, which will be described in greater detail hereinafter, includes traction sheaves 102 attached at both ends of a motor shaft extending through the motor 100. The motor 100 is positioned on the connecting beam 15 such that one of the car guide rails 9 is positioned between the traction sheaves 102. While the motor 100 is

illustrated as including a traction sheave **102** at both ends thereof, in certain implementations, a traction sheave **102** may be provided at only one end of the motor **100**.

[0042] The load bearing members **7** are wound around the traction sheaves **102**, passed through pulleys (not shown) provided on an upper surface of the counterweight **13**, and are secured to an end termination **21** provided at an upper end of a the counterweight guide rails **11** and an upper end of the car guide rail **9** adjacent to the motor **100**. The other end of each load bearing member **7** extends from the traction sheaves **102**, passes through pulleys **17** provided on an upper surface **19** of the elevator car **3**, and is secured to a separate end termination **21** provided at an upper end of the car guide rail **9** opposite of the car guide rail **9** provided adjacent to the motor **100**. Using this arrangement, the motor **100** is configured to drive the load bearing members **7** to lift and lower the elevator car **3**.

[0043] With reference to **FIGS. 2** and **3** and with continued reference to **FIG. 1**, the motor **100** is provided with a compact longitudinal arrangement making it more economical to manufacture and easier to install. More particularly, the motor **100** includes a housing **104** and a motor shaft **106** surrounded by the housing and having a first end **108** and a second end **110** extending outside of the housing **104**. A motor body **112** is arranged around a central portion of the motor shaft **106** and is positioned within the housing **104**. The motor body **112** may be any conventional motor body and typically includes a rotor **114** secured to the motor shaft **106** and configured to rotate with the motor shaft **106** and a stator **116** secured to the housing **104** and positioned away from the rotor **114** by an air gap **118**.

[0044] As discussed herein, the traction sheaves **102** are positioned on or formed within the first end **108** and the second end **110** of the motor shaft **106**. The traction sheaves **102** are configured to receive the load bearing members **7** of the elevator system **1** as described herein. While **FIGS. 2** and **3** illustrate the motor shaft **106** having a pair of traction sheaves **102** at each end, this is not to be construed as limiting the present disclosure as any suitable number of traction sheaves **102** may be provided at the ends of the motor shaft **106**, or only at one end.

[0045] With further reference to **FIGS. 4** and **5**, the motor **100** further comprises a pair of identical braking systems **120** positioned at a first end **122** and a second end **124** of the housing **104**, respectively. Each braking system **120** includes a brake rotor **126** connected to and rotatable with the motor shaft **106**. Each of the brake rotors **126** closes an axial opening at the end of the housing **104**. Since one side of the brake rotor **126** closing an axial opening at the end of the

housing **104** and is not covered, more thermal energy can leave the braking systems **120** as convection and radiant heat. This results in a higher thermal capacity of the braking systems **120** compared to enclosed disc brakes and therefore allows for a more compact motor arrangement.

[0046] A brake shoe **128** is positioned at each end of the housing **104**. The brake shoe **128** includes a brake pad **130** formed thereon. When the braking system **120** is actuated, the brake shoe **128** is moved to bring the brake pad **130** into contact with the brake rotor **126**. The braking system **120** also includes a brake actuator **132** comprised of a plurality of biasing members **134** and electromagnets **136**. The biasing members **134** may be coil springs or any other suitable biasing device. The electromagnetics **136** are configured to hold the brake shoe **128** at a spaced distance from the brake rotor **126** against the bias force of the biasing members **134**. Once a controller (not shown) deactivates the electromagnets **136** the bias force of the biasing members **134** move the brake shoe **128** to a brake position in which the brake pad **130** is in contact with the brake rotor **126** to resist rotation of the motor shaft **106**. Once the controller activates the electromagnets **136**, the brake shoe **128** is drawn back to a rotation position in which the brake pad **130** provided on the brake shoe **128** is free from contact with the brake rotor **126**.

[0047] The motor **100** also includes a bearing **138** positioned at each end **122**, **124** of the housing **104**. Each bearing **138** is positioned in contact with the motor shaft **106** and parallel to the brake actuator **132** in a longitudinal direction **L** of the motor shaft **106** such that the bearings **138** and the brake actuator **132** are coaxial. In addition, the bearings **138** and the brake actuator **132** are at least partially aligned in a radial direction of the motor shaft **106**. By positioning the bearings **138** and the brake actuators **132** in this coaxial manner, the overall horizontal length of the motor **100** can be decreased leading to a more compact motor design. As shown in **FIG. 3**, a length L_A of the brake actuator **132** in the longitudinal direction **L** of the motor shaft **106** is less than or equal to a length L_B of the bearing **138** in the longitudinal direction **L** of the motor shaft **106**.

[0048] With additional reference to **FIG. 6**, each end of the housing **104** includes a series of pockets **140** positioned around a circumference thereof for alternately positioning the biasing members **134** and the electromagnets **136** of the brake actuator **132**. Each end **122**, **124** of the housing **104** also includes brake shoe guiding surfaces **142** to guide the brake shoe **128** during movement from the rotation position to the brake position and to support the brake torque. The housing **104** also provides seating surfaces **144** at each end thereof **122**, **124** for the bearings **138**

and a seating surface **146** for the motor body. In addition, a plurality of ventilation openings **148** are formed around the circumference of each of the ends **122**, **124** of the housing **104** between each of the pockets **140**. These ventilation openings **148** are configured to extend to from the ends of the housing outwardly through the housing **104** at an angle.

[0049] With reference to **FIG. 7**, the motor **100** may also further comprise a ventilation system configured to allow heat to dissipate from the housing **104**. Such a ventilation system may include a plurality of ventilation openings **150** formed around a circumference of the brake rotor **126**, a plurality of ventilation openings **152** formed around a circumference of the brake shoe **128** and brake pad **130**, and the plurality of ventilation openings **148** formed in the ends of the housing **104** and configured to extend to a side of the housing **104**. The plurality of openings **152** formed around the circumference of the brake shoe **128** and brake pad **130** are provided to align with the plurality of openings **148** formed in the ends of the housing **104**. The brake pad **130** may also include air flow channels **154** formed therein to further aid in the movement of air through the braking system **120** and out of the housing **104**.

[0050] The motor **100** may optionally include dividing plates **137** positioned between the motor body or bodies **112** and the brake actuators **132**. As shown in **FIGS. 4** and **5**, the dividing plate **137** separates the pockets **140** from the biasing members **134** and the electromagnets **136** and the ventilation openings **148** from the motor body **112**. The covering of the ventilation openings **148** protects the motor body **112** against dust contaminations, e.g. from the brake pads **130**, but limits the cooling effect of the motor body **112**. In another version, not shown, the dividing plate **137** has openings aligned with the ventilation openings **148** at the housing ends and the air can flow through the motor. In the shown version, the dividing plate supports one end of the biasing members **134** and keeps the electromagnets **136** in the vertical position.

[0051] In operation, the brake rotor **126** ventilates the braking system **120**. As the brake rotor **126** rotates with the motor shaft **106**, air is drawn through the ventilation openings **150** of the brake rotor **126** due to the angular shape of these openings **150**. The air flow direction depends on the direction of rotation of the brake rotor **126**. The air then flows through the air flow channels **154** of the brake pad **130** and the openings **152** of the brake shoe **128**. The air then flows through the ventilation openings **148** of the housing **104** and out the side of the housing **104** to the atmosphere. The direction of air flow is shown by arrow **A** in **FIG. 7**. As discussed herein, since one side of the brake rotor **126** is not covered, thermal energy can leave the brake as

convection and radiant heat. In addition, the air flow channels **154** in the brake pads **130**, along with the openings **152** provided through the brake shoes **128** provided on the other side of the brake rotor **126**, support a fast heat dissipation and prevent peak temperatures, which reduce the lifetime of conventional enclosed disk brakes. The ventilation system described above allows for brake temperatures in the range of about 300° C without damaging the brake.

[0052] As shown in **FIG. 4**, the motor **100** includes two identical part sets provided at each end of the motor shaft **106**. More specifically, each end of the motor shaft **106** may include a housing **104**, a bearing **138**, a braking system **120**, a motor body **112**, and traction sheaves **102**. However, this is not to be construed as limiting the present invention as the braking system **120** and traction sheaves may only be provided at one end of the motor shaft **106**. In addition, both one piece housings and motor bodies (see **FIGS. 2** and **3**) as well as two-piece housings and motor bodies (see **FIG. 4**) have been envisioned.

[0053] Although the disclosure has been described in detail for the purpose of illustration based on what is currently considered to be the most practical and preferred embodiments, it is to be understood that such detail is solely for that purpose and that the disclosure is not limited to the disclosed embodiments, but, on the contrary, is intended to cover modifications and equivalent arrangements. For example, it is to be understood that the present disclosure contemplates that, to the extent possible, one or more features of any embodiment can be combined with one or more features of any other embodiment.

THE INVENTION CLAIMED IS

1. A motor comprising:
 - a housing;
 - a motor shaft surrounded by the housing and having at least a first end extending outward from the housing;
 - a motor body arranged around a central portion of the motor shaft and positioned within the housing;
 - at least one sheave positioned at the first end of the motor shaft and rotatable with the motor shaft; and
 - a braking system positioned at a first end of the housing, wherein the braking system comprises:
 - a brake rotor connected to and rotatable with the motor shaft closing an axial opening at the first end of the housing;
 - a brake shoe positioned at the first end of the housing; and
 - a brake actuator configured to selectively move the brake shoe between a brake position in which the brake shoe is in contact with the brake rotor to resist rotation of the motor shaft and a rotation position in which the brake shoe is free from contact with the brake rotor.
2. The motor of claim 1, further comprising a bearing positioned at the first end of the housing in contact with the motor shaft and parallel to the brake actuator in a longitudinal direction of the motor shaft, and/or wherein the bearing and the brake actuator are at least partially aligned in a radial direction of the motor shaft.
3. The motor of claim 2, wherein a length of the brake actuator in the longitudinal direction of the motor shaft is less than or equal to a length of the bearing in the longitudinal direction of the motor shaft.
4. The motor of claim 1, further comprising a ventilation system configured to allow heat to dissipate from the housing.

5. The motor of claim 4, wherein the ventilation system comprises:
a plurality of openings formed around a circumference of the brake rotor;
a plurality of openings formed around a circumference of the brake shoe; and
a plurality of openings formed in the first end of the housing and extending outwardly through the housing.

6. The motor of claim 5, wherein the plurality of openings formed around the circumference of the brake shoe is arranged to align with the plurality of openings formed in the first end of the housing.

7. The motor of claim 1, wherein the motor shaft further comprises a second end extending outside of the housing opposite to the first end of the motor shaft.

8. The motor of claim 7, wherein at least one sheave is positioned at the second end of the motor shaft and is rotatable with the motor shaft.

9. The motor of claim 7, wherein a second braking system is positioned at a second end of the housing.

10. The motor of claim 9, wherein the second braking system comprises:
a second brake rotor connected to and rotatable with the motor shaft and closing an axial opening at the second end of the housing;
a second brake shoe positioned at the second end of the housing; and
a second brake actuator configured to selectively move the second brake shoe between a brake position in which the second brake shoe is in contact with the second brake rotor to resist rotation of the motor shaft and a rotation position in which the second brake shoe is free from contact with the second brake rotor.

11. An elevator system comprising:
a car configured to move up and down within an elevator shaft; and

a motor disposed in the elevator shaft to move the car up and down within the elevator shaft, the motor comprising:

a housing;

a motor shaft surrounded by the housing and having at least a first end extending outward from the housing;

a motor body arranged around a central portion of the motor shaft and positioned within the housing;

at least one sheave positioned at the first end of the motor shaft and rotatable with the motor shaft; and

a braking system positioned at a first end of the housing, the braking system comprising: a brake rotor connected to and rotatable with the motor shaft and closing an axial opening at the first end of the housing; a brake shoe positioned at the first end of the housing; and a brake actuator configured to selectively move the brake shoe between a brake position in which the brake shoe is in contact with the brake rotor to resist rotation of the motor shaft and a rotation position in which the brake shoe is free from contact with the brake rotor.

12. The elevator system of claim 11, wherein the motor further comprises a bearing positioned at the first end of the housing in contact with the motor shaft and parallel to the brake actuator in a longitudinal direction of the motor shaft, and/or wherein the bearing and the brake actuator are at least partially aligned in a radial direction of the motor shaft.

13. The elevator system of claim 12, wherein a length of the brake actuator in the longitudinal direction of the motor shaft is less than or equal to a length of the bearing in the longitudinal direction of the motor shaft.

14. The elevator system of claim 11, wherein the motor further comprises a ventilation system configured to allow heat to dissipate from the housing.

15. The elevator system of claim 14, wherein the ventilation system comprises:

a plurality of openings formed around a circumference of the brake rotor;

a plurality of openings formed around a circumference of the brake shoe; and
a plurality of openings formed in the first end of the housing and extending outwardly through the housing.

16. The elevator system of claim 15, wherein the plurality of openings formed around the circumference of the brake shoe is arranged to align with the plurality of openings formed in the first end of the housing.

17. The elevator system of claim 11, wherein the motor shaft further comprises a second end extending outside of the housing opposite to the first end of the motor shaft.

18. The elevator system of claim 17, wherein at least one sheave is positioned at the second end of the motor shaft and is rotatable with the motor shaft.

19. The elevator system of claim 17, wherein a second braking system is positioned at a second end of the housing.

20. The elevator system of claim 19, wherein the second braking system comprises:

a second brake rotor connected to and rotatable with the motor shaft and closing an axial opening at the second end of the housing;

a second brake shoe positioned at the second end of the housing; and

a second brake actuator configured to selectively move the second brake shoe between a brake position in which the second brake shoe is in contact with the second brake rotor to resist rotation of the motor shaft and a rotation position in which the second brake shoe is free from contact with the second brake rotor.

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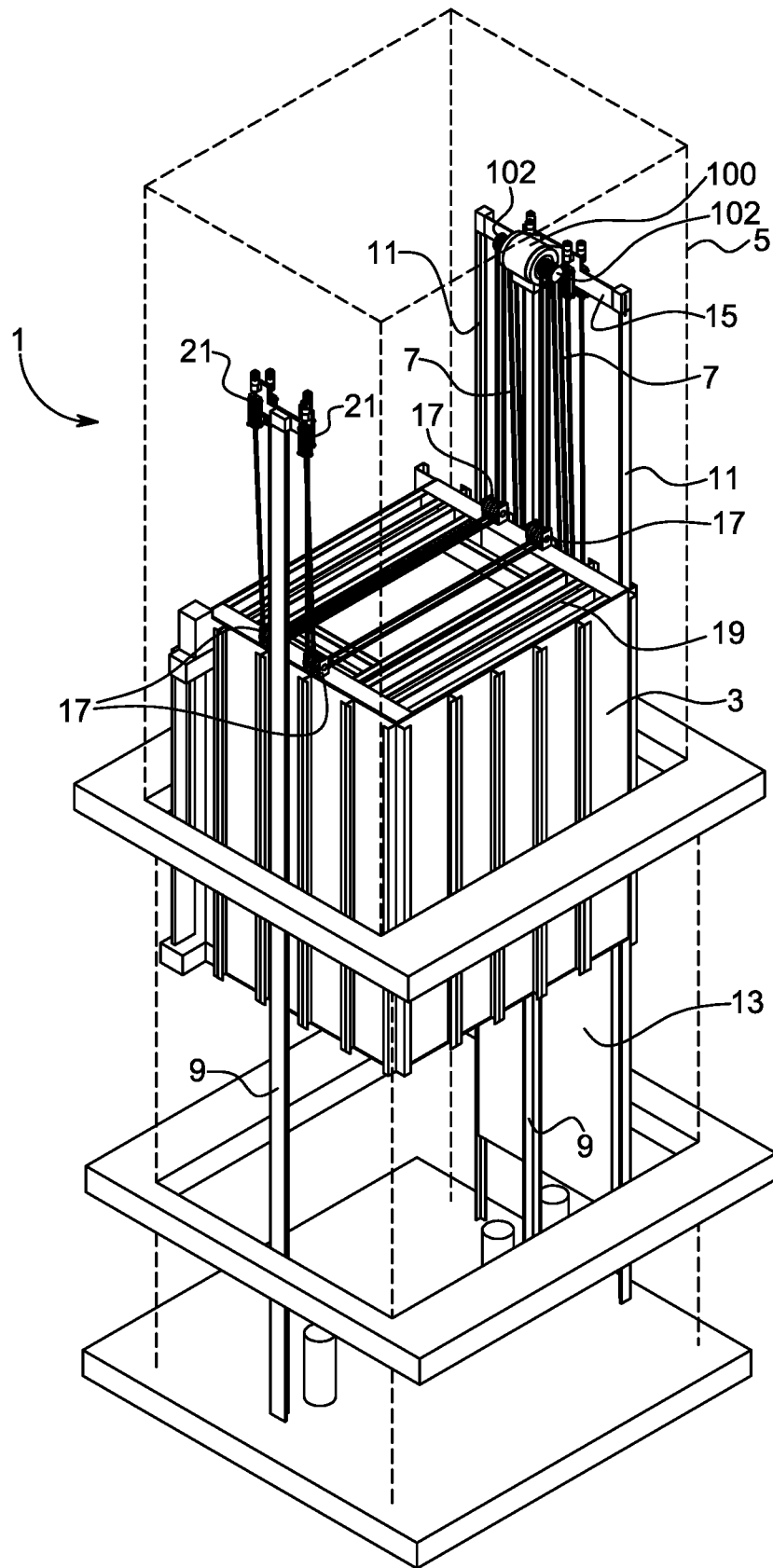


FIG. 1

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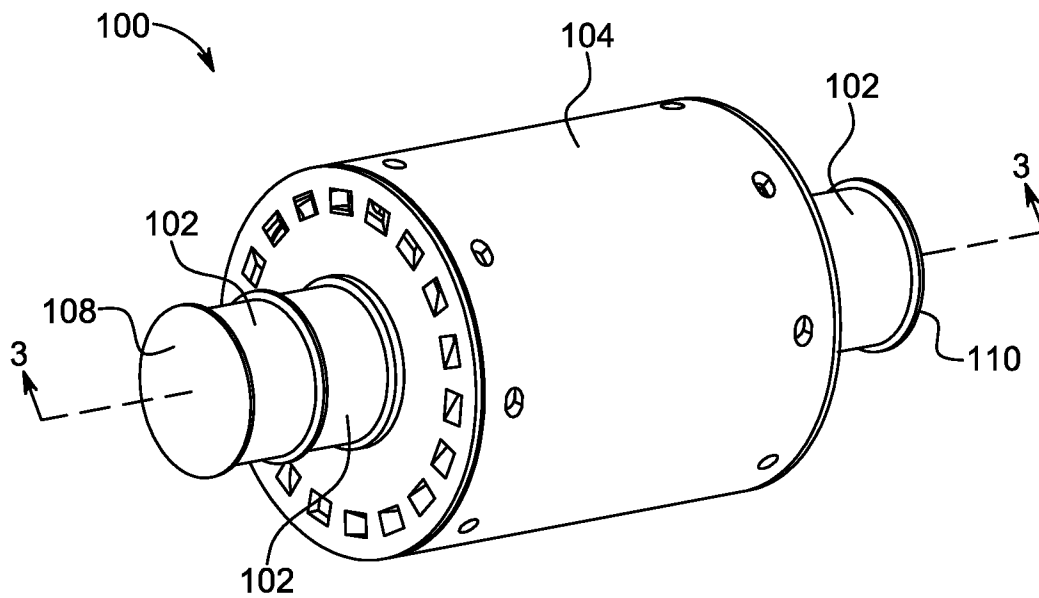


FIG. 2

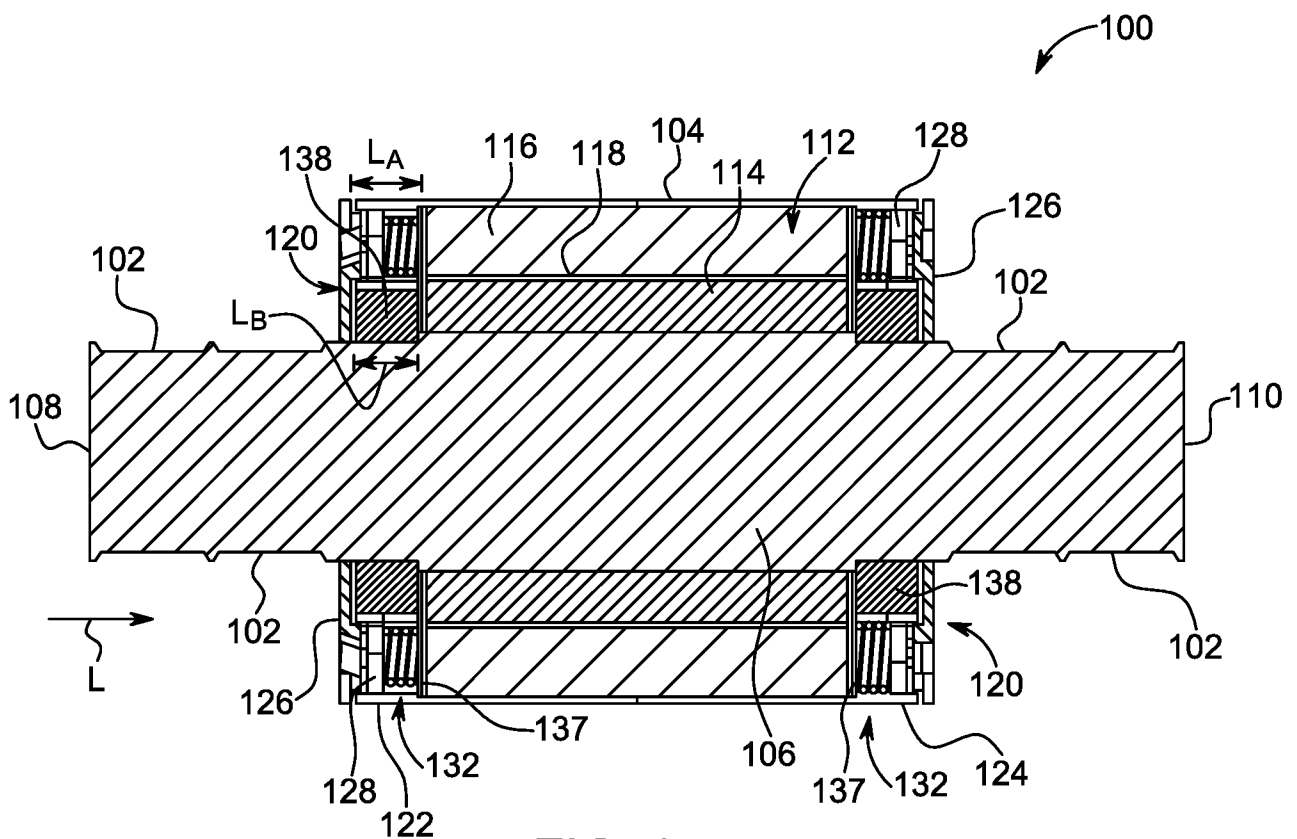


FIG. 3

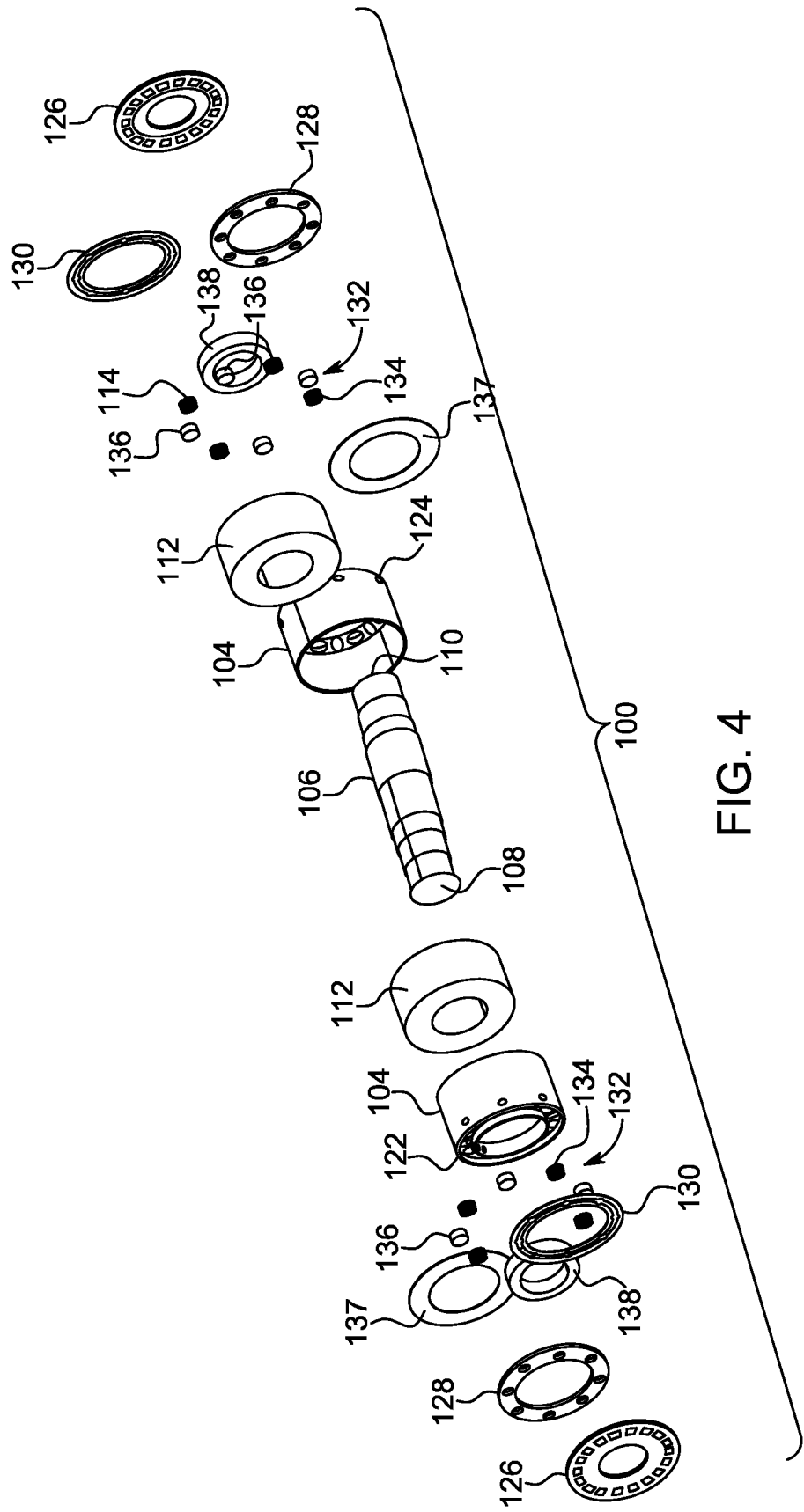


FIG. 4

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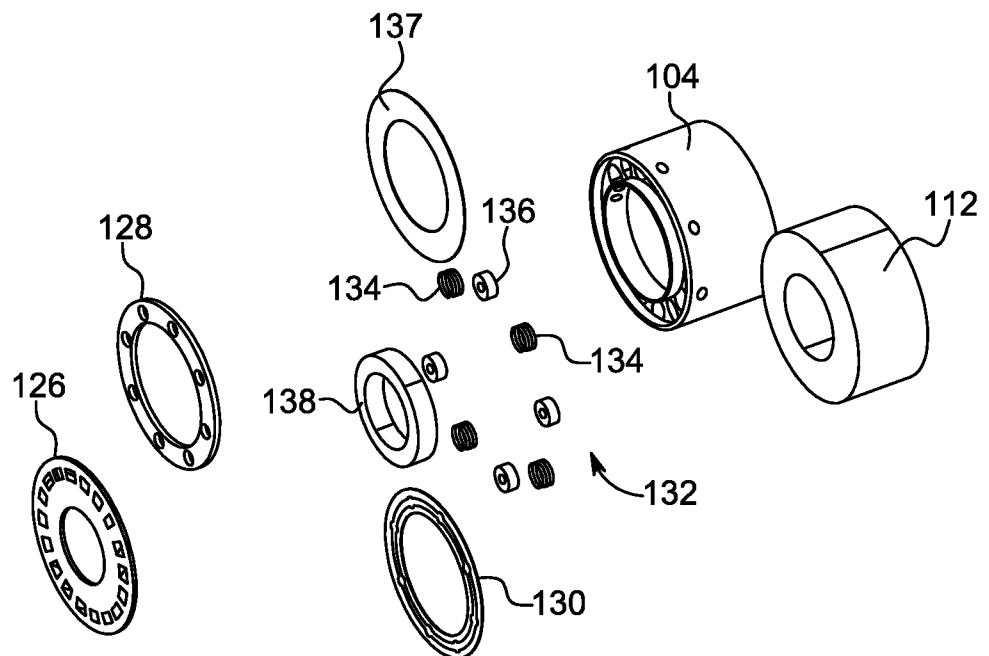


FIG. 5

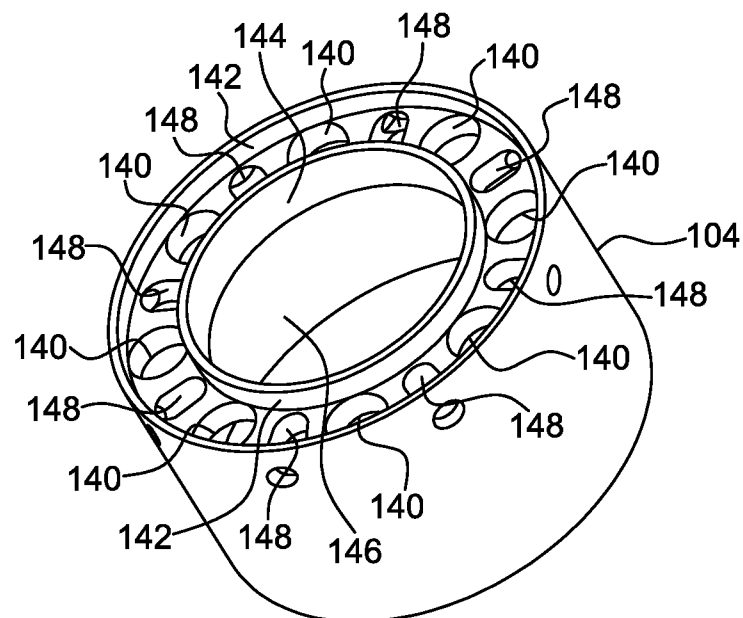


FIG. 6

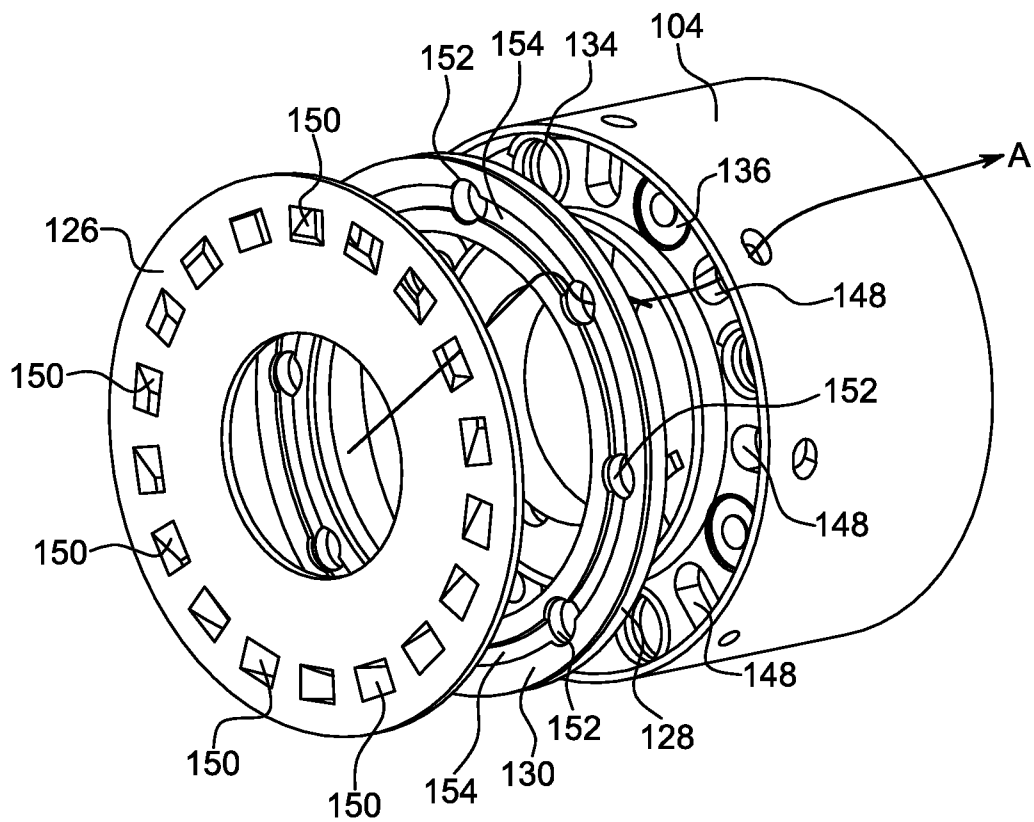


FIG. 7