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(54) **LUBRICANT SUPPORTED ELECTRIC MOTOR WITH WHEEL SUPPORT**

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(57) **ABSTRACT**

A lubricant supported electric motor includes a stator extending along an axis, and a rotor rotatably disposed around the stator in radially surrounding and spaced relationship to define at least one support chamber. A lubricant is disposed in the support chamber for supporting the rotor around the stator. A wheel rim is fixedly attached to the rotor and is disposed in surrounding relationship with the rotor and the stator. Thus, in a first aspect, rotation of the rotor is directly transferred to the wheel rim such that the wheel rim rotates in accordance with the rotation of the rotor. In accordance with another aspect, the rotor is rotatably disposed within the stator, and a planetary gear reduction mechanism is operably interconnected to the rotor, the stator, and the wheel rim and configured to rotate the wheel rim in response to rotation of the rotor within the stator.

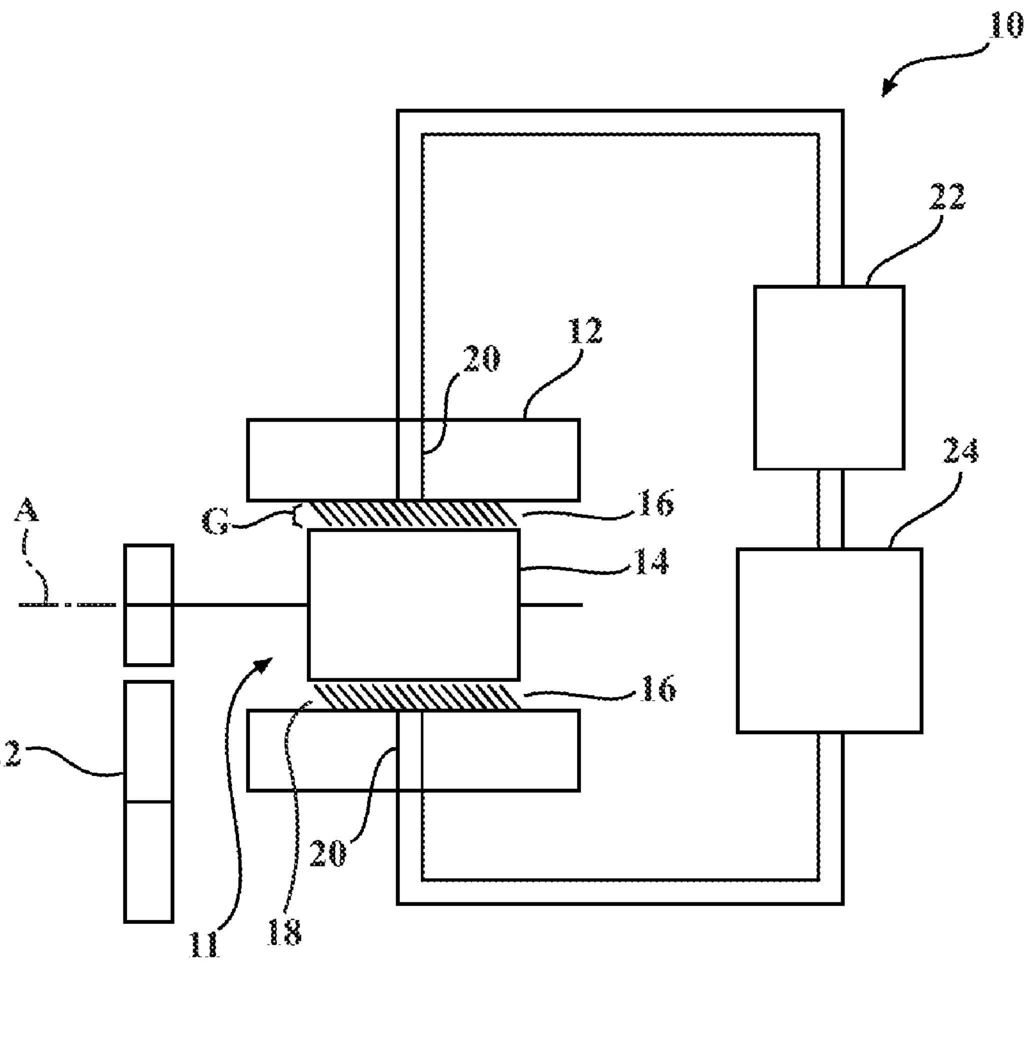
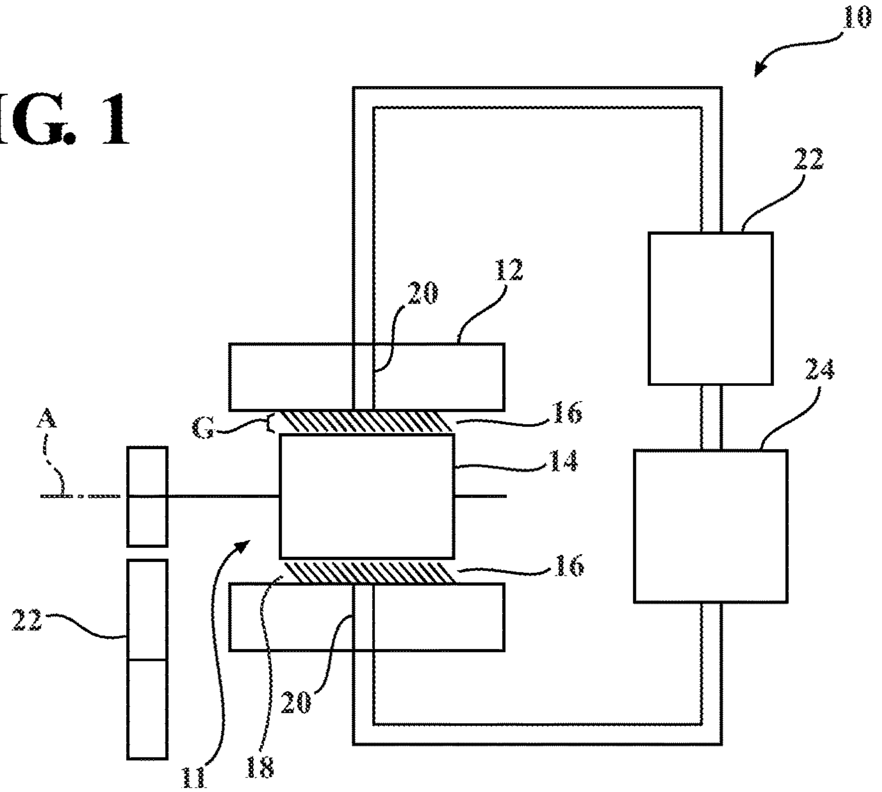


FIG. 1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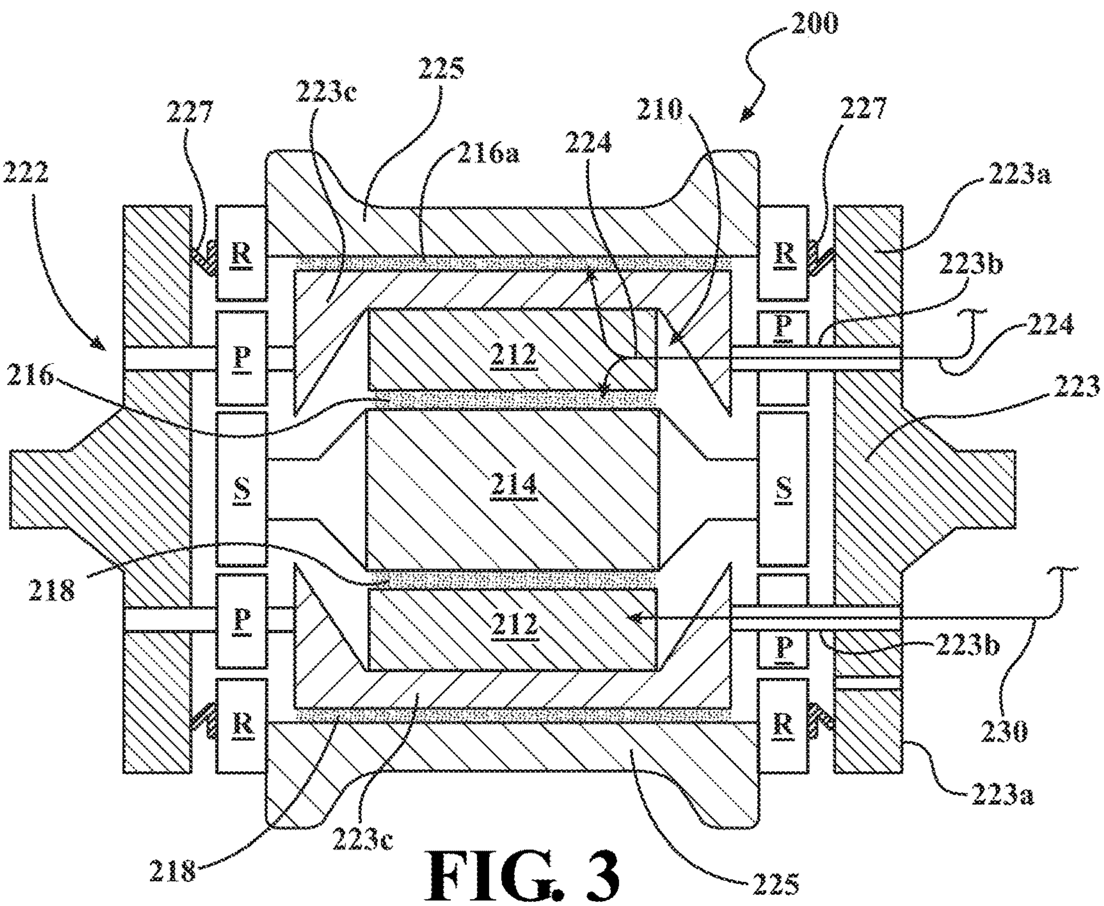
200
225
223c
227
210
224
227
216a
222
223a
R
R
223b
P
P
224
212
216
223
S
214
S
218
212
P
P
223b
R
R
230
223a
218
223c
225

FIG. 3

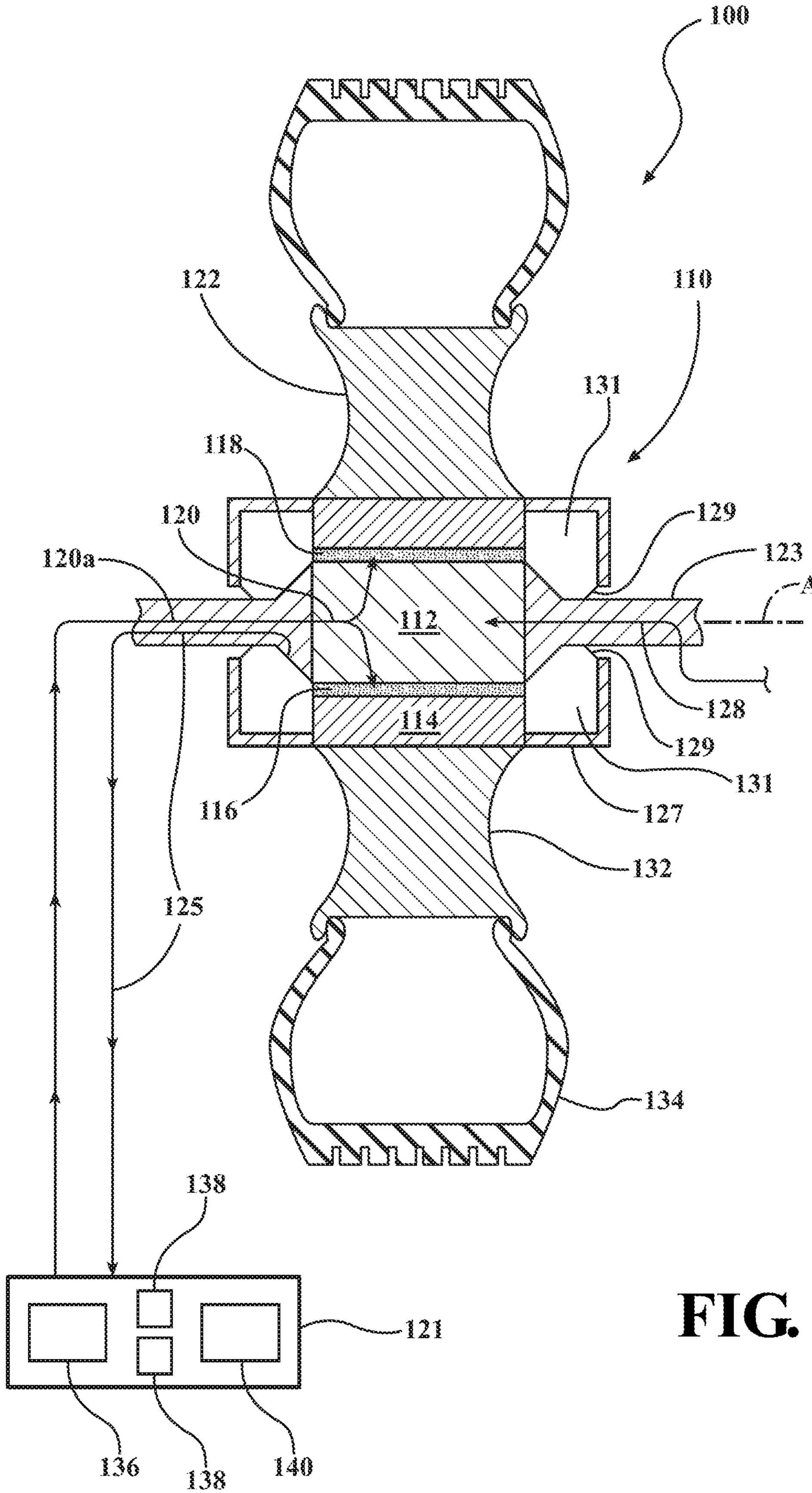
100
122
110
131
118
120
129
120a
123
A
112
128
114
129
116
131
127
132
125
134
138
121
136
138
140

FIG. 2

LUBRICANT SUPPORTED ELECTRIC MOTOR WITH WHEEL SUPPORT

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation of U.S. application Ser. No. 16/668,390 filed on Oct. 30, 2019, which claims the priority and benefit of U.S. Provisional Application Ser. No. 62/752,442 filed on Oct. 30, 2018, the entire disclosures of which are hereby incorporated by reference.

FIELD OF THE DISCLOSURE

[0002] The present disclosure relates generally to a lubricant supported electric motor. More specifically, the present disclosure relates to a lubricant supported electric motor with an integrated wheel support.

BACKGROUND OF THE INVENTION

[0003] This section provides a general summary of background information and the comments and examples provided in this section are not necessarily prior art to the present disclosure.

[0004] Various drivelines in automotive, truck, and certain off-highway applications take power from a central prime mover and distribute the power to the wheels using mechanical devices such as transmissions, transaxles, propeller shafts, and live axles. These configurations work well when the prime mover can be bulky or heavy, such as, for example, various internal combustion engines ("ICE"). However, more attention is being directed towards alternative arrangements of prime movers that provide improved environmental performance, eliminate mechanical driveline components, and result in a lighter-weight vehicle with more space for passengers and payload.

[0005] "On wheel", "in-wheel" or "near-wheel" motor configurations are one alternative arrangement for the traditional ICE prime mover that distributes the prime mover function to each or some of the plurality of wheels via one or more motors disposed on, within, or proximate to the plurality of wheels. For example, in one instance, a traction motor, using a central shaft though a rotor and rolling element bearings to support the rotor, can be utilized as the "on wheel", "in wheel" or "near wheel" motor configuration. In another instance, a lubricant supported electric motor, such as described in U.S. application Ser. No. 16/144,002, can be utilized as the "on wheel", "in wheel" or "near wheel" motor configuration. While each of these motor configurations result in a smaller size and lighter weight arrangement as compared to the prime movers based on the internal combustion engine, they each have certain drawbacks and disadvantages.

[0006] For example, the utilization of traction motors as the "on wheel", "in wheel" or "near wheel" configuration still results in motors that are too heavy and not robust enough to shock loading to be useful for wheel-end applications. In other words, present traction motors are large, heavy structures supported by rolling element bearings, which are too heavy and large to be practical for wheel end applications.

SUMMARY OF THE INVENTION

[0007] In accordance with one aspect, the subject invention is directed to a lubricant supported electric motor including a stator extending along an axis, and a rotor extending along the axis and rotatably disposed around the stator in radially surrounding and spaced relationship to define at least one support chamber extending between the stator and the rotor. A lubricant is disposed in the at least one support chamber for supporting the rotor around the stator. A wheel rim is fixedly attached to the rotor and is disposed in surrounding relationship with the rotor and the stator. Thus, in this aspect, rotation of the rotor is directly transferred to the wheel rim such that the wheel rim rotates in accordance with the rotation of the rotor. In other words, the rotor of the lubricant supported electric motor directly supports a driven wheel.

[0008] In accordance with another aspect, the subject invention is directed to a lubricant supported electric motor includes a stator extending along an axis, and a rotor extending along the axis and rotatably disposed radially within the stator in spaced relationship to define at least one support chamber extending between the stator and rotor. A lubricant is disposed in the at least one support chamber for supporting the rotor within the stator. A wheel rim is disposed in radially surrounding relationship with the stator and the rotor, and a planetary gear reduction mechanism is operably interconnected to the rotor, the stator, and the wheel rim and configured to rotate the wheel rim in response to rotation of the rotor within the stator.

[0009] The lubricant supported electric motor in either of these aspects is light and small, and thus contributes to the overall design strategy for eliminating weight and size from automobiles and land vehicles. Other advantages will be appreciated in view of the following more detailed description of the subject invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The drawings described herein are for illustrative purposes only of selected embodiments and not all possible implementations, and are not intended to limit the scope of the present disclosure.

[0011] FIG. **1** is a schematic view of a lubricant supported electric motor according to the subject disclosure;

[0012] FIG. **2** is a cross-sectional view of a first aspect of the lubricant supported electric motor illustrating a directly supported wheel; and

[0013] FIG. **3** is a cross-sectional view of another aspect of the lubricant supported electric motor illustrating a wheel end motor with a reduction mechanism and a wheel supported by a ring gear of the reduction mechanism.

DETAILED DESCRIPTION OF THE ENABLING EMBODIMENTS

[0014] Example embodiments of a lubricant supported electric motor with integrated wheel support will now be more fully described. Each of these example embodiments are provided so that this disclosure is thorough and fully conveys the scope of the inventive concepts, features and advantages to those skilled in the art. To this end, numerous specific details are set forth such as examples of specific components, devices and mechanisms associated with the lubricant supported electric motor to provide a thorough understanding of each of the embodiments associated with the present disclosure. However, as will be apparent to those skilled in the art, not all specific details described herein need to be employed, the example embodiments may be embodied in many different forms, and thus should not be construed or interpreted to limit the scope of the disclosure.

[0015] FIG. **1** illustrates a lubricant supported electric motor **10** in accordance with an aspect of the disclosure. As best illustrated in FIG. **1**, the lubricant supported electric motor **10** includes a stator **12** and a rotor **14** extending along an axis A and movably disposed within the stator **12** to define a support chamber or gap **16** therebetween. A lubricant **18** is disposed in the gap **16** for supporting the rotor **14** within the stator **12**, and providing continuous contact between these components. The lubricant **18** may therefore act as a buffer (e.g., suspension) between the rotor **14** and stator **12** minimizing or preventing contact therebetween. In other words, the lubricant **18** prevents direct contact between the stator **12** and rotor **14** and provides an electric lubricant supported motor **10** which is robust to shock and vibration loading due to the presence of the lubricant **18**. Additionally, and alternatively, a substantially incompressible lubricant **18** may be used in order to minimize the gap between the stator **12** and rotor **14**.

[0016] As further illustrated FIG. **1**, the stator **12** defines a passageway **20** disposed in fluid communication with the gap **16** for introducing the lubricant **18**. However, the passageway **20** could be provided on any other components of the lubricant supported electric motor **10** without departing from the subject disclosure. According to an aspect, the lubricant **18** may be cycled or pumped through the passageway **20** and into the gap **16** in various ways. For example, a high pressure source (e.g., a pump) **22** of the lubricant **18** may be fluidly coupled to a low pressure source (e.g., a sump) **24** of the lubricant **18**, where the lubricant may move from the high pressure source to the lower pressure source, through the passageway **20** and into the gap **16**. Rotation of the rotor **14** relative to the stator **12** may operate as a self-pump to drive lubricant **18** through the passageway **20** and into the gap **16**.

[0017] As further illustrated in FIG. **1**, the rotor **14** is interconnected to a drive assembly **22** for coupling the lubricant supported electric motor **10** to one of the plurality of wheels of a vehicle. For example, in one instance, the drive assembly **22** may include a planetary gear system. Alternatively, the drive assembly **22** may include one or more parallel axis gears. The stator **12** and rotor **14** are configured to exert an electromagnetic force therebetween to convert electrical energy into mechanical energy, moving the rotor **14** and ultimately driving the wheel coupled to the lubricant supported electric motor **10** via the drive assembly **22**. The drive assemblies **22** may provide one or more reduction ratios between the lubricant supported electric motor **10** and the wheel in response to movement of the rotor **14**.

[0018] The above described aspect of the disclosure illustrated in FIG. **1** is directed to the illustrated embodiment in which the stator **12** surrounds the rotor **14**. However, the general operation of the lubricant **18** and the relationship between the stator **12** and the rotor **14** may be used in alternative arrangements of the rotor **14** and stator **12**, such as the rotor **14** being disposed radially outward from the stator **12**, as further described below. In such instances, the wheel structure may be supported by the rotor **14**, rather than the rotor **14** being connected to a drive assembly that drives the wheel.

[0019] With reference to FIG. **2**, a wheel end electric motor system **100** of another aspect of the disclosure is provided. The system **100** may include a wheel directly supported on a lubricant supported electric motor **110**. This configuration may be desirable for single-track vehicles, such as scooters, where strong overturning moments on the wheel are reduced or non-existent.

[0020] The system **110** may include a stator **112** and a rotor **114** extending along an axis A movably disposed around the stator **112** to define a gap or support chamber **116** disposed therebetween. A lubricant **118** is disposed in the gap **116** for supporting the rotor **114** around the stator **112**, and providing continuous contact between these components. The lubricant **118** may therefore act as a buffer (e.g., suspension) between the rotor **114** and stator **112** minimizing or preventing contact therebetween. In other words, the lubricant **118** prevents direct contact between the stator **112** and the rotor **114** and provides an electric lubricant supported motor **110** which is robust to shock and vibration loading due to the presence of the lubricant **118**. Additionally, and alternatively, a substantially incompressible lubricant **118** may be used in order to minimize the gap between the stator **112** and the rotor **114**.

[0021] As further illustrated FIG. **2**, the stator **112** defines a passageway **120** disposed in fluid communication with the gap **116** for introducing the lubricant **118**. However, the passageway **120** could be provided on any other components of the lubricant supported electric motor **110** without departing from the subject disclosure. According to an aspect, the lubricant **118** may be cycled or pumped through the passageway **120** and into the gap **116** in various ways. For example, a high pressure source **121** (e.g., a pump) of the lubricant **118** may be fluidly coupled to a low pressure source (e.g., a sump, not shown) of the lubricant **118**, where the lubricant may move from the high pressure source to the lower pressure source, through the passageway **120** and into the gap **116**. Rotation of the rotor **114** relative to the stator **112** may operate as a self-pump to drive lubricant **118** through the passageway **120** and into the gap **116**.

[0022] The stator **112** may be attached to or integrated with an axle **123** that extends coaxially with the axis A. The axle **123** may provide a channel **120*a*** through which the lubricant **118** may pass between the pump **121** and the passageway **120** of the stator **112** that provides the lubricant **118** to the gap **116**. The axle **123** may further define an outlet **125** in fluid communication with the gap **116**. During operation of the motor **110**, the lubricant **118** may be drained from the gap **116** and directed back toward the pump **121**, with fresh lubricant **118** replacing the used lubricant **118**. Accordingly, the lubricant **118** may be cycled through the motor **110**.

[0023] The lubricant supported electric motor **110** may further include a housing or casing **127** that surrounds the stator **112**. The casing **127** may be attached to the rotor **114**, and may therefore rotate along with the rotor **114** during operation of the motor **110**. The casing **127** may further include a seal portion **129** that interfaces with the axle **123** and/or stator **112**. The casing **127** therefore defines an internal cavity **131**, which is disposed in fluid communication with and may include the gap **116**. The gap **116** generally refers to the area radially between the rotor **114** and stator **112**, but the gap **116** is in fluid communication with the remainder of the cavity **131**, and lubricant in the gap **116** may flow freely into the remainder of the cavity **131**. The above described outlet **125** may intersect the cavity **131** at a location axially outward from the gap **116**. As the rotor

114 rotates and the casing **127** rotates, the seal portion **129** will generally bear against axle **123** and/or stator **112**, while retaining the lubricant **118** within the cavity **131**, such that the lubricant **118** will be limited to exiting the cavity via the outlet **125**.

[0024] The axle **123** is preferably connected to the vehicle suspension or chassis (not shown), and does not rotate. The axle **123** may include wiring channels or passageways **128** for receiving and routing wiring or the like that may transfer current to the stator **112**. The stator **112** includes windings or the like that receive a current for creating the electrical field that drives the rotor **114**. The current supplied to the stator **112** may be a phase current.

[0025] In the system **100** of FIG. **2**, the rotor **114** is rotationally fixed to a wheel **122**. The wheel **122** may be in the form of a wheel rim **132** with an attached tire **134**, or the wheel **122** may include an outer surface designed to directly bear against a ground surface. The rotor **114** may be directly attached to the wheel **122**, or the rotor **114** may be fixedly attached to the wheel **122** via intermediate structure. In the system of FIG. **2**, the rotor **114** and wheel **122** are directly attached, permitting direct-drive of the wheel **122** from the motor **110**.

[0026] Optionally, the system **110** may include a suspension element disposed radially between the rotor **114** and the wheel **122** to provide a damping feature. This suspension material may be in the form of a compliant wheel structure, and allow the wheel **122** to shift radially relative to the rotor **114**, which acts as a hub. This additional damping material may allow for the system **100** to be used in various vehicles, such as electric bikes or golf carts, such that other suspension components typically attached to the axle **123** may be eliminated or reduced.

[0027] As described above, the lubricant **118** may delivered to the gap **116** (and also the cavity **131**) through the axle **123** and stator **112**. The stator **112** may include lubricant channels **120** therein that communicate with corresponding lubricant channels **120*a*** in the axle **123**. The lubricant **118** cycles through the system **100**, where it drains from the gap **116** and cavity **131** through the outlet **125** in the axle **123** and returns to the pump **121**. The pump **121** may include a known mechanism for pumping fluid, and the pump **121** may further include additional components for treating the lubricant **118**, such as a thermal control mechanism **136** that may cool or heat the lubricant to a desired temperature to control viscosity. The thermal control mechanism **136** may include sensors **138** and a controller **140** for managing the lubricant temperature. The pump **121** may further include a filter mechanism that filters the lubricant **118** to remove impurities and the like. The pump **121** may include sensors associated with the filter mechanism to measure the status of the fluid and/or filter.

[0028] The above described system **100**, providing wheel support on the electric motor **110**, reduces the overall size of the wheel end system, such that the motor **110** does not need to placed beside the wheel hub to drive the wheel.

[0029] With reference to FIG. **3**, in another aspect, a system **200** includes a lubricant supported electric motor **210** having a stator **212** and a rotor **214**. In this aspect, the rotor **214** is disposed within the stator **212**, similar to the arrangement of the lubricant supported electric motor **10** shown in FIG. **1**. However, unlike the lubricant supported motor **10** of FIG. **1**, gear reduction and wheel support is provided by structure surrounding the rotor **214**, which is further described below.

[0030] The lubricant supported electric motor **210** includes a gap or support chamber **216** disposed between radially between the rotor **214** and stator **212**, with the gap **116** configured to receive lubricant **218** to support the rotor **214** within the stator **212**. The lubricant **218** within the gap **216** may also drain out of the gap **216** and be cycled through the system **210** to a pump or the like (not shown in FIG. **3**), similar to the pump **121** of the system **100**.

[0031] The lubricant supported electric motor **210** further includes a gear reduction mechanism **222**. The gear reduction mechanism **222** may be in the form of a planetary gear reduction mechanism, in which a number of circumferentially fixed planet gears P are disposed around a rotatable sun gear S, which rotates the planet gears P about their individual axes, causing a ring gear R that surrounds the planet gears P to rotate at a different rotational velocity than the sun gear S.

[0032] The planet gears P are attached to a planet carrier **223**, which may be fixedly attached to a vehicle chassis. The planet carrier **223** may be considered a replacement for an axle type structure, or the chassis may include an axle portion that is fixed to the planet carrier **223**. The planet carrier **223** remains in a generally fixed position relative to the axle/chassis of the vehicle. The planet carrier **223** may include a pair of outer body portions **223*a*** that support a plurality of circumferentially arranged pins **223*b***. The pins **223*b*** remain in a generally fixed position relative to the planet carrier **223**, and the pins **223*b*** support the planet gears P for rotation. Thus, each of the individual planet gears P may rotate about an axis defined by the pin **223*b*** on which they are supported.

[0033] The planet carrier may further include an inner body portion **223*c***. The inner body portion **223*c*** may have the same general axial location as the rotor **214** and stator **212**, and the inner body portion **223*c*** may have an annular shape that supports the pins **223*b***, similar to the outer body portion **223*a***. Thus, the pins **223*b*** extend axially between the outer body portion **223*a*** and the inner body portion **223*c***. The inner body portion **223*c***, along with the outer body portion **223*a*** and the pins **223*b***, remains stationary during operation of the motor **210**.

[0034] The stator **212** is mounted to or otherwise fixedly attached to the inner body portion **223*c***. The stator **212** may be integrally formed with the inner body portion **223*c***, or it may be separate component. The stator **212**, including the windings and the like, may be disposed radially inward from the inner body portion **223*c***, such that the stator **212** is radially between the inner body portion **223*c*** and the rotor **214**. In an alternative approach, the stator **212** may be mounted or attached to the inner body portion **223*c*** such that the inner body portion **223*c*** is disposed radially between the stator **212** and the rotor **214**. In this approach, the distance between the rotor **214** and the stator **212** is small enough that the current applied to the stator **212** will still effectively rotate the rotor **214**.

[0035] The stator **212** and the planet carrier **223** thereby combine to define a fixed structure, with the rotor **214** disposed within this fixed assembled structure. The lubricant **218** may be delivered into the lubricant supported electric motor **210** and drained from the motor **210** via fluid channels

224 disposed in both the planet carrier 223 and the stator 212. The fluid channels 224 may extend through one or more of the pins 223*b*.

[0036] The reduction mechanism 222 includes the ring gear R previously described above. The ring gear R has a generally annular shape and circumferentially and radially surrounds the planet gears P. The ring gear R therefore has inner teeth that engage outer teeth of the planet gears P. The ring gear R may be in the form of axially outer portions that are disposed on opposite axial sides of the rotor 214 and stator 212. The ring gear R rotates in response to rotation of the planet gears P.

[0037] The ring gear R is fixedly attached to a wheel rim 225 that surrounds the inner body portion 223*c*, stator 212, and rotor 214. The wheel rim 225 will therefore rotate around the stationary stator 212 and inner body portion 223*c* of the planet carrier 223 in accordance with the rotation of the ring gear R. The ring gear R and wheel rim 225 will also rotate around the rotor 214, which is disposed at the radial center of the motor 210. The wheel rim 225 may support a tire attached thereto (not shown in FIG. 3), or the wheel rim 225 may include wheel structure configured to engage the ground in lieu of a separate tire.

[0038] As described above, the lubricant 218 is disposed in the gap 216 between the rotor 214 and the stator 212 or inner body portion 223*c* of the planet carrier 223 that supports that the stator 212. As illustrated in FIG. 3, the lubricant 218 may also be disposed radially between the wheel rim 225 and the inner body portion 223*c* or the stator 212 (whichever is disposed radially adjacent the wheel rim 225) in an outer gap 216*a*. The lubricant 218 may be delivered to the outer gap 216*a* via the channel 224 extending through the stator 212 and the inner body portion 223*c*, or the lubricant 218 may reach the outer gap 216*a* by traveling through other fluid channels defined within the lubricant supported electric motor 210.

[0039] The system 200 may include a sealing portion 227 that extends between the outer portion 223*a* of the planet carrier 223 and the ring gear R, with the sealing portion 227 being fixed to either the outer body portion 223*a* or the ring gear R. The sealing portion 227 operates to seal the interior of the lubricant supported electric motor 210 and retain the lubricant 218 therein, such that the lubricant will be limited to exiting the lubricant supported electric motor 210 via a drain channel. The system 200 may also include wiring channels or passageways 230 extending through the pins 223*b* and the inner body portion 223*c* of the planet carrier 223 for receiving and routing wiring or the like to transfer current to the stator 212.

[0040] As described above, the rotor 214 is disposed within the stator 212 and is supported by the lubricant 218. The rotor 214 may therefore rotate relative to the stator 212 in response to providing the current to the stator 212. The rotor 214 is fixedly attached to the sun gears S, which have outer teeth configured to engage the outer teeth of the planet gears P. When the rotor 214 rotates, the sun gears S accordingly rotate along with the rotor 214. Rotation of the sun gears S causes a rotation of the planet gears P about their individual axes, which in turn cause a rotation of the ring gear R and the wheel rim 225.

[0041] Thus, the wheel rim 225 is directly supported by the reduction mechanism 222, in particular the ring gear R, and the reduction mechanism is directly supported by the lubricant supported electric motor 210 and attached to the lubricant supported electric motor 210. In particular, the stator 212 is supported by or supports the inner body portion 223*c* of the planet carrier 223. The system 200 can therefore provide integrated gear reduction, allowing for a smaller assembly, and eliminating additional connective components that would otherwise connect an electric motor with a reduction mechanism that is further attached to a wheel.

[0042] The foregoing description of the embodiments has been provided for purposes of illustration and description. It is not intended to be exhaustive or to limit the disclosure. Individual elements or features of a particular embodiment are generally not limited to that particular embodiment, but, where applicable, are interchangeable and can be used in a selected embodiment, even if not specifically shown or described. The same may also be varied in many ways. Such variations are not to be regarded as a departure from the disclosure, and all such modifications are intended to be included within the scope of the disclosure.

What is claimed is:

1. A lubricant supported electric motor comprising:

a stator extending along an axis;

a rotor extending along the axis and rotatably disposed around the stator in radially surrounding and spaced relationship to define at least one support chamber extending between the stator and rotor;

a lubricant disposed in the at least one support chamber for supporting the rotor around the stator; and

a wheel rim fixedly attached to the rotor and disposed in surrounding relationship with the rotor and the stator, wherein rotation of the rotor is directly transferred to the wheel rim such that the wheel rim rotates in accordance with the rotation of the rotor.

2. A lubricant supported electric motor as set forth in claim **1**, wherein the stator is fixedly attached to an axle extending along the axis and configured for attachment to a vehicle chassis.

3. A lubricant supported electric motor as set forth in claim **2**, further comprising:

a casing fixedly attached to the rotor for rotation therewith, the casing extending axially from the rotor in surrounding relationship with the stator and the axle to define an interior cavity disposed therebetween; and

the interior cavity disposed in fluid communication with the at least one support chamber.

4. A lubricant supported electric motor as set forth in claim **3**, further comprising a seal extending between the casing and the axle for retaining the lubricant within the interior cavity during rotation of the rotor and the casing.

5. A lubricant supported electric motor as set forth in claim **3**, wherein the stator defines a passageway disposed in fluid communication with the at least one support chamber for introducing the lubricant.

6. A lubricant supported electric motor as set forth in claim **5**, further comprising:

the axle defining a fluid channel disposed in fluid communication with the passageway; and

a pump disposed in fluid communication with the channel for pumping the lubricant serially through the fluid channel and the passageway to the at least one support chamber.

7. A lubricant supported electric motor as set forth in claim **6**, wherein the axle defines an outlet disposed in fluid communication with the internal cavity and the pump for draining the lubricant from the at least one support chamber and the internal cavity back towards the pump.

8. A lubricant supported electric motor as set forth in claim **2**, wherein the axle defines a wiring channel disposed in communication with the stator for transferring current to the stator.

9. A lubricant supported electric motor as set forth in claim **6**, wherein the pump includes a thermal control mechanism for cooling or heating the lubricant pumped to the support chamber to a predetermined temperature.

10. A lubricant supported electric motor comprising:

a stator extending along an axis;

a rotor extending along the axis and rotatably disposed radially within the stator in spaced relationship to define at least one support chamber extending between the stator and rotor;

a lubricant disposed in the at least one support chamber for supporting the rotor within the stator;

a wheel rim disposed in radially surrounding relationship with the stator and the rotor; and

a planetary gear reduction mechanism operably interconnected to the rotor, the stator, and the wheel rim and configured to rotate the wheel rim in response to rotation of the rotor within the stator.

11. A lubricant supported motor as set forth in claim **10**, wherein the planetary gear reduction mechanism includes a sun gear disposed along the axis, a plurality of a planet gears engaged with and circumferentially disposed around the sun gear, and a ring gear engaged with and circumferentially disposed around the planet gears; and wherein the rotor is interconnected with the sun gear, the stator is interconnected with the plurality of planet gears, and the wheel rim is interconnected with the ring gear to establish the operable interconnection of the planetary gear reduction mechanism.

12. A lubricant supported electric motor as set forth in claim **11**, further comprising:

a planet carrier interconnected to the stator and defining a plurality of pins disposed in circumferentially fixed relationship about the axis, and

each of the plurality of planet gears rotatably supported by one of the plurality of pins to establish the operable connection between the stator and the plurality of planet gears.

13. A lubricant supported electric motor as set forth in claim **12**, wherein the planet carrier includes an inner body portion disposed within the wheel rim in axially aligned relationship with the rotor and the stator and an outer body portion disposed axially outside of and in spaced relationship with the inner body portion, and each of the plurality of pins extending between the inner and outer body portions.

14. A lubricant supported electric motor as set forth in claim **13**, wherein the inner body portion is disposed radially between the stator and the wheel rim.

15. A lubricant supported electric motor as set forth in claim **13**, wherein the outer body portion is fixedly attached to a vehicle chassis.

16. A lubricant supported electric motor as set forth in claim **13**, where the stator defines at least one passageway disposed in fluid communication with the at least one support chamber, the planet carrier defines at least one channel extending through the plurality of pins and disposed in fluid communication with the at least one passageway, and a pump disposed in fluid communication with the at least one channel for pumping the lubricant serially through the at least one channel and the at least one passageway to the support chamber.

17. A lubricant supported electric motor as set forth in claim **16**, further comprising a seal extending between the ring gear and the outer body portions of the planet carrier for retaining the lubricant within the support chamber.

18. A lubricant supported electric motor as set forth in claim **16**, wherein the inner body portion of the planet carrier is disposed in spaced relationship with the wheel rim to define an outer gap, and the at least one passageway of the stator is disposed in fluid communication with the outer gap to deliver the lubricant to the outer gap in addition to the support chamber.

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