US 20260009429A1

(19) **United States**
(12) **Patent Application Publication**
Sandoz

(10) **Pub. No.: US 2026/0009429 A1**
(43) **Pub. Date: Jan. 8, 2026**

(54) SLIP GEAR ASSEMBLY FOR SNOWMOBILE

(71) Applicant: **Textron Inc.**, Providence, RI (US)

(72) Inventor: **Samuel Sandoz**, Providence, RI (US)

(21) Appl. No.: **18/763,549**

(22) Filed: **Jul. 3, 2024**

Publication Classification

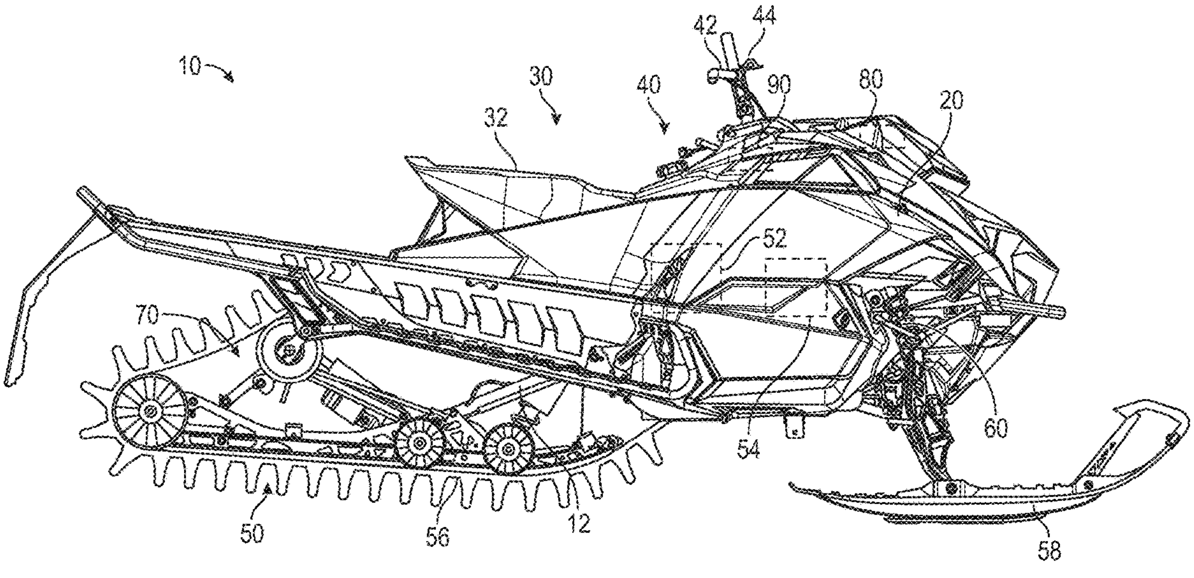
(51) **Int. Cl.**

F16D 7/02	(2006.01)
B62M 9/02	(2006.01)
B62M 27/02	(2006.01)

(52) **U.S. Cl.**
CPC ***F16D 7/027*** (2013.01); ***B62M 9/02*** (2013.01); ***B62M 27/02*** (2013.01)

(57) ABSTRACT

A gear assembly for transferring power between a prime mover and a tractive element of a snowmobile includes a first body configured to couple to the prime mover, a second body configured to couple to the tractive element, a first pressure plate coupled to the first body, and a second pressure plate coupled to the second body. The first pressure plate includes a first friction surface. The second pressure plate includes a second friction surface. The second friction surface forms a friction torque with the first friction surface such that the second pressure plate is coupled to the first pressure plate when a torque between the first pressure plate and the second pressure plate is less the friction torque and the second pressure plate and the first pressure plate separately rotate when the torque is greater than to the friction torque



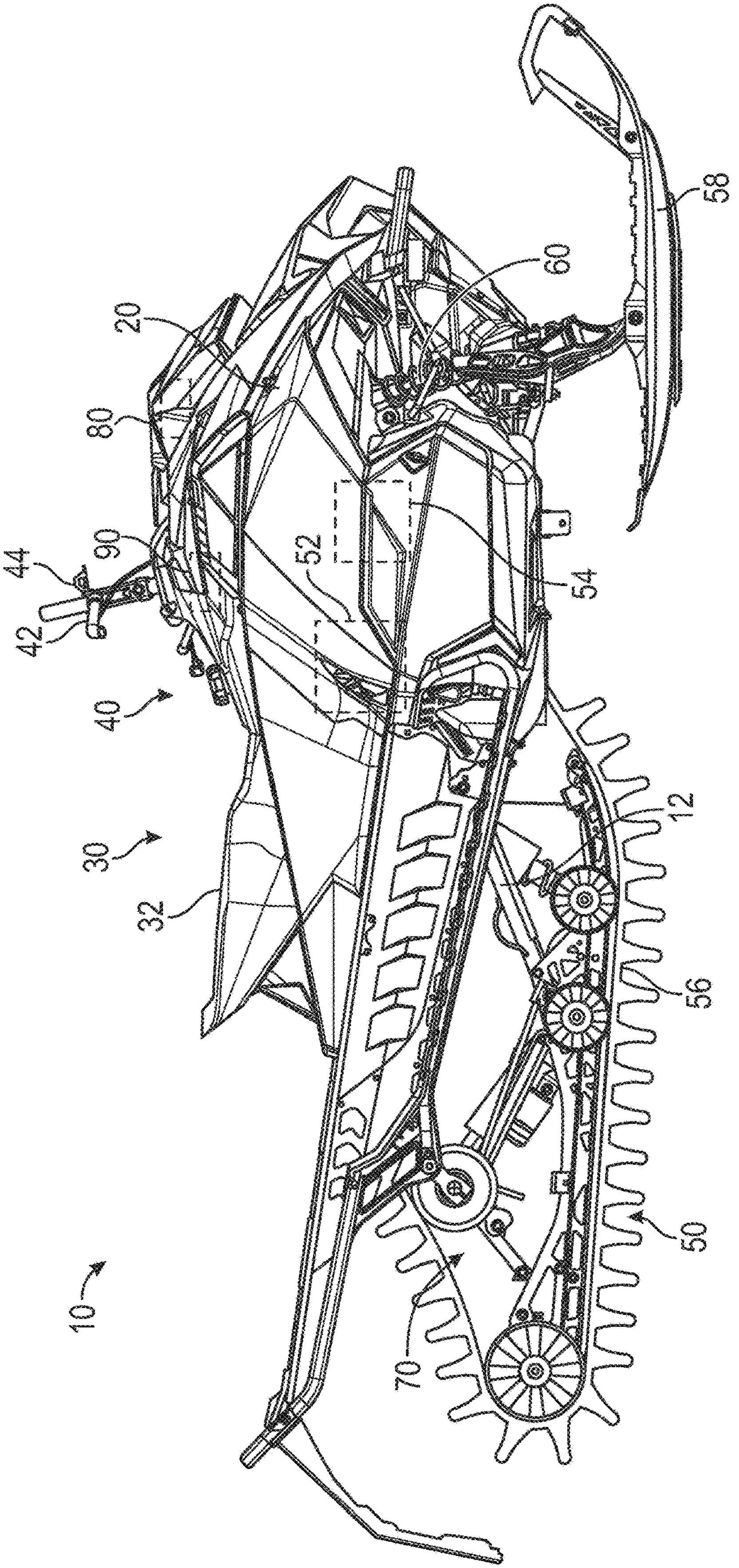


FIG. 1

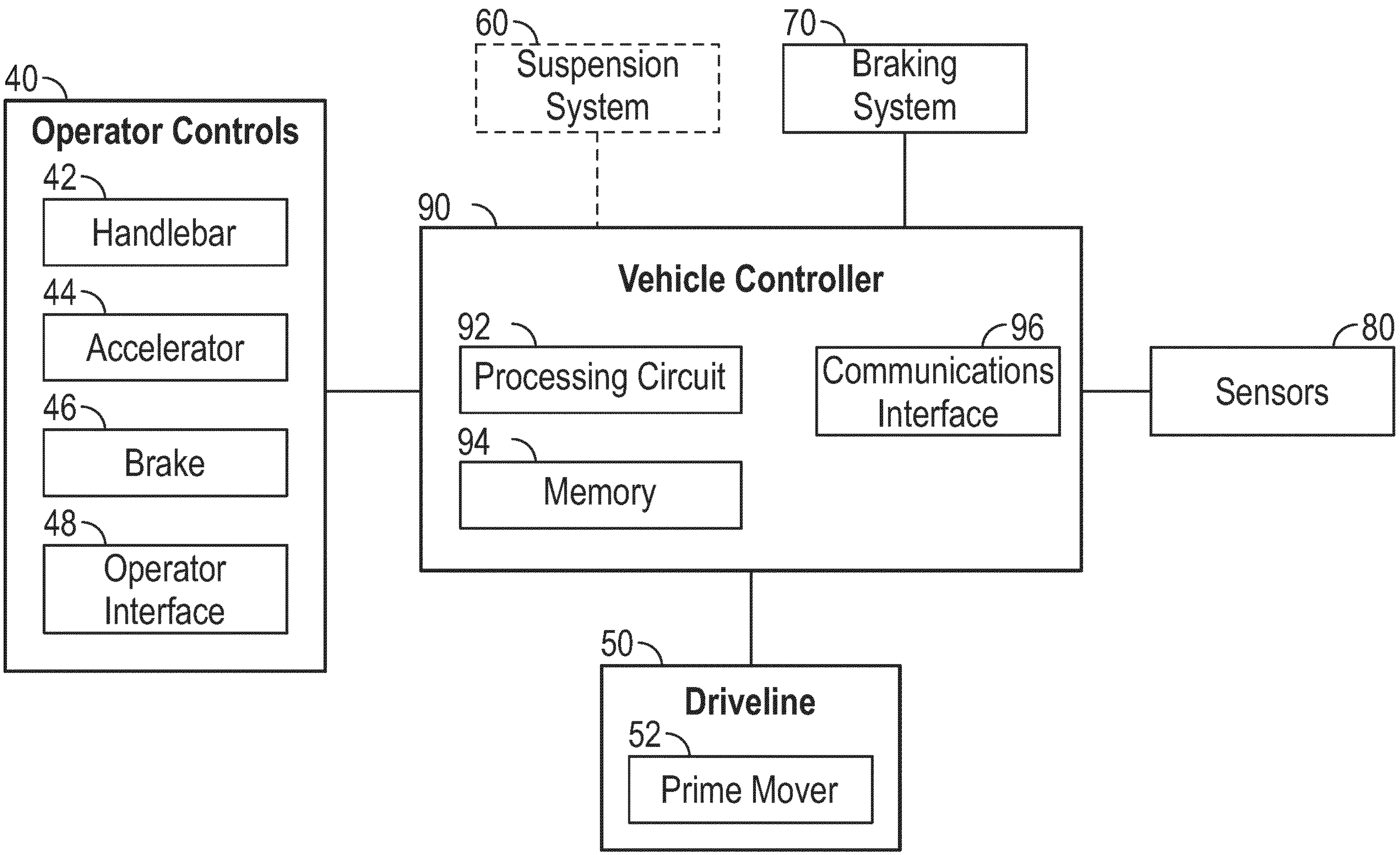

40
Operator Controls
42
Handlebar
44
Accelerator
46
Brake
48
Operator Interface
60
Suspension System
70
Braking System
90
Vehicle Controller
92
Processing Circuit
94
Memory
96
Communications Interface
80
Sensors
50
Driveline
52
Prime Mover

FIG. 2

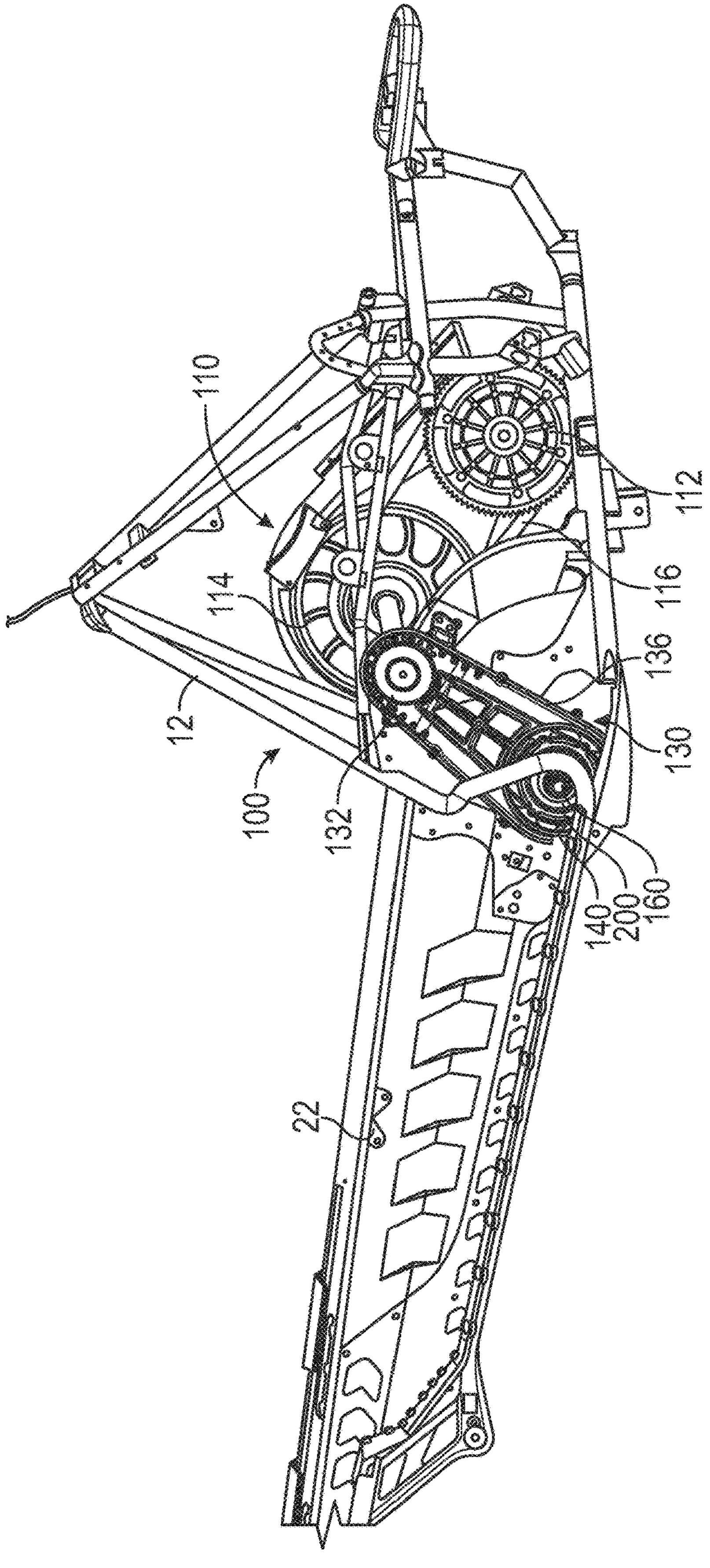


FIG. 3

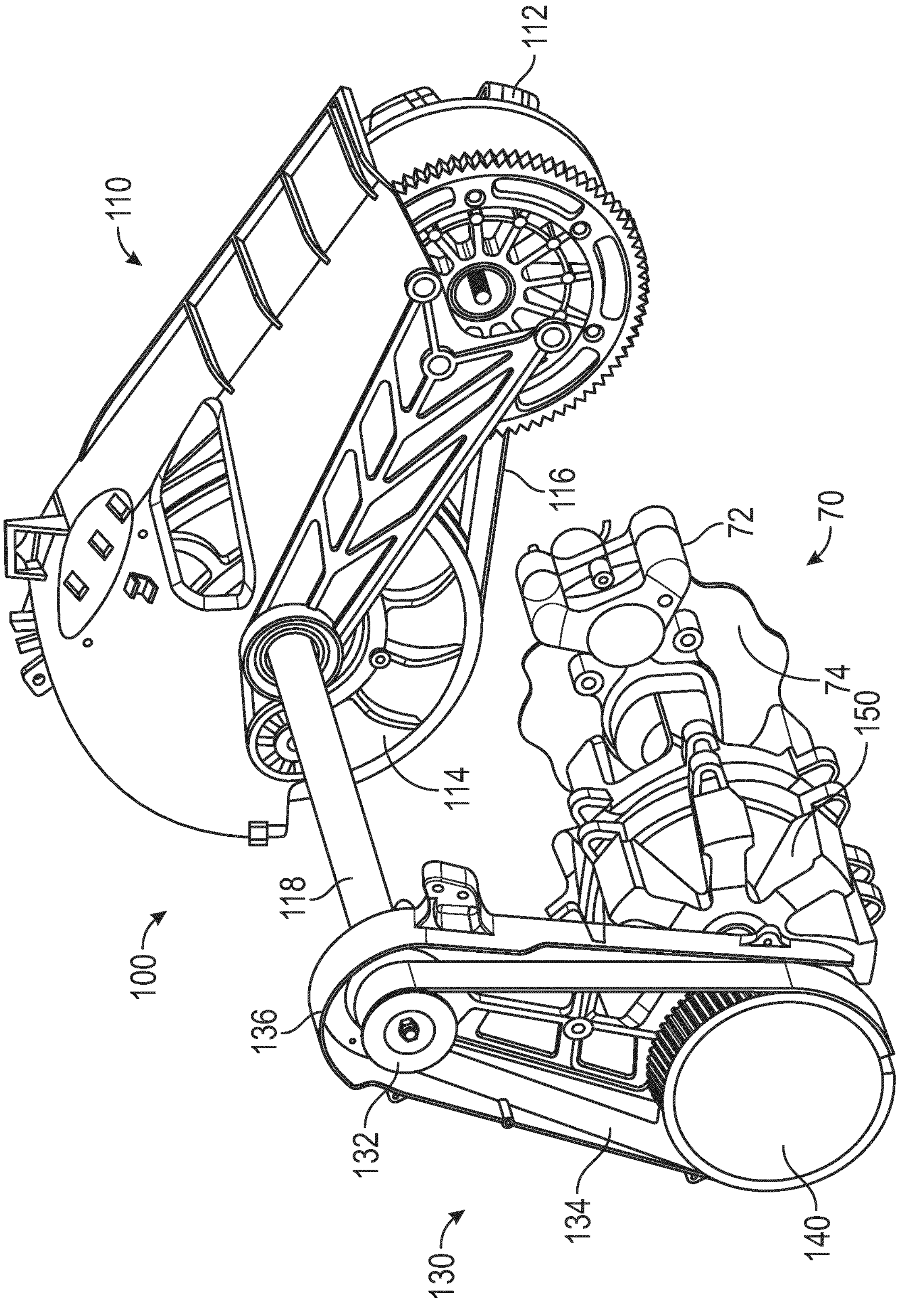


FIG. 4

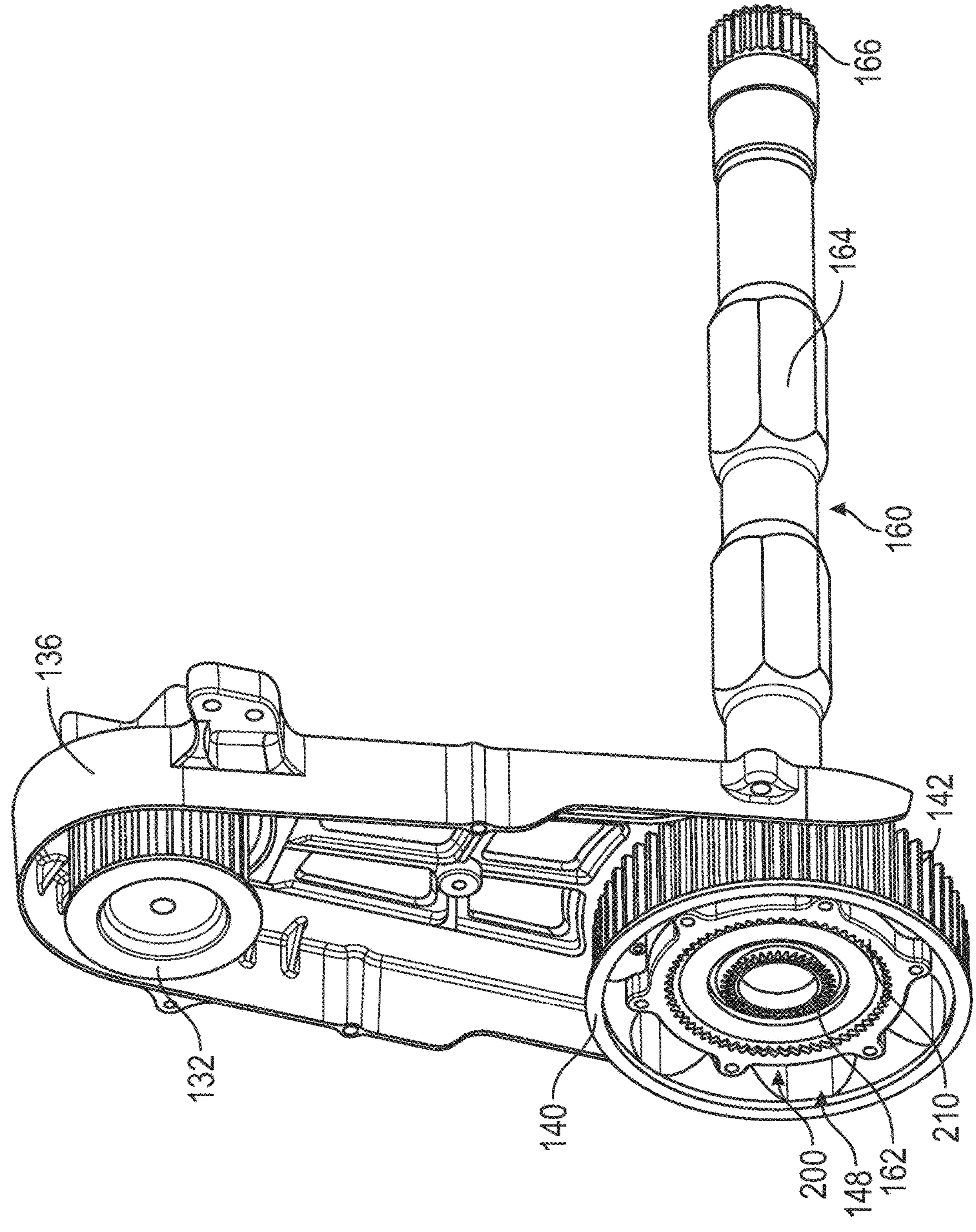


FIG. 5

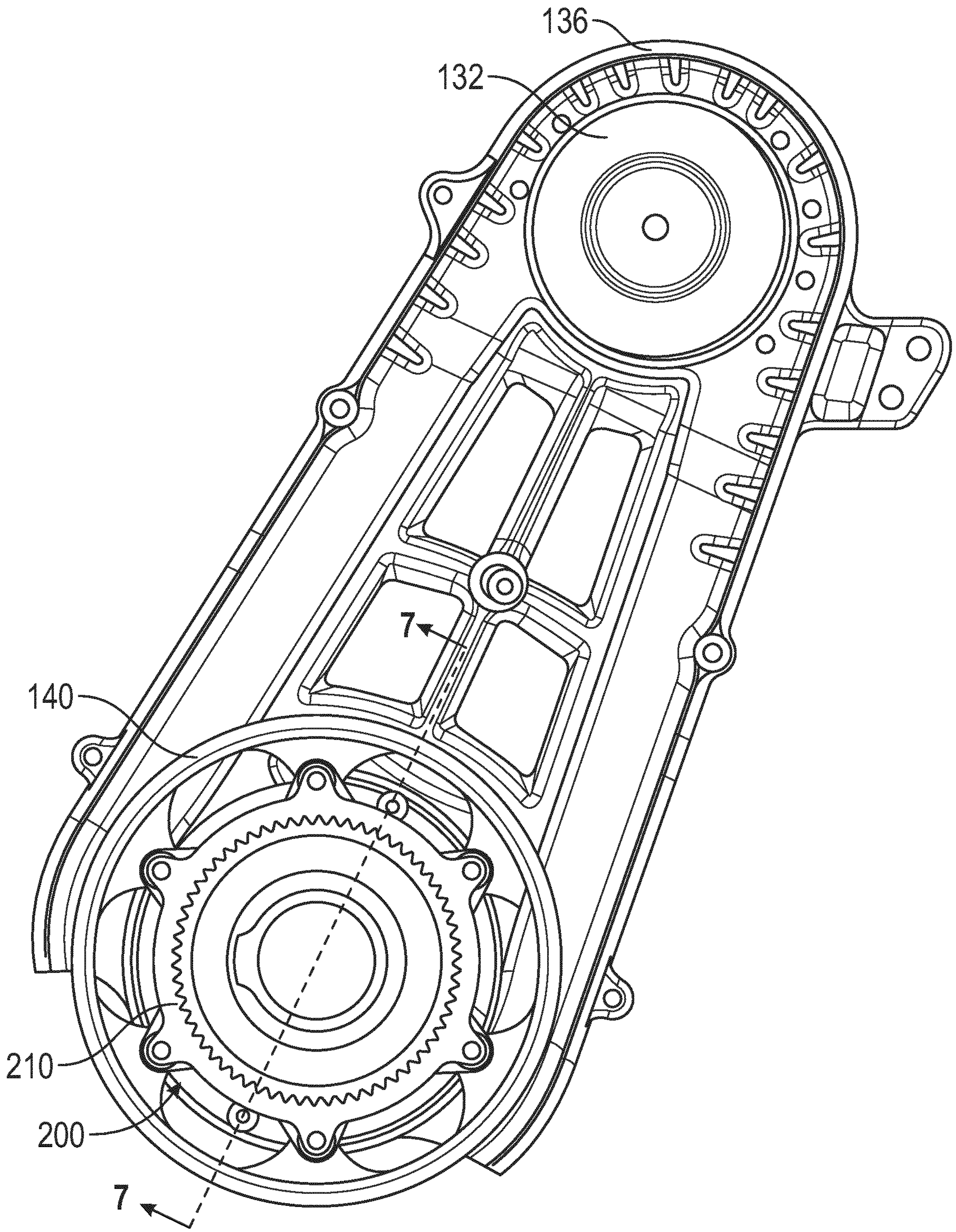


FIG. 6

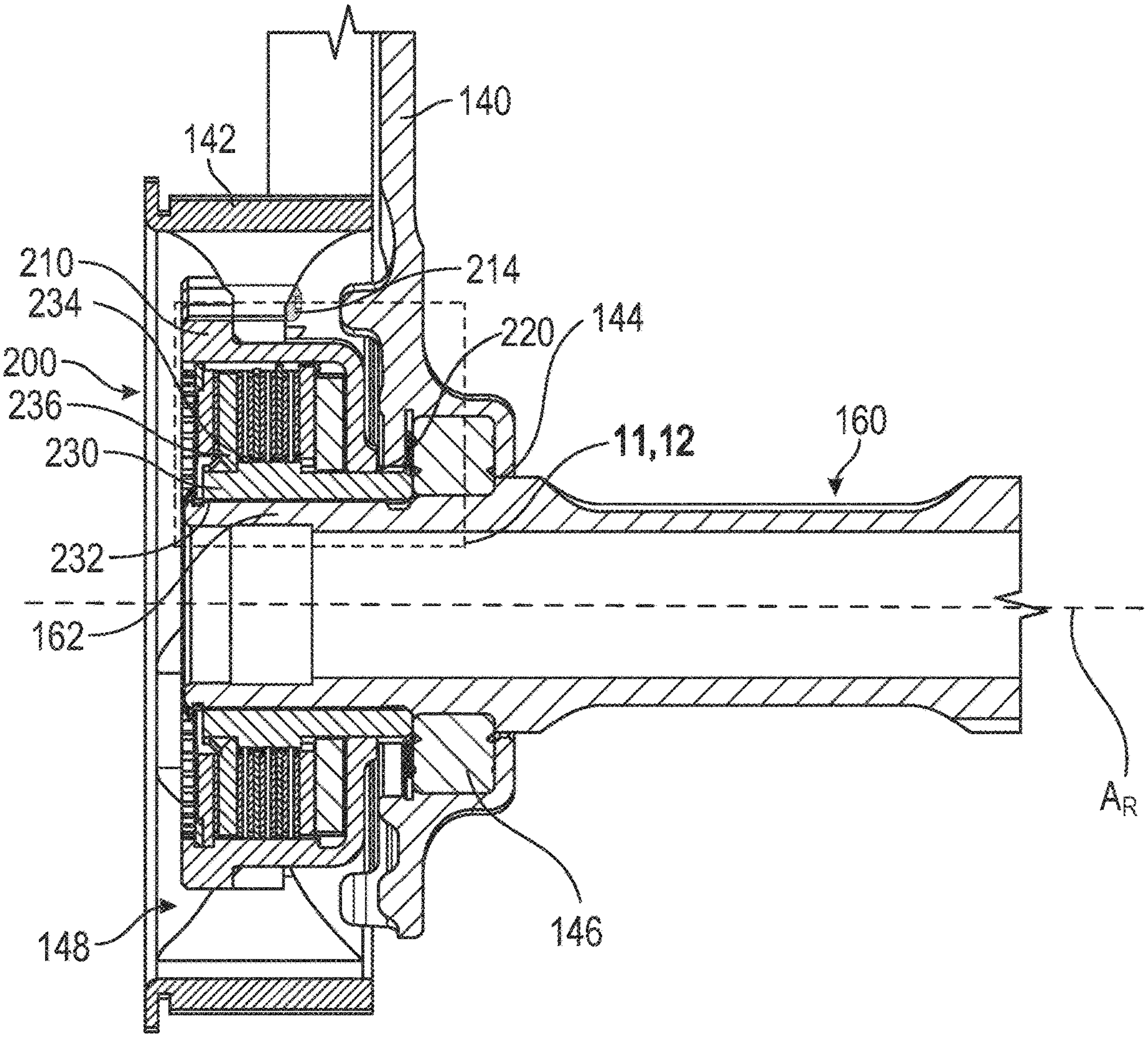

140
142
210
214
234
220
144
200
236
230
11,12
160
232
162
A_R
148
146

FIG. 7

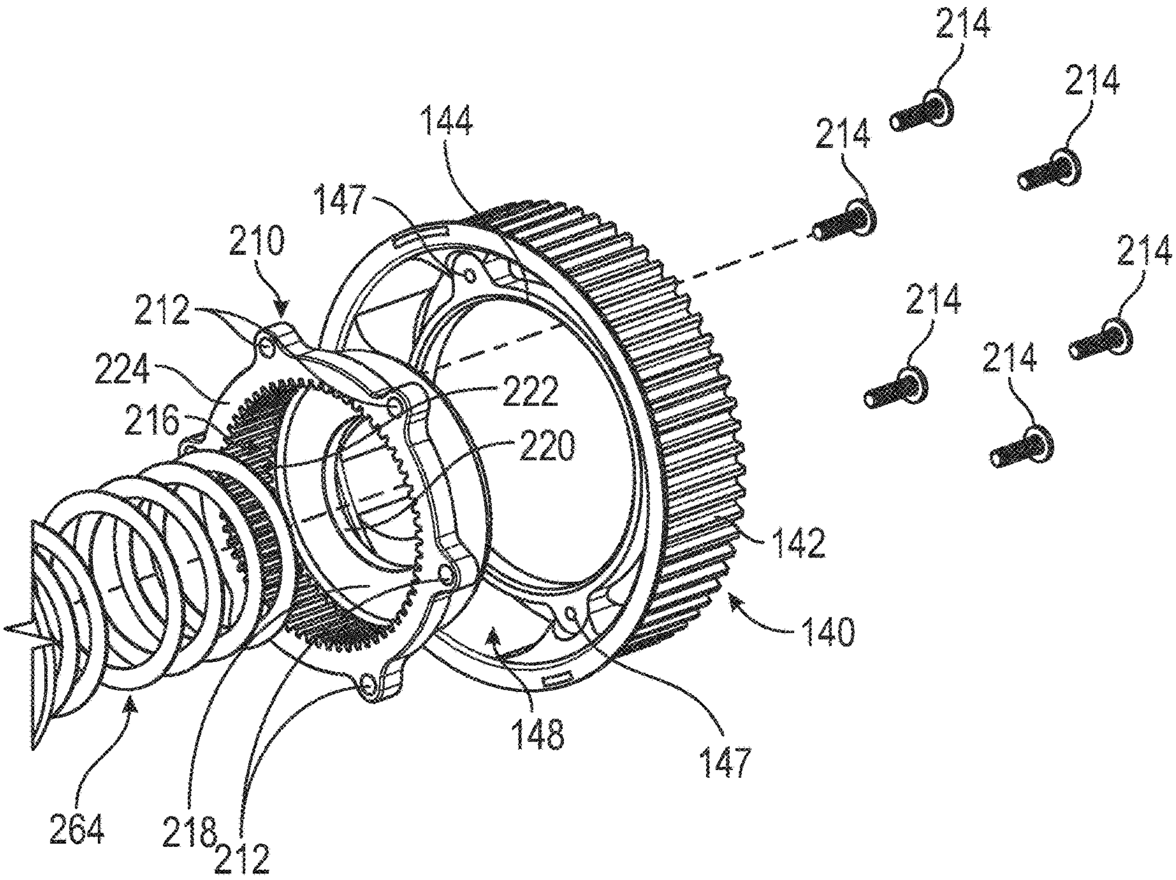

214
214
214
214
214
214
214
144
147
210
212
224
216
222
220
142
140
148
147
264
218
212

FIG. 8

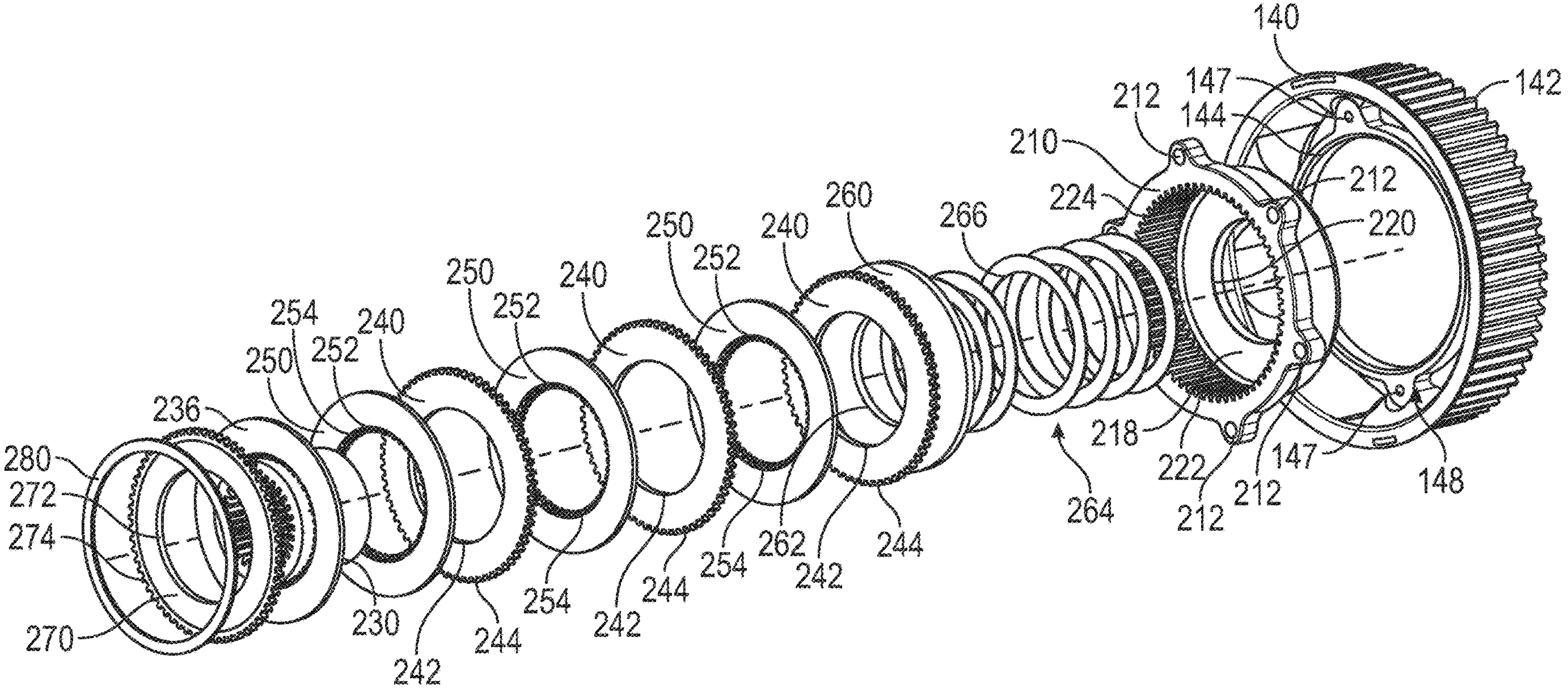

140
147
142
212
144
210
212
224
220
266
260
250
240
252
250
240
252
254
240
250
252
236
280
272
274
270
230
242
244
254
242
244
254
262
242
244
264
218
222
212
212
147
148

FIG. 9

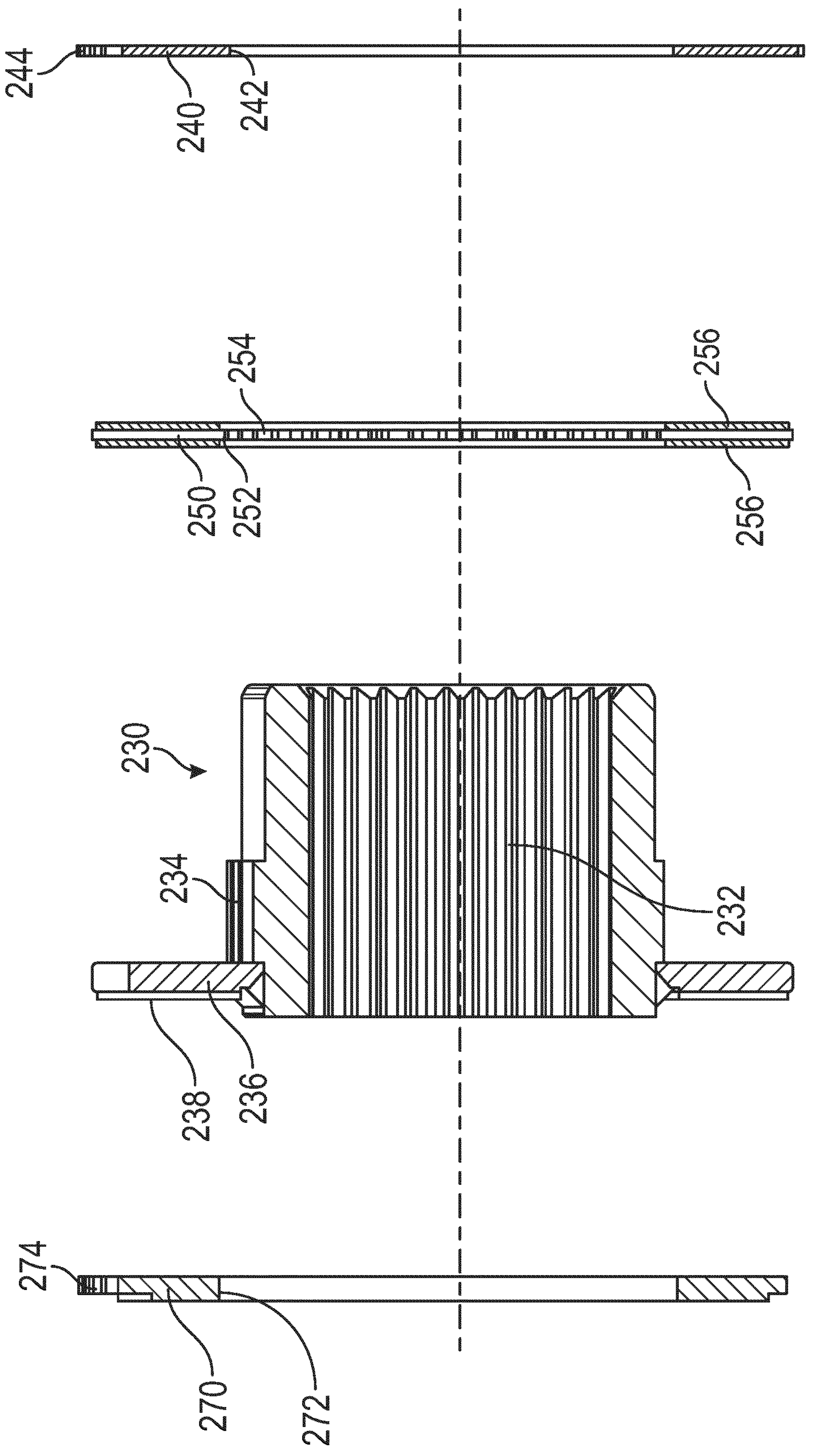


FIG. 10

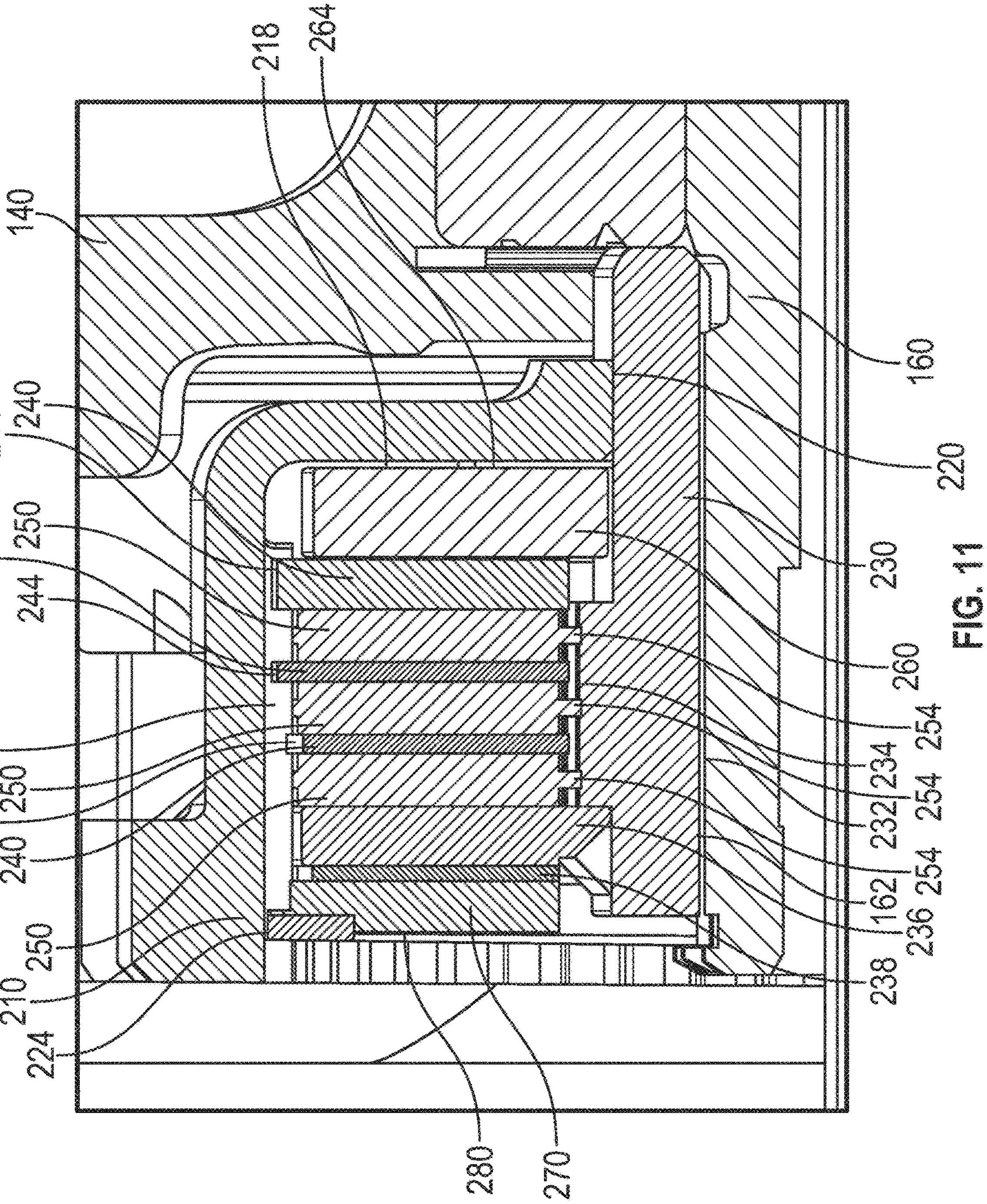

140
218
264
160
220
230
260
254
234
254
232
162
254
236
238
244
240
250
240
244
222
250
244
240
250
210
224
280
270

FIG. 11

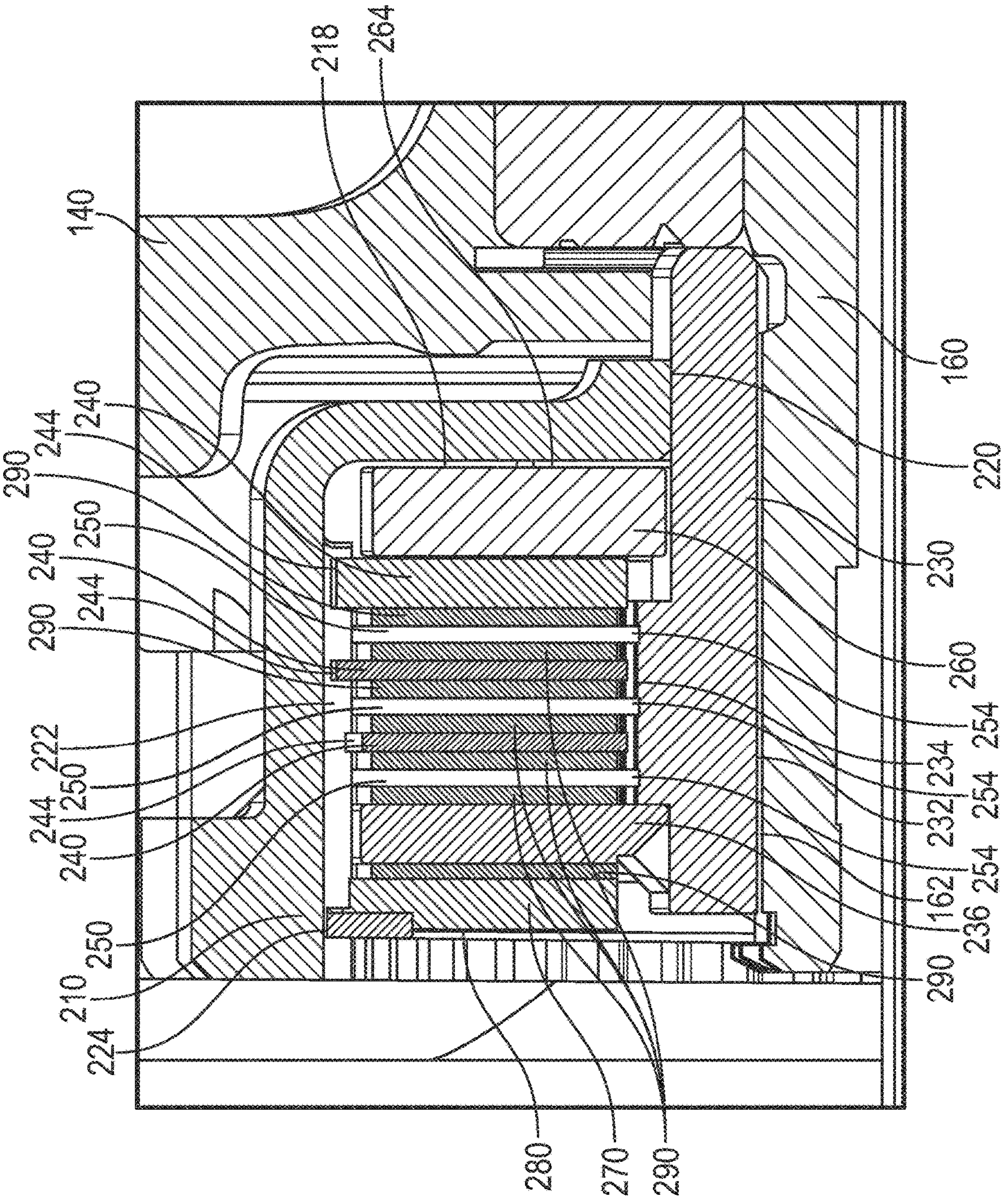

140
218
264
160
220
230
260
254
234
254
232
254
162
236
290
240
244
240
290
244
250
240
244
290
222
250
244
240
250
210
224
280
270
290

FIG. 12

SLIP GEAR ASSEMBLY FOR SNOWMOBILE

BACKGROUND

[0001] The present application relates to a drive system of a vehicle. More specifically, the present application relates to belt drive system of a snowmobile.

SUMMARY

[0002] One embodiment relates to a gear assembly for transferring power between a prime mover and a tractive element of a snowmobile. The slip gear assembly includes a first body configured to couple to a sprocket of the snowmobile coupled to the prime mover, a second body configured to couple to a shaft of the snowmobile coupled to the tractive element, a first pressure plate coupled to the first body, and a second pressure plate coupled to the second body. The first body, the second body, the first pressure plate, and the second pressure plate are configured to rotate about an axis. The first pressure plate includes a first friction surface positioned on at least one side of the first pressure plate. The second pressure plate includes a second friction surface positioned on at least one side of the second pressure plate. The second friction surface forms a friction torque between the second friction surface and the first friction surface such that the second pressure plate is coupled to the first pressure plate when a torque between the first pressure plate and the second pressure plate is less the friction torque and the second pressure plate and the first pressure plate separately rotate when the torque between the first pressure plate and the second pressure plate is greater than or equal to the friction torque

[0003] Another embodiment relates to a vehicle. The vehicle includes a frame, a tractive assembly coupled to the frame, a prime mover configured to provide power to the tractive assembly to drive the tractive assembly, and a transmission assembly configured to transfer the power from the prime mover to the tractive assembly. The tractive assembly is configured to propel the vehicle. The transmission assembly includes a slip gear assembly configured to receive the power from the prime mover and provide the power to the tractive assembly. The slip gear assembly includes a first body configured to receive the power from the prime mover, a second body configured to provide the power to the tractive assembly, a first pressure plate coupled to the first body, and a second pressure plate coupled to the second body. The second pressure plate contacts the first pressure plate to form a friction torque between the second pressure plate and the first pressure plate such that the first pressure plate is coupled to the second pressure plate when a torque between the first pressure plate and the second pressure plate is less than the friction torque to allow for the power to be transferred from the prime mover to the tractive assembly and the second pressure plate and the first pressure plate separately rotate when the torque between the first pressure plate and the second pressure plate is greater than or equal to the friction torque to prevent the power from being transferred from the prime mover to the tractive assembly.

[0004] Still another embodiment relates to a transmission assembly for transmitting power between a prime mover and a tractive assembly of a snowmobile. the transmission assembly includes a belt assembly configured to receive the power from the prime mover, a shaft configured to provide the power to the tractive assembly, and a slip gear assembly configured to transfer the power from the belt assembly to the shaft. The belt assembly includes a first sprocket configured to receive the power from the prime mover, a second sprocket, and a belt coupled to the first sprocket and the second sprocket. The belt is configured to transfer the power between the first sprocket and the second sprocket. The slip gear assembly includes a first body removably coupled to the second sprocket and a second body removably coupled to the shaft. The second body is coupled to the first body when a torque between the first body and the second body is less than a torque threshold and the second body and the first body separately rotate when the torque between the first body and the second body is greater than or equal to the torque threshold.

[0005] This summary is illustrative only and is not intended to be in any way limiting. Other aspects, inventive features, and advantages of the devices or processes described herein will become apparent in the detailed description set forth herein, taken in conjunction with the accompanying figures, wherein like reference numerals refer to like elements.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. **1** is a side view of a vehicle, according to an exemplary embodiment.

[0007] FIG. **2** is a schematic block diagram of the vehicle of FIG. **1**, according to an exemplary embodiment.

[0008] FIG. **3** is a side view of a transmission assembly of the vehicle of FIG. **1**, according to an exemplary embodiment.

[0009] FIG. **4** is a perspective view of the transmission assembly of FIG. **3**, according to an exemplary embodiment.

[0010] FIG. **5** is a detailed perspective view of a portion of the transmission assembly of FIG. **3**, according to an exemplary embodiment.

[0011] FIG. **6** is a detailed side view of a portion of the transmission assembly of FIG. **5**, according to an exemplary embodiment.

[0012] FIG. **7** is a cross-section view of a slip gear assembly of the transmission assembly of FIG. **6**, according to an exemplary embodiment.

[0013] FIG. **8** is an exploded view of a portion of the slip gear assembly of FIG. **7**, according to an exemplary embodiment.

[0014] FIG. **9** is an exploded view of the slip gear assembly of FIG. **7**, according to an exemplary embodiment.

[0015] FIG. **10** is an exploded cross-section view of a portion of the slip gear assembly of FIG. **7**, according to an exemplary embodiment.

[0016] FIG. **11** is a detailed view of a portion of the slip gear assembly of FIG. **7**, according to an exemplary embodiment.

[0017] FIG. **12** is another detailed view of a portion of the slip gear assembly of FIG. **7**, according to an exemplary embodiment.

DETAILED DESCRIPTION

[0018] Before turning to the figures, which illustrate certain exemplary embodiments in detail, it should be understood that the present disclosure is not limited to the details or methodology set forth in the description or illustrated in the figures. It should also be understood that the terminology used herein is for the purpose of description only and should not be regarded as limiting.

[0019] According to an exemplary embodiment, a vehicle of the present disclosure includes a transmission configured to facilitate selectively transferring torque between a tractive assembly of the vehicle and a prime mover of the vehicle configured to provide power to the tractive assembly to drive the tractive assembly. The transmission includes a slip gear assembly configured to transfer torque between the prime mover and the tractive assembly when the torque is below a torque threshold and prevent the transfer of the torque between the prime mover and the tractive assembly when the torque is greater than or equal to the torque threshold. The slip gear assembly may include a first body or a first body assembly configured to receive the power from the prime mover, a second body or a second body assembly configured to provide the power from the prime mover to the tractive assembly, a first pressure plate coupled to the first body or the first body assembly and configured to rotate with the first body or the first body assembly, and a second pressure plate coupled to the second body or the second body assembly and configured to rotate with the second body or the second body assembly. The first pressure plate includes a first friction surface configured to selectively couple with a second friction surface of the second pressure plate through a friction toque between the first friction surface and the second friction surface. When the torque between the first pressure plate and the second pressure plate is below the torque threshold, the friction torque between the first friction surface and the second friction surface couples the first pressure plate to the second pressure plate and the torque is transferred through the slip gear assembly. When the torque between the first pressure plate and the second pressure plate is above the torque threshold, the friction torque between the first friction surface and the second friction surface is overcome, the first pressure plate rotates relative to the second pressure plate, and the torque is not transferred through the slip gear assembly. The slip gear assembly may be configured as a modular slip gear assembly that may be changed out for another slip gear assembly when performance of the slip gear assembly is diminished. The slip gear assembly may be configured as a dry slip gear assembly that does not include a fluid lubricant.

Overall Vehicle

[0020] As shown in FIGS. **1** and **2**, a machine or vehicle, shown as vehicle **10**, includes a chassis, shown as frame **12**, a body assembly, shown as body **20**, coupled to the frame **12** and having an occupant portion or section, shown as occupant seating area **30**; operator input and output devices, shown as operator controls **40**, that are disposed within the occupant seating area **30**; a drivetrain, shown as driveline **50**, coupled to the frame **12** and at least partially disposed under the body **20**; a vehicle suspension system, shown as suspension system **60**, coupled to the frame **12** and one or more components of the driveline **50**; a vehicle braking system, shown as braking system **70**, coupled to one or more components of the driveline **50** to facilitate selectively braking the one or more components of the driveline **50**; one or more first sensors, shown as sensors **80**; and a vehicle control system, shown as vehicle controller **90**, coupled to the operator controls **40**, the driveline **50**, the suspension system **60**, the braking system **70**, and the sensors **80**. In some embodiments, the vehicle **10** includes more or fewer components. As shown in FIG. **3**, the body **20** include a tunnel assembly, shown as tunnel **22**, configured to receive at least a portion of the driveline **50** to prevent the portion of the driveline **50** from transferring material (e.g., snow, rocks, etc.) into the occupant seating area **30**.

[0021] According to an exemplary embodiment, the vehicle **10** is a tracked, winter-focused off-road machine or vehicle configured to be operated on a snowy and/or icy surface (e.g., operated in snow, on ice, etc.). In some embodiments, the tracked, winter-focused off-road machine or vehicle is a lightweight or recreational machine or vehicle such as a snowmobile, a snow bike, a snow scooter, a snow all-terrain vehicle ("ATV"), a snow utility task vehicle ("UTV"), a snow plow machine, and/or another type of lightweight or recreational machine configured to be operated on a snowy and/or icy surface. In other embodiments, the tracked, snow-focused off-road machine or vehicle is a large machine or vehicle such as a snowcat, a snow groomer, a snow plow machine, a tractor, and/or another type of large machine or vehicle configured to be operated on a snowy and/or icy surface. In still other embodiments, the vehicle **10** is a non-tracked, off-road machine or vehicle such as an ATV, a UTV, a dirt bike, and/or another type of non-tracked, off-road machine or vehicle.

[0022] According to the exemplary embodiment shown in FIG. **1**, the occupant seating area **30** includes a first seat, shown as operator seat **32**, configured to support an operator of the vehicle **10**. In some embodiments, the occupant seating area **30** includes a double seat configured to support the operator of the vehicle **10** and a passenger of the vehicle **10** behind the operator, or a triple seat configured to support the operator of the vehicle **10** and two passengers of the vehicle **10** behind the operator. In some embodiments, the occupant seating area **30** includes a second seat positioned rearward of or to the side of the operator seat **32**. The second seat may be configured to support passengers of the vehicle **10**. In some embodiments, in addition to or in place of the second seat, the vehicle **10** includes one or more rear accessories. Such rear accessories may include a ski rack, a bed, a cargo body (e.g., for a storage, etc.), and/or other rear accessories.

[0023] According to an exemplary embodiment, the operator controls **40** are configured to provide an operator with the ability to control one or more functions of and/or provide commands to the vehicle **10** and the components thereof (e.g., turn on, turn off, drive, turn, brake, engage various operating modes, raise/lower an implement, etc.). As shown in FIGS. **1** and **2**, the operator controls **40** include a steering interface (e.g., a handlebar, a steering column, a handlebar assembly, joystick(s), a steering wheel, etc.), shown as handlebar **42**, an accelerator interface (e.g., a pedal, a throttle, a throttle lever, etc.), shown as accelerator **44**, a braking interface (e.g., a brake pedal, a brake lever, a brake arm, etc.), shown as brake interface **46**, and one or more additional interfaces (e.g., a light control interface, an operational mode interface, etc.), shown as operator interfaces **48**. The operator interface **48** may include one or more displays and one or more input devices. The one or more displays may be or include a touchscreen, an LCD display, a LED display, a speedometer, gauges, warning lights, etc. The one or more input device may be or include buttons, switches, knobs, levers, dials, etc.

[0024] According to an exemplary embodiment, the driveline **50** is configured to propel the vehicle **10**. As shown in FIGS. **1** and **2**, the driveline **50** includes a primary driver, shown as prime mover **52**, an energy storage device, shown as energy storage **54**, a first tractive assembly (e.g., tracks, treads, axles, differentials, etc.), shown as rear tractive assembly **56**, and a second tractive assembly (e.g., skis, runners, slides, etc.), shown as front tractive assembly **58**. In some embodiments, the driveline **50** is a conventional driveline whereby the prime mover **52** is an internal combustion engine and the energy storage **54** is a fuel tank. The internal combustion engine may be a spark-ignition internal combustion engine or a compression-ignition internal combustion engine that may use any suitable fuel type (e.g., diesel, ethanol, gasoline, natural gas, propane, etc.). In some embodiments, the driveline **50** is an electric driveline whereby the prime mover **52** is an electric motor and the energy storage **54** is a battery system. In some embodiments, the driveline **50** is a fuel cell electric driveline whereby the prime mover **52** is an electric motor and the energy storage **54** is a fuel cell (e.g., that stores hydrogen, that produces electricity from the hydrogen, etc.). In some embodiments, the driveline **50** is a hybrid driveline whereby (i) the prime mover **52** includes an internal combustion engine and an electric motor/generator and (ii) the energy storage **54** includes a fuel tank and/or a battery system.

[0025] According to the exemplary embodiment shown in FIG. **1**, the rear tractive assembly **56** includes a rear tractive element that is configured as a track and the front tractive assembly **58** includes front tractive elements configured as skis. For example, the rear tractive element may be configured as a track configured to engage a snowy surface in order to drive the vehicle **10** and the front skis may be configured to slide or glide along the snowy surface. In some embodiments, the rear tractive assembly **56** includes a plurality of the rear tractive elements configured as tracks. In some embodiments, the rear tractive assembly **56** is at least partially disposed within the tunnel **22**. By way of example, a top portion of the rear tractive assembly **56** may be disposed within the tunnel **22** to prevent the rear tractive assembly **56** from transferring snow into the occupant seating area **30**. In some embodiments, the front tractive assembly **58** includes front tractive elements that are configured as tracks. In other embodiments, the front tractive assembly **58** and the rear tractive assembly **56** include tractive elements that are configured as wheels.

[0026] According to an exemplary embodiment, the prime mover **52** is configured to provide power to drive the rear tractive assembly **56** (e.g., to provide rear-track drive, etc.). In some embodiments, the prime mover **52** is configured to provide power to drive the rear tractive assembly **56** and/or the front tractive assembly **58** (e.g., to provide front-track drive, to provide all-track drive, etc.). In some embodiments, the driveline **50** includes a transmission device (e.g., a gearbox, a continuous variable transmission ("CVT"), the transmission assembly **100**, etc.) positioned between (a) the prime mover **52** and (b) the rear tractive assembly **56**. In a non-track arrangement, the rear tractive assembly **56** may include a drive shaft, a differential, and/or an axle. In such non-track arrangement, the rear tractive assembly **56** includes two axles or a tandem axle arrangement. According to an exemplary embodiment, the front tractive assembly **58** is steerable (e.g., using the handlebar **42**). In some embodiments, the rear tractive assembly **56** is additionally or alternatively steerable. In some embodiments, both the rear tractive assembly **56** and the front tractive assembly **58** are fixed and not steerable (e.g., employ skid steer operations).

[0027] In some embodiments, the driveline **50** includes a plurality of prime movers **52**. By way of example, the driveline **50** may include a first of the prime movers **52** that drives a first one of the rear tractive elements and a second of the prime movers **52** that drives a second one of the rear tractive elements when the rear tractive assembly **56** includes two rear tractive elements.

[0028] According to an exemplary embodiment, the suspension system **60** includes one or more suspension components (e.g., shocks, dampers, springs, etc.) positioned between the frame **12** and one or more components (e.g., tractive elements, axles, etc.) of the rear tractive assembly **56** and/or the front tractive assembly **58**. In some embodiments, the vehicle **10** does not include the suspension system **60**.

[0029] According to an exemplary embodiment, the braking system **70** includes one or more braking components (e.g., disc brakes, drum brakes, in-board brakes, axle brakes, etc.) positioned to facilitate selectively braking one or more components of the driveline **50**. In some embodiments, the one or more braking components include one or more rear braking components positioned to facilitate braking one or more components of the rear tractive assembly **56** (e.g., the rear axle, the rear tractive elements, etc.). In some embodiments (e.g., embodiments with two rear tractive elements), the one or more rear braking components include two rear braking components, one positioned to facilitate braking each of the rear tractive elements. According to the exemplary embodiment shown in FIG. **4**, the braking system **70** includes a brake assembly (e.g., a braking element, etc.), shown as brake **72**, coupled to the frame **12** and/or the body **20**, and a brake disk, shown as brake disk **74**, coupled to a rotating component of the driveline **50**. The brake **72** is configured to selectively engage the brake disk **74** to facilitate braking the rotating component of the driveline **50** (e.g., via friction, etc.).

[0030] The sensors **80** may include various sensors positioned about the vehicle **10** to acquire vehicle information or vehicle data regarding operation of the vehicle **10** and/or the location thereof. By way of example, the sensors **80** may include an accelerometer, a gyroscope, a compass, a position sensor (e.g., a GPS sensor, etc.), suspension sensor(s), wheel/track sensors, an audio sensor or microphone, a camera, an optical sensor, a proximity detection sensor, and/or other sensors to facilitate acquiring vehicle information or vehicle data regarding operation of the vehicle **10** and/or the location thereof. According to an exemplary embodiment, one or more of the sensors **80** are configured to facilitate detecting and obtaining vehicle telemetry data including position of the vehicle **10**, whether the vehicle **10** is moving, travel direction of the vehicle **10**, slope of the vehicle **10**, speed of the vehicle **10**, vibrations experienced by the vehicle **10**, sounds proximate the vehicle **10**, suspension travel of components of the suspension system **60**, and/or other vehicle telemetry data.

[0031] The vehicle controller **90** may be implemented as a general-purpose processor, an application specific integrated circuit ("ASIC"), one or more field programmable gate arrays ("FPGAs"), a digital-signal-processor ("DSP"), circuits containing one or more processing components, circuitry for supporting a microprocessor, a group of processing components, or other suitable electronic processing components. According to the exemplary embodiment shown in FIG. **2**, the vehicle controller **90** includes a processing circuit **92**, a memory **94**, and a communications interface **96**. The processing circuit **92** may include an ASIC, one or more FPGAs, a DSP, circuits containing one or more processing components, circuitry for supporting a microprocessor, a group of processing components, or other suitable electronic processing components. In some embodiments, the processing circuit **92** is configured to execute computer code stored in the memory **94** to facilitate the activities described herein. The memory **94** may be any volatile or non-volatile or non-transitory computer-readable storage medium capable of storing data or computer code relating to the activities described herein. According to an exemplary embodiment, the memory **94** includes computer code modules (e.g., executable code, object code, source code, script code, machine code, etc.) configured for execution by the processing circuit **92**. In some embodiments, the vehicle controller **90** may represent a collection of processing devices. In such cases, the processing circuit **92** represents the collective processors of the devices, and the memory **94** represents the collective storage devices of the devices.

[0032] In one embodiment, the vehicle controller **90** is configured to selectively engage, selectively disengage, control, or otherwise communicate with components of the vehicle **10** (e.g., via the communications interface **96**, a controller area network ("CAN") bus, etc.). According to an exemplary embodiment, the vehicle controller **90** is coupled to (e.g., communicably coupled to) components of the operator controls **40** (e.g., the handlebar **42**, the accelerator **44**, the brake interface **46**, the operator interface **48**, etc.), components of the driveline **50** (e.g., the prime mover **52**), components of the braking system **70**, and the sensors **80**. By way of example, the vehicle controller **90** may send and receive signals (e.g., control signals, location signals, etc.) with the components of the operator controls **40**, the components of the driveline **50**, the components of the braking system **70**, the sensors **80**, and/or remote systems or devices (via the communications interface **96** as described in greater detail herein).

Transmission Assembly

[0033] As shown in FIGS. **3** and **4**, the driveline **50** includes a transmission (e.g., a drivetrain, a transmission system, etc.), shown as transmission assembly **100**, coupled between (i) the prime mover **52** and (ii) the front tractive assembly **58** and/or the rear tractive assembly **56**. The transmission assembly **100** is configured to transfer power (e.g., motive power, torque, etc.) between the prime mover **52** and the rear tractive assembly **56**. In some embodiments, the transmission assembly **100** is additionally or alternatively configured to transfer power between the prime mover **52** and the front tractive assembly **58** (e.g., in embodiments where the front tractive assembly **58** includes tracks or wheels). According to an exemplary embodiment, the transmission assembly **100** is configured to manipulate (e.g., reduce, increase, etc.) an input (e.g., a torque, speed, power, etc.) provided by the prime mover **52** to the front tractive assembly **58** and/or the rear tractive assembly **56** when the transmission assembly **100** transfers the power between (i) the prime mover **52** and (ii) the front tractive assembly **58** and/or the rear tractive assembly **56**. By way of example, when the vehicle **10** performs a jump (e.g., disengages from the ground, etc.), the vehicle **10** may land while the prime mover **52** is providing power to the front tractive assembly **58** and/or the rear tractive assembly **56** via the transmission assembly **100**. When landing, the front tractive assembly **58** and/or the rear tractive assembly **56** may apply a load spike (e.g., a sudden increase in load, etc.) on the transmission assembly **100** due to the front tractive assembly **58** and/or the rear tractive assembly **56** engaging the ground. The load spike may be above a load rating (e.g., a toque limit, a torque rating, etc.) of the prime mover **52** and/or components of the transmission assembly **100**. As a result, the transmission assembly **100** limits the load transferred between the between (i) the prime mover **52** and (ii) the front tractive assembly **58** and/or the rear tractive assembly **56** based on a load threshold that is less than or equal to the load rating of the prime mover **52** and/or components of the transmission assembly **100** to protect the prime mover **52** and/or components of the transmission assembly **100** from the load spike.

[0034] As shown in FIGS. **3** and **4**, the transmission assembly **100** includes a first or transmission input assembly (e.g., a continuous variable transmission clutch, etc.), shown as clutch assembly **110**, coupled to the prime mover **52** and configured to receive the power provided by the prime mover **52**; a second or transmission output assembly (e.g., torque transfer system, etc.), shown as belt assembly **130**, coupled to the clutch assembly **110** and configured to receive power from the clutch assembly **110**; a third or tractive output assembly (e.g., a drive cog, a drive gear, a drive wheel, a track sprocket, etc.), shown as drive sprocket **150**, configured to engage the rear tractive assembly **56** and provide power to the rear tractive assembly **56** to drive the rear tractive assembly **56**; a shaft (e.g., a torque shaft, etc.), shown as drive shaft **160**, coupled to the drive sprocket **150** and configured to provide power to the drive sprocket **150**; and a slip gear (e.g., modular slip gear, modular slip gear assembly, etc.), shown as slip gear assembly **200**, (a) coupled to the belt assembly **130**, (b) coupled to the drive shaft **160**, and (c) configured to selectively transfer power between the belt assembly **130** and the drive shaft **160**. By way of example, the prime mover **52** may generate power for driving the rear tractive assembly **56** and provide the power to the clutch assembly **110**, the clutch assembly **110** may provide the power to the belt assembly **130**, the belt assembly **130** may provide the power to the drive shaft **160** through the slip gear assembly **200**, and the drive shaft **160** may provide the power to the drive sprocket **150** which uses the power to drive the rear tractive assembly **56**. In other embodiments, the transmission assembly **100** includes a different configuration of components configured to transfer the power provided by the prime mover **52** to the front tractive assembly **58** and/or the rear tractive assembly **56**. By way of example, the transmission assembly **100** may not include the clutch assembly **110** and the prime mover **52** may directly provide the power to the belt assembly **130**.

[0035] As shown in FIG. **4**, the clutch assembly **110** includes a primary clutch assembly (e.g., a first clutch wheel, etc.), shown as primary clutch **112**, coupled to the prime mover **52** and configure to be driven by the prime mover **52**, a secondary clutch assembly (e.g., a second clutch wheel, etc.), shown as secondary clutch **114**, a first belt (e.g., a first torque transfer belt, etc.), shown as clutch belt **116**, engaged with the primary clutch **112** and the secondary clutch **114** and configured to be driven by the rotation of the primary clutch **112** to rotate the secondary clutch **114**, and a first shaft (e.g., a power shaft, etc.), shown as jack shaft **118**, coupled to the secondary clutch **114** and configured to rotate with the secondary clutch **114**. As the prime mover **52** drives the primary clutch **112**, the power provided by the prime mover **52** is transferred through the clutch assembly **110** to the jack shaft **118** through the rotation of the primary clutch **112** and the secondary clutch **114**. In some embodiments, the clutch assembly **110** is configured as a continuous variable transmission clutch (e.g., a CVT system, etc.). By way of example, the primary clutch **112** and the secondary clutch **114** may each include a stationary sheave and moveable sheave. As a rotational speed of the primary clutch **112** and the secondary clutch **114** increase (e.g., based on a speed of the prime mover **52** increasing, etc.), the moveable sheaves of the primary clutch **112** and the secondary clutch **114** are actuated toward or away from the stationary sheave of the primary clutch **112** and the secondary clutch **114**. As the moveable sheaves are actuated toward or away from the stationary sheaves, the clutch belt **116** may move between different diameters of the primary clutch **112** and the secondary clutch **114** to change an effective gear ratio of the clutch assembly **110**. The clutch assembly **110** may allow for smooth and continuous delivery of the power provided by the prime mover **52** via the jack shaft **118** through the rotation of the jack shaft **118**.

[0036] As shown in FIG. **4**, the belt assembly **130** includes a first sprocket (e.g., first drive sprocket, etc.), shown as top drive sprocket **132**, coupled to the jack shaft **118** and configured to rotate with the jack shaft **118**, a second belt (e.g., belt system belt, etc.), shown as drive belt **134**, engaged with the top drive sprocket **132** and configured to be driven by the top drive sprocket **132**, a housing (e.g., a belt bracket, a belt frame, etc.), shown as belt housing **136**, coupled to the frame **12** and/or the body **20** and configured to house the other components of the belt assembly **130**, and a second sprocket (e.g., second drive sprocket, etc.), shown as bottom drive sprocket **140**, engaged with the drive belt **134** and configured to be rotated by the top drive sprocket **132** via the drive belt **134**. As the top drive sprocket **132** is rotated with the jack shaft **118**, the power provided by the jack shaft **118** to the top drive sprocket **132** is transferred through the belt assembly **130** to the bottom drive sprocket **140** through the drive belt **134**. By transferring the power from the top drive sprocket **132** to the bottom drive sprocket **140** via the drive belt **134**, the belt assembly **130** may offset the rotation associated with the power received from the clutch assembly **110** from a first axis extending along the jack shaft **118** to a second axis, shown as axis A_R, extending along the drive shaft **160**.

[0037] The configuration of the belt assembly **130** may depend on positions of the drive sprocket **150** and the front tractive assembly **58** and/or the rear tractive assembly **56**. By way of example, the top drive sprocket **132** may be driven by the jack shaft **118** to rotate about the first axis extending along the length of the jack shaft **118** and the drive belt **134** may drive the bottom drive sprocket **140** to rotate about the axis A_R extending along the drive shaft **160**. In other embodiments, the belt assembly **130** includes other components configured to transfer the power from the top drive sprocket **132** to the bottom drive sprocket **140** (e.g., other than using the drive belt **134**, etc.). By way of example, the belt assembly **130** may include a chain engaged with the top drive sprocket **132** and the bottom drive sprocket **140** and configured to be driven by the rotation of the top drive sprocket **132** to rotate the bottom drive sprocket **140** to transfer the power from the top drive sprocket **132** to the bottom drive sprocket **140**. By way of another example, the belt assembly **130** may include at least one gear engaged with the top drive sprocket **132** and the bottom drive sprocket **140** and configured to be driven by the rotation of the top drive sprocket **132** to rotate the bottom drive sprocket **140** to transfer the power from the top drive sprocket **132** to the bottom drive sprocket **140**.

[0038] As shown in FIGS. **5** and **7**-**9**, the bottom drive sprocket **140** defines a first spline (e.g., toothed connection, serration, etc.), shown as bottom drive sprocket spline **142**, configured to engage the drive belt **134** so that the bottom drive sprocket **140** is rotated by the top drive sprocket **132** via the drive belt **134**. In some embodiments, a configuration of the bottom drive sprocket spline **142** varies based on a desired gear ratio of the belt assembly **130**. By way of example, if the desired gear ratio of the belt assembly **130** is 1:3 and a spline of the top drive sprocket **132** has ten teeth (e.g., ten grooves, etc.), the bottom drive sprocket spline **142** may have thirty teeth to achieve the desired gear ratio of the belt assembly **130**.

[0039] As shown in FIGS. **7**-**9**, the bottom drive sprocket **140** defines a first aperture (e.g., a first hole, a first slot, an aperture, a recess, etc.), shown as bottom drive aperture **144**, extending through the bottom drive sprocket **140**. The bottom drive aperture **144** may be centered on the axis A_R that extends along the length of the drive shaft **160**. As shown in FIG. **7**, the bottom drive aperture **144** is configured to align with the drive shaft **160** to receive the drive shaft **160** such that the drive shaft **160** extends through the bottom drive aperture **144** to extend through the bottom drive sprocket **140**. As shown in FIG. **7**, the bottom drive sprocket **140** includes a first bearing (e.g., a first bushing, a first bearing assembly, etc.), shown as drive bearing **146**, positioned proximate the bottom drive aperture **144** and configured to receive the drive shaft **160**. The drive bearing **146** may support the bottom drive sprocket **140** on the drive shaft **160** while allowing for independent rotation of the bottom drive sprocket **140** and the drive shaft **160** about the axis A_R. In other embodiments, the drive bearing **146** at least partially extends through the bottom drive aperture **144**. By way of example, the drive bearing **146** may be press fit into the bottom drive aperture **144**.

[0040] As shown in FIGS. **8** and **9**, the bottom drive sprocket **140** defines a plurality of first apertures (e.g., coupling apertures, fastener apertures, etc.), shown as mounting apertures **147**, extending through the rear wall of the drive sprocket **140** and around the bottom drive aperture **144**. The mounting apertures **147** are configured to couple the bottom drive sprocket **140** to the slip gear assembly **200** (e.g., via fasteners **214**, etc.). The mounting apertures **147** may be evenly spaced around the bottom drive aperture **144** and extend parallel to the bottom drive aperture **144**.

[0041] As shown in FIGS. **5** and **7**-**9**, the bottom drive sprocket **140** defines a first opening (e.g., a slip gear opening, a first cavity, a first chamber, a first recess, etc.), shown as bottom drive sprocket opening **148**, extending partially through the bottom drive sprocket **140**. The bottom drive sprocket opening **148** is configured to receive at least a portion of the slip gear assembly **200**. The bottom drive sprocket opening **148** may extend through the bottom drive sprocket **140** in a direction parallel to the bottom drive aperture **144**. In some embodiments, the bottom drive sprocket opening **148** is centered about the axis A_R. In other embodiments, the bottom drive sprocket opening **148** is offset from the axis A_R.

[0042] As shown in FIGS. **5** and **7**, the drive shaft **160** includes a first shaft interface (e.g., a first spline, a first torque interface, etc.), shown as gear interface **162**, coupled to the slip gear assembly **200** and configured receive power from the slip gear assembly **200**, a second shaft interface (e.g., a hex profile interface, a second torque interface, etc.), shown as drive sprocket interface **164**, coupled to the drive sprocket **150** and configured to provide power to the drive sprocket **150**, and a third shaft interface (e.g., a second spline, a third torque interface, etc.), shown as brake shaft interface **166**, coupled to the brake disk **74** and configured to receive the braking from the brake **72** via the brake disk **74** to brake the driveline **50**. The gear interface **162** may engage with a profile of the slip gear assembly **200** to couple the drive shaft **160** to the slip gear assembly **200** to receive the power from the slip gear assembly **200**. By way of example, the gear interface **162** may be configured as a first spline configured to interface with a second spline of the slip gear assembly **200** to transfer torque between the gear interface **162** and the slip gear assembly **200**. The drive sprocket interface **164** may engage with a profile of the drive sprocket **150** to couple the drive shaft **160** to the drive sprocket **150** to provide the power to the drive sprocket **150**. By way of example, the drive sprocket interface **164** may be formed in a hexagon shape configured to interface with a hexagon aperture defined by the drive sprocket **150**. The brake **72** may engage with a profile of the brake disk **74** to couple the drive shaft **160** to the brake disk **74** to receive the braking from the brake **72**.

Slip Gear Assembly

[0043] As shown in FIGS. **5-7** and **9**, the slip gear assembly **200** is coupled between the bottom drive sprocket **140** and the drive shaft **160** and is configured to transfer the power received by the bottom drive sprocket **140** to the drive shaft **160**. While transferring the power received by the bottom drive sprocket **140** to the drive shaft **160**, the slip gear assembly **200** is configured limit loads (e.g., torques, forces, etc.) transferred between the bottom drive sprocket **140** and the drive shaft **160**. The slip gear assembly **200** may be configured to limit loads above a load threshold (e.g., a torque threshold, a force threshold, etc.) from being transferred between the bottom drive sprocket **140** and the drive shaft **160**. As a result, the slip gear assembly **200** may prevent loads above the load threshold applied by the drive shaft **160** on the slip gear assembly **200** from being transferred to the bottom drive sprocket **140**, allowing for the operator to continue to drive the vehicle **10** through high loading conditions (e.g., jumps, uneven terrain, terrain with varying traction, etc.).

[0044] By way of example, the slip gear assembly **200** may be configured to have a load threshold that is below a loading capacity (e.g., a maximum load rating, a maximum torque rating, etc.) of the bottom drive sprocket **140**, the prime mover **52**, and/or other components of the transmission assembly **100** configured to transmit power between the bottom drive sprocket **140** and the prime mover **52** (e.g., the clutch assembly **110**, the top drive sprocket **132**, the drive belt **134**, etc.). When a load above the loading capacity is applied to the bottom drive sprocket **140**, the prime mover **52**, and/or other components of the transmission assembly **100**, the bottom drive sprocket **140**, the prime mover **52**, and/or other components of the transmission assembly **100** may fail (e.g., break, no longer function, etc.), which may create issues with providing power to the front tractive assembly **58** and/or the rear tractive assembly **56** from the prime mover **52** to drive the front tractive assembly **58** and/or the rear tractive assembly **56**. As a result, the slip gear assembly **200** limiting the load transferred from the drive shaft **160** to the bottom drive sprocket **140** to the load threshold may protect the bottom drive sprocket **140**, the prime mover **52**, and/or other components of the transmission assembly **100** from receiving loads above their load capacities.

[0045] According to an exemplary embodiment, the slip gear assembly **200** is configured as a dry slip gear assembly (e.g., a non-lubricated slip gear assembly, an open slip gear assembly, etc.) that does not contain a fluid lubricant (e.g., oil, grease, etc.). By way of example, while operating the slip gear assembly **200**, the components of the slip gear assembly **200** are configured to slip when loads above the load threshold of the slip gear assembly **200** are applied to the slip gear assembly **200**. Various components of the slip gear assembly may be configured as friction plates that directly contact each other. The friction plates may slip when the friction between the materials of the friction plates is overcome by the load. The slip gear assembly **200** may rely on the materials of the friction plates to keep the friction between the friction plates constant instead of relying on fluid lubricant positioned between the friction plates to keep the friction constant. As a result, the slip gear assembly **200** does not need to be fluid tight (e.g., water-tight, etc.) as the slip gear assembly **200** does not need to contain a fluid. Additionally, the slip gear assembly **200** does not need to incorporate rotating seals between components of the slip gear assembly **200** that rotate relative each other in order to contain fluid lubricants, which can complicate assemblies and are common points of failure of assemblies. By way of example, the components of the slip gear assembly **200** may be open (e.g., fluidly accessible, etc.) to an environment surrounding the slip gear assembly **200**. As a result, fluids contained within the slip gear assembly **200** (e.g., moisture, snow melt, etc.) may drain from the slip gear assembly **200** and not corrode the components of the slip gear assembly **200**.

[0046] As shown in FIGS. **5-9**, **11**, and **12**, the slip gear assembly **200** includes a first body (e.g., first housing, first bracket, etc.), shown as slip gear outer body **210**, removably coupled to the bottom drive sprocket **140** and configured to rotate with the bottom drive sprocket **140**; a second body (e.g., a second housing, a second bracket, etc.), shown as slip gear inner body **230**, removably coupled to the drive shaft **160** and configured to rotate with the drive shaft **160**, a first plurality of pressure plates, shown as outer pressure plates **240**, configured to engage the slip gear outer body **210** and rotate with the slip gear outer body **210**, and a second plurality of pressure plates, shown as inner pressure plates **250**, configured to engage in the slip gear inner body **230** and rotate with the slip gear inner body **230**. In some embodiments, the slip gear outer body **210**, the slip gear inner body **230**, the outer pressure plates **240**, and the inner pressure plates **250** are configured to rotate about the axis A_R. As the bottom drive sprocket **140** is rotated by the drive belt **134**, the slip gear outer body **210** may rotate at the same rotational speed as the bottom drive sprocket **140**. In some embodiments, the slip gear outer body **210** is at least partially received within the bottom drive sprocket opening **148**. In other embodiments, the slip gear outer body **210** is positioned outside of the bottom drive sprocket opening **148**.

[0047] As shown in FIGS. **8** and **9**, the slip gear outer body **210** defines a plurality of second apertures, shown as outer body apertures **212**, extending through the slip gear outer body **210**. The outer body apertures **212** are configured to align with the mounting apertures **147** of the bottom drive sprocket **140** to selectively receive a plurality of fasteners (e.g., bolts, screws, rivets, nails, anchors, etc.), shown as outer body fasteners **214**, to removably couple the slip gear outer body **210** to the bottom drive sprocket **140**. The outer body fasteners **214** may transfer the power from the bottom drive sprocket **140** to the slip gear outer body **210** to transfer the power from the bottom drive sprocket **140** to the slip gear assembly **200**.

[0048] As shown in FIGS. **8** and **9**, the slip gear outer body **210** defines a second opening (e.g., a second cavity, a slip gear assembly cavity, a second chamber, a second recess, etc.), shown as slip gear cavity **216**, extending partially through the slip gear outer body **210**. The slip gear cavity **216** is configured to receive the outer pressure plates **240**, the inner pressure plates **250**, and the slip gear inner body **230**. According to an exemplary embodiment, the slip gear cavity **216** is open to an environment surrounding the vehicle **10**. By way of example, the slip gear assembly **200** may not be sealed off from the environment by a seal (e.g., a gasket, a fluid seal, etc.). The slip gear cavity **216** may be centered around the axis A_R. By way of example, the slip gear cavity **216** may be a cylindrical cavity that is centered on a rotational axis that the slip gear outer body **210** rotates around when the slip gear outer body **210** rotates with the bottom drive sprocket **140**. As shown in FIGS. **8**, **9**, **11**, and **12**, the slip gear outer body **210** includes a first surface (e.g., a first contact surface, etc.), shown as slip gear contact surface **218**, that defines a bottom or rear of the slip gear cavity **216**. The slip gear contact surface **218** is oriented perpendicular to the axis A_R.

[0049] As shown in FIGS. **8**, **9**, **11**, and **12**, the slip gear outer body **210** defines a third aperture, shown as outer body shaft aperture **220**, extending through the slip gear outer body **210**. In some embodiments, the outer body shaft aperture **220** extends through the slip gear contact surface **218**. By way of example, when the slip gear cavity **216** is configured as a cylindrical cavity and the outer body shaft aperture **220** is circular, a first radius of the slip gear cavity **216** may be greater than a second radius of the outer body shaft aperture **220**. The outer body shaft aperture **220** may be centered on the axis A_R that extends along the length of the drive shaft **160**. As shown in FIG. **7**, the outer body shaft aperture **220** is configured to align with and receive the drive shaft **160** such that the drive shaft **160** extends through the slip gear outer body **210**. In some embodiments, the outer body shaft aperture **220** is configured to align with and receive the slip gear inner body **230** such that the slip gear inner body **230** extends through the outer body shaft aperture **220**.

[0050] As shown in FIGS. **8**, **9**, **11**, and **12**, the slip gear outer body **210** includes a first engagement interface, shown as outer body engagement interface **222**, extending around an inner surface of the slip gear outer body **210** defined by the slip gear cavity **216**. The outer body engagement interface **222** is configured to engage the outer pressure plates **240** to couple the outer pressure plates **240** to the slip gear outer body **210**. By way of example, the outer body engagement interface **222** may engage the outer pressure plates **240** to transfer the power provided by the prime mover **52** from the slip gear outer body **210** to the outer pressure plates **240**. In some embodiments, the outer body engagement interface **222** extends along a depth of the slip gear cavity **216** from the slip gear contact surface **218** to a top or front of the slip gear cavity **216**. According to an exemplary embodiment, the outer body engagement interface **222** is configured as a first portion of a spline connection (e.g., an involute spline connection, a straight-sided spline connection, a helical spine connection, etc.) between the slip gear outer body **210** and the outer pressure plates **240**. For example, the outer body engagement interface **222** may be configured as a female spline portion of the spline connection configured to engage male spline portions of the outer pressure plates **240** to couple the slip gear outer body **210** to the outer pressure plates **240**. In other embodiments, the outer body engagement interface **222** is configured as a first portion of other mating connections configured to engage second portions of the other mating connections defined by the outer pressure plates **240**. For example, the outer body engagement interface **222** may be configured as a female portion of a polygonal connection (e.g., a hexagonal connection, an octagonal connection, etc.), a female portion of a keyed connection, etc.

[0051] As shown in FIGS. **8**, **9**, **11**, and **12**, the slip gear outer body **210** defines a groove (e.g., a gap, etc.), shown as retainer groove **224**, extending around the inner surface of the slip gear outer body **210** defined by the slip gear cavity **216** and radially outward from the slip gear cavity into the slip gear outer body **210**. By way of example, when the slip gear cavity **216** is configured as a cylindrical cavity, the first radius of the slip gear cavity **216** may be less than a third radius of the retainer groove **224**. The retainer groove **224** may be positioned between the top of the slip gear cavity **216** and the slip gear contact surface **218**.

[0052] As shown in FIGS. **7** and **10-12**, the slip gear inner body **230** includes a fourth shaft interface (e.g., fourth torque interface, etc.), shown as axle interface **232**, extending through the slip gear inner body **230** and configured to engage the gear interface **162** of the drive shaft **160** to couple the slip gear inner body **230** to the drive shaft **160**. The axle interface **232** is configured to engage the gear interface **162** to rotate the drive shaft **160** with the slip gear inner body **230**. The axle interface **232** may transfer power from the slip gear inner body **230** to the drive shaft **160** through the gear interface **162**. According to an exemplary embodiment, the axle interface **232** and the gear interface **162** are configured as opposing portions of a spline connection between the axle interface **232** and the gear interface **162**. By way of example, the axle interface **232** may be configured as a female spline portion and the gear interface **162** may be configured as a male spline portion configured to engage the female spile portion to couple the slip gear inner body **230** to the drive shaft **160**. In other embodiments, the axle interface **232** and the gear interface **162** are configured as other mating connections configured to couple the slip gear inner body **230** to the drive shaft **160**. By way of example, the axle interface **232** and the gear interface **162** may be configured as opposing portions of a polygonal connection, a keyed connection, etc.

[0053] As shown in FIGS. **7** and **10-12**, the slip gear inner body **230** includes a second engagement interface, shown as inner body engagement interface **234**, extending around an outer surface of the slip gear inner body **230**. The inner body engagement interface **234** is configured to engage the inner pressure plates **250** to couple the inner pressure plates **250** to the slip gear inner body **230**. By way of example, the inner body engagement interface **234** may engage the inner pressure plates **250** to transfer the power provided by the prime mover **52** from the inner pressure plates **250** to the slip gear inner body **230**. According to an exemplary embodiment, the inner body engagement interface **234** is configured as a first portion of a spline connection between the slip gear inner body **230** and the inner pressure plates **250**. By way of example, the inner body engagement interface **234** may be configured as a male spline portion of the spine connection configured to engage female spine portions of the inner pressure plates **250** to couple the slip gear inner body **230** to the inner pressure plates **250**. In other embodiments, the inner body engagement interface **234** is configured as a first portion of other mating connections configured to engage second portions of the other mating connections included in the inner pressure plates **250**. For example, the inner body engagement interface **234** may be configured as a male portion of a polygonal connection, a male portion of a keyed connection, etc.

[0054] As shown in FIGS. **7** and **9-12**, the slip gear inner body **230** includes a flange, shown as inner body flange **236**, extending outward at an end of the slip gear inner body **230**. The inner body flange **236** is configured to retain (e.g., contain, etc.) the outer pressure plates **240** and the inner pressure plates **250** between the inner body flange **236** and the slip gear contact surface **218**. By way of example, the inner body flange **236** and the slip gear contact surface **218** may prevent the outer pressure plates **240** from disengaging from the outer body engagement interface **222** and the inner pressure plates **250** from disengaging from the inner body engagement interface **234**. The inner body flange **236** extends further than the inner body engagement interface **234** such that a first maximum radius of the inner body flange **236** is greater than a second maximum radius of the inner body engagement interface **234**.

[0055] According to an exemplary embodiment, the inner body flange **236** includes at least one first friction surface positioned on a side of the inner body flange **236**. The first friction surface may extend in a direction perpendicular to the axis A_R. In some embodiments, the inner body flange **236** is formed from steel (e.g., hardened steel, etc.) and the first friction surface may have first friction properties based on friction properties of the steel. By way of example, the inner body flange **236** may be formed from steel to accommodate the loads on the inner body flange **236** from retaining the outer pressure plates **240** and the inner pressure plates **250**. According to the exemplary embodiment shown in FIGS. **10** and **11**, the first friction surface of the inner body flange **236** is coated with a coating (e.g., a copper coating, a ceramic coating, a dry lubricant coating, a rubber coating, etc.), shown as flange surface coating **238**, formed from a material with high friction properties (e.g., copper, ceramic, dry lubricant, rubber, materials with a high surface roughness, materials with a low hardness, materials with higher friction properties than steel, etc.) so that the first friction surface may form a high coefficient of friction with other surfaces (e.g., higher than a coefficient of friction between two steel surfaces, etc.). By way of example, the inner body flange **236** may be formed from steel to accommodate the loads on the inner body flange **236** from retaining the outer pressure plates **240** and the inner pressure plates **250** and the first friction surface of the inner body flange **236** may be coated with the flange surface coating **238** formed from copper, dry lubricant, rubber, and/or ceramic. In other embodiments, the inner body flange **236** is formed from materials that have high friction properties so that the first friction surface of the inner body flange **236** may form high coefficients of friction with other surfaces. By way of example, the inner body flange **236** may be formed from copper, ceramic, rubber, or other materials with higher friction properties than steel.

[0056] As shown in FIGS. **9** and **10**, each of the outer pressure plates **240** define a fourth aperture, shown as outer plate aperture **242**, extending through the outer pressure plates **240**. The outer plate aperture **242** may be centered on the axis A_R that extends along the length of the drive shaft **160**. The outer plate apertures **242** are configured to align with and receive the drive shaft **160** such that the drive shaft **160** extends through the outer pressure plates **240**. In some embodiments, the outer plate apertures **242** are configured to align with and receive the slip gear inner body **230** such that the slip gear inner body **230** extends through the outer plate apertures **242**.

[0057] As shown in FIGS. **9-12**, each of the outer pressure plates **240** include a third engagement interface, shown as outer plate engagement interface **244**, extending around an outer surface or periphery of the outer pressure plates **240**. The outer plate engagement interfaces **244** are configured to engage the outer body engagement interface **222** of the slip gear outer body **210** to couple the outer pressure plates **240** to the slip gear outer body **210**. By way of example, the outer body engagement interfaces **222** may engage with the outer plate engagement interface **244** to transfer the power provided by the prime mover **52** from the slip gear outer body **210** to the outer pressure plates **240**. According to an exemplary embodiment, the outer plate engagement interfaces **244** are configured as the second portions of the spline connection between the slip gear outer body **210** and the outer pressure plates **240**. By way of example, the outer plate engagement interfaces **244** may be configured as the male portions of the spline connection configured to engage the outer body engagement interface **222** configured as the female portion of the spline connection. In other embodiments, the outer plate engagement interfaces **244** are configured as the second portions of other mating connections configured to engage the outer body engagement interface **222** configured as the first portion of the other mating connections.

[0058] According to an exemplary embodiment, each of the outer pressure plates **240** includes second friction surfaces positioned on opposing sides of the outer pressure plates **240**. The second friction surfaces of the outer pressure plates **240** may extend along the outer pressure plates **240** in a direction perpendicular to the axis A_R. In some embodiments, the outer pressure plates **240** are formed from steel (e.g., hardened steel, etc.) and the second friction surfaces may have second friction properties based on friction properties of the steel. By way of example, the outer pressure plates **240** may be formed from steel to accommodate the loads transferred between the slip gear outer body **210** and the outer pressure plates **240** via the engagement of the outer body engagement interface **222** with the outer plate engagement interfaces **244**. In other embodiments, the outer pressure plates **240** are formed from materials that have high friction properties (e.g., high surface roughness, low hardness, friction properties than steel, etc.) so that the second friction surfaces may form high coefficients of friction with other surfaces. By way of example, the outer pressure plates **240** may be formed from copper, ceramic, rubber, or other materials with higher friction properties than steel. In still other embodiments, the second friction surfaces of the outer pressure plates **240** are coated with a material with high friction properties (e.g., higher than steel, etc.) so that the second friction surfaces may form high coefficients of friction with other surfaces (e.g., higher than a coefficient of friction between two steel surfaces, etc.). By way of example, the outer pressure plates **240** may be formed from steel to accommodate the loads transferred between the slip gear outer body **210** and the outer pressure plates **240** via the engagement of the outer body engagement interface **222** with the outer plate engagement interfaces **244** and the second friction surfaces of the outer pressure plates **240** may be coated with copper, a solid lubricant, rubber, and/or ceramic.

[0059] As shown in FIGS. **9** and **10**, each of the inner pressure plates **250** define a fifth aperture, shown as inner plate aperture **252**, extending through the inner pressure plates **250**. The inner plate aperture **252** may be centered on the axis A_R that extends along the length of the drive shaft **160**. The inner plate apertures **252** are configured to align with and receive the drive shaft **160** such that the drive shaft **160** extends through the inner pressure plates **250**. In some embodiments, the inner plate apertures **252** are configured to align with and receive the slip gear inner body **230** such that the slip gear inner body **230** extends through the inner plate apertures **252**.

[0060] As shown in FIGS. **9-12**, each of the inner pressure plates **250** includes a fourth engagement interface, shown as inner plate engagement interface **254**, extending around an inner surface or periphery of the inner pressure plates **250** defined by the inner plate aperture **252**. The inner plate engagement interfaces **254** are configured to engage the inner body engagement interface **234** of the slip gear inner body **230** to couple the inner pressure plates **250** to the slip gear inner body **230**. By way of example, the inner plate engagement interfaces **254** may engage with the inner body engagement interface **234** to transfer the power provided by the prime mover **52** from the inner pressure plates **250** to the slip gear inner body **230**. According to an exemplary embodiment, the inner plate engagement interfaces **254** are configured as the second portions of the spline connection between the slip gear inner body **230** and the inner pressure plates **250**. By way of example, the inner plate engagement interfaces **254** may be configured as the female portions of the spline connection configured to engage the inner body engagement interface **234** configured as the female portion of the spine connection. In other embodiments, the inner plate engagement interfaces are configured as the second portions of other mating connections configured to engage the inner body engagement interface **234** configured as the first portion of the other mating connections.

[0061] According to an exemplary embodiment, each of the inner pressure plates **250** include third friction surfaces positioned on opposing sides of the inner pressure plates **250**. The third friction surfaces may extend in a direction perpendicular to the axis A_R. In some embodiments, the inner pressure plates **250** are formed from steel (e.g., hardened steel, etc.) and the third friction surfaces may have third friction properties based on friction properties of the steel. By way of example, the inner pressure plates **250** may be formed from steel to accommodate the loads transferred between the inner pressure plates **250** and the slip gear inner body **230** via the engagement of the inner body engagement interface **234** with the inner plate engagement interface **254**. According to the exemplary embodiment shown in FIG. **10**, the third friction surfaces of the inner pressure plates **250** are coated with a coating (e.g., a copper coating, a ceramic coating, a rubber coating, a dry lubricant coating, etc.), shown as inner plate surface coating **256**, formed from a material with high friction properties (e.g., copper, rubber, ceramic, dry lubricant, materials with a high surface roughness, materials with a low hardness, materials with higher friction properties than steel, etc.) so that the third friction surfaces may form a high coefficient of friction with the second friction surfaces of the outer pressure plates **240** and/or other surfaces (e.g., higher than a coefficient of friction between two steel surfaces, etc.). By way of example, the inner pressure plates **250** may be formed from steel to accommodate the loads transferred between the slip gear inner body **230** and the inner pressure plates **250** via the engagement of the inner body engagement interface **234** with the inner plate engagement interface and the third friction surfaces of the inner pressure plates **250** may be coated with the inner plate surface coating **256** formed from copper, rubber, dry lubricant, and/or ceramic. In other embodiments, the inner pressure plates **250** are formed from materials that have high friction properties so that the third friction surface of the inner pressure plates **250** may form high coefficients of friction with the second friction surfaces of the outer pressure plates **240** and/or other surfaces. By way of example, the inner pressure plates **250** may be formed from copper, rubber, ceramic, or other materials with higher friction properties than steel.

[0062] As shown in FIGS. **9-12**, the outer pressure plates **240** and the inner pressure plates **250** may be arranged in alternating pattern between the inner body flange **236** of the slip gear inner body **230** and the slip gear contact surface **218** of the slip gear outer body **210**. By way of example, the outer pressure plates **240** and the inner pressure plates **250** may be arranged in a direction from the inner body flange **236** of the slip gear inner body **230** to the slip gear contact surface **218** of the slip gear outer body **210** as a first of the inner pressure plates **250**, followed by a first of the outer pressure plates **240**, followed by a second of the inner pressure plates **250**, followed by a second of the outer pressure plates **240**, followed by a third of the inner pressure plates **250**, followed by a third of the outer pressure plates **240**. In other embodiments, the slip gear assembly **200** includes a different number of the inner pressure plates **250** and a different number of the outer pressure plates **240** positioned between the inner body flange **236** of the slip gear inner body **230** and the slip gear contact surface **218** of the slip gear outer body **210** (e.g., one, two, four, etc.).

[0063] According to the exemplary embodiment shown in FIGS. **9-11**, the outer pressure plates **240** and the inner pressure plates **250** are arranged in the slip gear assembly **200** such that at least one of the second friction surfaces of each of the outer pressure plates **240** is in contact (e.g., direct contact, etc.) with one of the third friction surfaces of the inner pressure plates **250** to form a coefficient of friction between the second friction surfaces of the outer pressure plates **240** that are in contact with the third friction surfaces of the inner pressure plates **250**. The friction between the second friction surfaces of the outer pressure plates **240** and the third friction surfaces of the inner pressure plates **250** may allow for the outer pressure plates **240** to selectively couple with the inner pressure plates **250** when a load torque (e.g., a load, a load force, etc.) applied on the inner pressure plates **250** by the outer pressure plates **240** is less than a friction torque (e.g., a friction force, etc.) between the second friction surfaces of the outer pressure plates **240** and the third friction surfaces of the inner pressure plates **250**. When the load torque applied on the outer pressure plates **240** by the inner pressure plates **250** exceeds the friction torque between the second friction surfaces of the outer pressure plates **240** and the third friction surfaces of the inner pressure plates **250**, the friction coupling the second friction surfaces of the outer pressure plates **240** and the third friction surfaces of the inner pressure plates **250** may be overcome and the outer pressure plates **240** may rotate (e.g., slip, etc.) relative to the inner pressure plates **250**. By way of example, when a load applied on the outer pressure plates **240** and/or the inner pressure plates **250** exceeds the load threshold of the slip gear assembly **200**, the load torque applied on the outer pressure plates **240** by the inner pressure plates **250** may overcome the friction torque between the second friction surfaces of the outer pressure plates **240** and the third friction surfaces of the inner pressure plates **250**, causing the inner pressure plates **250** to slip relative to the outer pressure plates **240** and the load to not be transferred between the outer pressure plates **240** and the inner pressure plates **250**.

[0064] In some embodiments, the positions of the outer pressure plates **240** and/or the inner pressure plates **250** are swapped (e.g., changed, etc.) for other configurations of the outer pressure plates **240** and/or the inner pressure plates **250** to modify the load threshold of the slip gear assembly **200**. By way of example, since the friction torque between the outer pressure plates **240** and the inner pressure plates **250** depends on the coefficient of friction between the second friction surfaces of the outer pressure plates **240** and the third friction surfaces of the inner pressure plates **250**, the load threshold of the slip gear assembly **200** may be modified by changing the coefficient of friction between the second friction surfaces of the outer pressure plates **240** and the third friction surfaces of the inner pressure plates **250**. If a first combination of the outer pressure plates **240** and the inner pressure plates **250** where the third friction surface of the inner pressure plates **250** are coated in ceramic results in a first coefficient of friction and a second combination of the outer pressure plates **240** and the inner pressure plates **250** where the third friction surface of the inner pressure plates **250** are coated in copper results in a second coefficient of friction different than the first coefficient of friction, the outer pressure plates **240** and the inner pressure plates **250** may be changed between the first combination and the second combination to increase or decrease the load threshold of the slip gear assembly **200**.

[0065] As shown in FIGS. **9**, **11**, and **12**, the slip gear assembly **200** includes a compression component (e.g., a spring, a compression bushing, a Belleville washer, a disc spring, etc.), shown as spring **260**, positioned between (i) the slip gear contact surface **218** of the slip gear outer body **210** and (ii) the outer pressure plates **240** and the inner pressure plates **250**. The spring **260** may be placed in compression to provide a normal force on the outer pressure plates **240** and the inner pressure plates **250**. The normal force applied by the spring **260** on the outer pressure plates **240** and the inner pressure plates **250** is in a direction parallel to the axis A_R and is configured to push the outer pressure plates **240** and the inner pressure plates **250** towards the inner body flange **236** of the slip gear inner body **230**. In other embodiments, the spring **260** is positioned between (i) the inner body flange **236** and (ii) the outer pressure plates **240** and the inner pressure plates **250** so that the normal force applied by the spring **260** on the outer pressure plates **240** and the inner pressure plates **250** towards the slip gear contact surface **218**. In still other embodiments, the spring **260** is positioned between at least one of the outer pressure plates **240** and at least one of the inner pressure plates **250**. In various embodiments, the slip gear assembly **200** includes a plurality of the springs **260**.

[0066] As shown in FIG. **9**, the spring **260** defines a sixth aperture, shown as spring aperture **262**, extending through the spring **260**. The spring aperture **262** may be centered on the axis A_R that extends along the length of the drive shaft **160**. The spring aperture **262** is configured to align with and receive the drive shaft **160** such that the drive shaft **160** extends through the spring **260**. In some embodiments, the spring aperture **262** is configured to align with and receive the slip gear inner body **230** such that the slip gear inner body **230** extends through the spring **260**.

[0067] In some embodiments, the spring **260** is swapped (e.g., changed, etc.) for other configurations of the spring **260** to modify the load threshold of the slip gear assembly **200**. By way of example, since the friction torque between the outer pressure plates **240** and the inner pressure plates **250** depends on a force between the outer pressure plates **240** and the inner pressure plates **250** perpendicular to the second friction surfaces of the outer pressure plates **240** and the third friction surfaces of the inner pressure plates **250**, the load threshold of the slip gear assembly **200** may be modified by changing the normal force applied by the spring **260** on the outer pressure plates **240** and the inner pressure plates **250**. If a first of the springs **260** with a first spring constant results in a first normal force being applied by the spring **260** on the outer pressure plates **240** and the inner pressure plates **250** and a second of the springs **260** with a second spring constant higher than the first spring constant results in a second normal force that is higher than the first normal force being applied by the spring **260** on the outer pressure plates **240** and the inner pressure plates **250**, the slip gear assembly **200** may be changed from including the first of the springs **260** to including the second of the springs **260** to increase the load threshold of the slip gear assembly **200**.

[0068] As shown in FIGS. **8**, **9**, **11**, and **12**, the slip gear assembly **200** includes at least one spacer (e.g., a filler, an insert, a washer, etc.), shown as shim **264**, positioned between the spring **260** and the slip gear contact surface **218** of the slip gear outer body **210**. The shim **264** is configured to change a spacing of the spring **260** relative to the slip gear contact surface **218**. By way of example, the shim **264** may be added between the spring **260** and the slip gear contact surface **218** to increase a compression of the spring **260**, thereby increasing the normal force provided by the spring **260** on the outer pressure plates **240** and the inner pressure plates **250**. In some embodiments, the slip gear assembly

200 includes multiple of the shims **264** (i.e., a shim stack) positioned between the spring **260** and the slip gear contact surface **218** of the slip gear outer body **210**. The multiple of the shims **264** may further increase the compression of the spring **260**. In other embodiments, the shim **264** is positioned between the spring **260** and the inner body flange **236** (e.g., when the spring **260** is positioned between (i) the inner body flange **236** and (ii) the outer pressure plates **240** and the inner pressure plates **250**, etc.). In still other embodiments, the slip gear assembly **200** does not include the shim **264**.

[0069] As shown in FIG. **9**, the shim **264** defines a seventh aperture, shown as shim aperture **266**, extending through the shim **264**. The shim aperture **266** may be centered on the axis A_R that extends along the length of the drive shaft **160**. The shim aperture **266** is configured to align with and receive the drive shaft **160** such that the drive shaft **160** extends through the shim **264**. In some embodiments, the shim aperture **266** is configured to align with and receive the slip gear inner body **230** such that the slip gear inner body **230** extends through the shim **264**.

[0070] In some embodiments, the shim **264** is swapped (e.g., changed, etc.) for another configuration of the shim **264** to modify the load threshold of the slip gear assembly **200**. By way of example, since the friction torque between the outer pressure plates **240** and the inner pressure plates **250** depends on the normal force between the outer pressure plates **240** and the inner pressure plates **250**, the load threshold of the slip gear assembly **200** may be modified by changing the normal force applied by the spring **260** on the outer pressure plates **240** and the inner pressure plates **250**. If a first of the shims **264** with a first thickness causes a first compression of the spring **260** that results in a first normal force being applied by the spring **260** on the outer pressure plates **240** and the inner pressure plates **250** and a second of the shims **264** with a second thickness that is greater than the first thickness causes a second compression of the spring **260** results in a second normal force that is higher than the first normal force being applied by the spring **260** on the outer pressure plates **240** and the inner pressure plates **250**, the slip gear assembly **200** may be changed from including the first of the shims **264** to including the second of the shims **264** to increase the load threshold of the slip gear assembly **200**. In various embodiments, the shims **264** are added or removed from the slip gear assembly **200** to modify the load threshold of the slip gear assembly **200**.

[0071] As shown in FIGS. **9-12**, the slip gear assembly **200** includes a plate (e.g., a retainer plate, a retention plate, etc.), shown as face plate **270**, configured to engage the slip gear outer body **210** and rotate with the slip gear outer body **210**. As shown in FIGS. **9** and **10**, the face plate **270** defines an eight aperture, shown as face plate aperture **272**, extending through the face plate **270**. The face plate aperture **272** may be centered on the axis A_R that extends along the length of the drive shaft **160**. The face plate aperture **272** is configured to align with and receive the drive shaft **160** such that the drive shaft **160** extends through the face plate **270**. In some embodiments, the face plate aperture **272** is configured to align with and receive the slip gear inner body **230** such that the slip gear inner body **230** extends through the face plate **270**.

[0072] As shown in FIGS. **9** and **10**, the face plate **270** includes a fifth engagement interface, shown as face plate engagement interface **274**, extending around an outer surface or periphery of the face plate **270**. The face plate engagement interface **274** is configured to engage the outer body engagement interface **222** of the slip gear outer body **210** to couple the face plate **270** to the slip gear outer body. By way of example, the outer body engagement interfaces **222** may engage with the face plate engagement interface **274** to transfer the power provided by the prime mover **52** from the slip gear outer body **210** to the face plate **270**. According to an exemplary embodiment, the face plate engagement interface **274** is configured as the second portion of the spline connection between the slip gear outer body **210** and the face plate **270**. By way of example, the face plate engagement interface **274** may be configured as the male portion of the spline connection configured to engage the outer body engagement interface **222** configured as the female portion of the spline connection. In other embodiments, the face plate engagement interface **274** is configured as the second portion of other mating connections configured to engage the outer body engagement interface **222** configured as the first portion of the other mating connections.

[0073] According to an exemplary embodiment, the face plate **270** includes a fourth friction surface positioned on a surface of the face plate **270**. The fourth friction surface of the face plate **270** may extend along the face plate **270** in a direction perpendicular to the axis A_R. In some embodiments, the face plate **270** is formed from steel (e.g., hardened steel, etc.) and the fourth friction surface may have fourth friction properties based on friction properties of steel. By way of example, the face plate **270** may be formed from steel to accommodate the loads transferred between the slip gear outer body **210** and the face plate **270** via the engagement of the outer body engagement interface **222** with the face plate engagement interface **274**. In other embodiments, the face plate **270** is formed from materials that have high friction properties (e.g., high surface roughness, low hardness, friction properties than steel, etc.) so that the fourth friction surface may form a high coefficient of friction with the third friction surface of the inner body flange **236** and/or other surfaces. By way of example, the face plate **270** may be formed from copper, ceramic, rubber, or other materials with higher friction properties than steel. In still other embodiments, the fourth friction surface of the face plate **270** is coated with a material with high friction properties (e.g., higher than steel, etc.) so that the fourth friction surface may form high coefficient of friction with the third friction surface of the inner body flange **236** and/or other surfaces (e.g., higher than a coefficient of friction between two steel surfaces, etc.). By way of example, the face plate **270** may be formed from steel to accommodate the loads transferred between the slip gear outer body **210** and the face plate **270** via the engagement of the outer body engagement interface **222** with the face plate engagement interface **274** and the fourth friction surfaces of the face plate **270** may be coated with copper, rubber, a solid lubricant, and/or ceramic.

[0074] As shown in FIGS. **9**, **11**, and **12**, the slip gear assembly **200** includes a retainer (e.g., a retainer clip, a retainer body, etc.), shown as retainer ring **280**, coupled to the slip gear outer body **210** and configured to interface with the face plate **270**. A first portion of the retainer ring **280** extends into the retainer groove **224** and a second portion of the retainer ring **280** contacts the face plate **270** to prevent the face plate **270**, the outer pressure plates **240**, the inner pressure plates **250**, the spring **260**, and/or the shim **264** from being removed from the slip gear cavity **216**. By way of example, when the retainer ring **280** extends into the retainer groove **224** and contacts the face plate **270**, the retainer ring **280** may hold the face plate **270**, the outer pressure plates **240**, the inner pressure plates **250**, the spring **260**, and/or the shim **264** between the retainer ring **280** and the slip gear contact surface **218** of the slip gear outer body **210**. When the retainer ring **280** is positioned in the retainer groove **224**, the spring **260** is compressed and applies the normal force on the outer pressure plates **240** and the inner pressure plates **250**. In some embodiments, the retainer ring **280** transfers the normal force applied by the spring **260** on the outer pressure plates **240** and the inner pressure plates **250** to the slip gear outer body **210**. By way of example, the spring **260** may be compressed by the slip gear contact surface **218** of the slip gear outer body **210** via the shim **264** on a first side of the spring **260** and by the retainer groove **224** of the slip gear outer body **210** via the retainer ring **280**, the face plate **270**, the outer pressure plates **240**, and the inner pressure plates **250** on a second side of the spring **260**.

[0075] According to the exemplary embodiment shown in FIGS. **11** and **12**, the outer pressure plates **240** vary in thickness. By way of example, the outer pressure plate **240** positioned closest to the spring **260** may have a first thickness that is greater than a second thickness of the other of the outer pressure plates **240** to accommodate the normal force applied on the outer pressure plate **240** positioned closest to the spring **260** by the spring **260**. In some embodiments, the inner pressure plates **250** vary in thickness.

[0076] According to the exemplary embodiment shown in FIG. **12**, the slip gear assembly **200** includes a plurality of discs (e.g., friction discs, etc.), shown as insert discs **290**, inserted between the outer pressure plates **240** and the inner pressure plates **250**. The insert discs **290** include fifth friction surfaces positioned on opposing sides of the insert discs **290**. The fifth friction surface may extend in a direction perpendicular to the axis A_R. According to the exemplary embodiment shown in FIG. **12**, the insert discs **290** are formed from materials that have high friction properties (e.g., copper, rubber, ceramic, materials with a high surface roughness, materials with a low hardness, materials with higher friction properties than steel, etc.) so that the fifth friction surfaces of the insert discs **290** may form high coefficient of frictions with the second friction surfaces of the outer pressure plates **240**, the third friction surfaces of the inner pressure plates **250**, and/or other surfaces. By way of example, the insert discs **290** may be formed from copper, rubber, ceramic, or other materials with higher friction properties than steel. In other embodiments, the fifth friction surfaces of the insert discs **290** are coated with a coating (e.g., a copper coating, a ceramic coating, a rubber coating, a dry lubricant coating, etc.) formed from a material with high friction properties (e.g., copper, rubber, ceramic, dry lubricant, materials with a high surface roughness, materials with a low hardness, materials with higher friction properties than steel, etc.) so that the fifth friction surface may form a high coefficient of friction with the second friction surfaces of the outer pressure plates **240**, the third friction surfaces of the inner pressure plates **250**, and/or other surfaces.

[0077] According to the exemplary embodiment shown in FIG. **12**, the outer pressure plates **240**, the inner pressure plates **250**, and the insert discs **290** are arranged in the slip gear assembly **200** such that the fifth friction surfaces of the insert discs **290** are in contact (e.g., direct contact, etc.) with at least one of the first friction surfaces of the inner body flange **236**, the second friction surfaces of the outer pressure plates **240**, the third friction surfaces of the inner pressure plates **250**, or the fourth friction surface of the face plate **270** to form coefficient of frictions between (i) the fifth friction surfaces of the insert discs **290** and (ii) the first friction surfaces of the inner body flange **236**, the second friction surfaces of the outer pressure plates **240**, the third friction surfaces of the inner pressure plates **250**, and the fourth friction surface of the face plate **270** that are in contact with the fifth friction surfaces of the insert discs **290**. The friction between (i) the fifth friction surfaces of the insert discs **290** and (ii) the second friction surfaces of the outer pressure plates **240** and the third friction surfaces of the inner pressure plates **250** may allow for the outer pressure plates **240** to selectively couple with the inner pressure plates **250** when a load torque applied on the outer pressure plates **240** by the inner pressure plates **250** through the insert discs **290** is less than a first friction torque between the fifth friction surfaces of the insert discs **290** and the second friction surfaces of the outer pressure plates **240** and less than a second friction torque between the fifth friction surfaces of the insert discs **290** and the third friction surfaces of the inner pressure plates **250**. When the load torque applied on the inner pressure plates **250** by the outer pressure plates **240** via the insert discs **290** exceeds either the first friction torque between the fifth friction surfaces of the insert discs **290** and the second friction surfaces of the outer pressure plates **240** or the second friction torque between the fifth friction surfaces of the insert discs **290** and the third friction surfaces of the inner pressure plates **250**, the first friction torque or the second friction may be overcome and the outer pressure plates **240** may rotate relative to the inner pressure plates **250**.

[0078] In some embodiments, the insert discs **290** are configured as wear components that wear throughout the operation of the vehicle **10**. When operation of the slip gear assembly **200** has degraded due to the wear of the insert discs **290**, the insert discs **290** may be replaced to increase the performance of the slip gear assembly **200** without replacing other components of the slip gear assembly **200** (e.g., the outer pressure plates **240**, the inner pressure plates **250**, etc.). Since the insert discs **290** are simpler components than the other components of the slip gear assembly **200** (e.g., formed out of a softer material, have less features, etc.), the insert discs **290** may make a process of refurbishing the slip gear assembly **200** easier.

Modular Slip Gear Assembly

[0079] As shown in FIGS. **3** and **5-7**, the slip gear assembly **200** is configured as a modular slip gear assembly that can be replaced by another modular slip gear assembly. By way of example, while operating the vehicle **10** in certain conditions (e.g., in a race, over jumps, etc.), performance of the slip gear assembly **200** may degrade (e.g., the outer pressure plates **240** and/or the inner pressure plates **250** may wear, the load threshold of the slip gear assembly **200** may decrease, etc.). By configuring the slip gear assembly **200** as the modular slip gear assembly, a first of the slip gear assemblies **200** may be replaced with a second of the slip gear assemblies **200** when the performance of the first of the slip gear assemblies **200** has degraded, allowing for the operational level of the vehicle **10** to be restored. By way of example, if the operator of the vehicle **10** determines that the performance of the slip gear assembly **200** has degraded during a race, the operator may replace the slip gear assembly **200** without removing the other components of the transmission assembly **100**, allowing the operator to improve the performance of the vehicle **10** quickly and easily during or between race events. In order to remove the slip gear assembly **200** from the transmission assembly **100**, the outer body fasteners **214** are removed from the outer body apertures **212** so that the slip gear assembly **200** can be slid off of an end of the drive shaft **160** to disengage the axle interface **232** from the gear interface **162** of the drive shaft **160**. Another of the slip gear assemblies **200** can then be installed into the transmission assembly **100** by sliding the slip gear assembly **200** onto the end of the drive shaft **160** to engage the axle interface **232** with the gear interface **162** and insert the outer body fasteners **214** through the outer body apertures **212** to couple the slip gear assembly **200** to the bottom drive sprocket **140**.

[0080] According to an exemplary embodiment, the slip gear assembly **200** is configured to couple to multiple different configurations of the bottom drive sprocket **140**. By being able to couple to the multiple different configurations of the bottom drive sprocket **140**, the gear ratio of the belt assembly **130** may be changed by changing the bottom drive sprocket **140** without changing the slip gear assembly **200**. By way of example, the operator of the vehicle **10** may desire to change the gear ratio of the belt assembly **130** in order to adjust the performance of the vehicle **10** (e.g., increase a power provided to the front tractive assembly **58** and/or the rear tractive assembly **56**, increase a speed of the front tractive assembly **58** and/or the rear tractive assembly **56**, etc.). The operator of the vehicle **10** may exchange a first of the bottom drive sprockets **140** with a first number of teeth for a second of the bottom drive sprockets **140** with a second with a second number of teeth to change the gear ratio of the belt assembly **130**. When the first of the bottom drive sprockets **140** and the second of the bottom drive sprockets **140** have the same pattern of the mounting apertures **147**, the outer body apertures **212** of the slip gear outer body **210** of the slip gear assembly **200** may align with the mounting apertures **147** of either the first of the bottom drive sprockets **140** or the second of the bottom drive sprockets **140** to receive the outer body fasteners **214** to couple the slip gear outer body **210** to either the bottom drive sprockets **140** or the second of the bottom drive sprockets **140**. As a result, the operator may utilize the slip gear assembly **200** with either the first of the bottom drive sprockets **140** or the second of the bottom drive sprockets **140** based on the desired gear ratio of the belt assembly **130**.

[0081] In some embodiments, multiple different configurations of the slip gear assembly **200** is configured to be installed into the transmission assembly **100** to allow for changes in performance to the vehicle **10** without modifying the other components of the transmission assembly **100**. By way of example, the operator of the vehicle **10** may desire a first of the slip gear assemblies **200** with a first load threshold during a cross-country race and a second of the slip gear assemblies **200** with a second load threshold during a snow-cross race (e.g., a race that includes jumps, etc.) that is lower than the first load threshold due to load spikes that are generated while landing a jump in the vehicle **10** under power. In order to achieve the desired load thresholds, the operator may install the first of the slip gear assemblies **200** with the first load threshold into the transmission assembly **100** during the cross-country race and may swap the first of the slip gear assemblies **200** with the second of the slip gear assemblies **200** during the snow-cross race. As a result, the operator may achieve the desired load thresholds without having to modify the other components of the transmission assembly **100** and/or use different of the vehicles **10** for the different races.

[0082] According to an exemplary embodiment, since the bottom drive sprocket **140** is a separate component (e.g., not integrally formed with, coupled to, etc.), the slip gear assembly **200**, the bottom drive sprocket **140** and the slip gear outer body **210** may be formed from separate materials. In some embodiments, the bottom drive sprocket **140** is formed from a first material (e.g., a lightweight material, etc.) with a lower density than a second material used to form the slip gear outer body **210**. By way of example, the slip gear outer body **210** may be formed out of steel (e.g., hardened steel, etc.) in order to accommodate the loads transferred between the slip gear outer body **210** and the outer pressure plates **240** and/or wear caused by other components of the slip gear assembly **200** while the bottom drive sprocket **140** may be formed out of aluminum since the loading and wear demands of the bottom drive sprocket **140** are lower. By forming the bottom drive sprocket **140** out of aluminum, a weight of the transmission assembly **100** may be decreased (e.g., compared to when the bottom drive sprocket **140** is formed out of steel, etc.), allowing for better performance (e.g., higher speeds, faster acceleration, etc.) of the vehicle **10**. In various embodiments, since the slip gear assembly **200** limits limit loads transferred from the drive shaft **160** to the bottom drive sprocket **140**, other components of the driveline **50** (e.g., components of the transmission assembly **100** positioned between the bottom drive sprocket **140** and the prime mover **52**, components of the prime mover **52**, etc.) are formed from lightweight materials (e.g., lighter than the material used to form the slip gear outer body **210**, etc.) in order to decrease a weight of the vehicle **10**.

[0083] As utilized herein with respect to numerical ranges, the terms “approximately,” “about,” “substantially,” and similar terms generally mean+/−10% of the disclosed values, unless specified otherwise. As utilized herein with respect to structural features (e.g., to describe shape, size, orientation, direction, relative position, etc.), the terms “approximately,” “about,” “substantially,” and similar terms are meant to cover minor variations in structure that may result from, for example, the manufacturing or assembly process and are intended to have a broad meaning in harmony with the common and accepted usage by those of ordinary skill in the art to which the subject matter of this disclosure pertains. Accordingly, these terms should be interpreted as indicating that insubstantial or inconsequential modifications or alterations of the subject matter described and claimed are considered to be within the scope of the disclosure as recited in the appended claims.

[0084] It should be noted that the term “exemplary” and variations thereof, as used herein to describe various embodiments, are intended to indicate that such embodiments are possible examples, representations, or illustrations of possible embodiments (and such terms are not intended to connote that such embodiments are necessarily extraordinary or superlative examples).

[0085] The term “coupled” and variations thereof, as used herein, means the joining of two members directly or indirectly to one another. Such joining may be stationary (e.g., permanent or fixed) or moveable (e.g., removable or releasable). Such joining may be achieved with the two members coupled directly to each other, with the two members coupled to each other using a separate intervening member and any additional intermediate members coupled with one another, or with the two members coupled to each other using an intervening member that is integrally formed as a single unitary body with one of the two members. If "coupled" or variations thereof are modified by an additional term (e.g., directly coupled), the generic definition of "coupled" provided above is modified by the plain language meaning of the additional term (e.g., "directly coupled" means the joining of two members without any separate intervening member), resulting in a narrower definition than the generic definition of "coupled" provided above. Such coupling may be mechanical, electrical, or fluidic.

[0086] References herein to the positions of elements (e.g., "top," "bottom," "above," "below") are merely used to describe the orientation of various elements in the figures. It should be noted that the orientation of various elements may differ according to other exemplary embodiments, and that such variations are intended to be encompassed by the present disclosure.

[0087] The hardware and data processing components used to implement the various processes, operations, illustrative logics, logical blocks, modules, and circuits described in connection with the embodiments disclosed herein may be implemented or performed with a general purpose single- or multi-chip processor, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array (FPGA), or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A general purpose processor may be a microprocessor, or, any conventional processor, controller, microcontroller, or state machine. A processor also may be implemented as a combination of computing devices, such as a combination of a DSP and a microprocessor, a plurality of microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration. In some embodiments, particular processes and methods may be performed by circuitry that is specific to a given function. The memory (e.g., memory, memory unit, storage device) may include one or more devices (e.g., RAM, ROM, Flash memory, hard disk storage) for storing data and/or computer code for completing or facilitating the various processes, layers and modules described in the present disclosure. The memory may be or include volatile memory or non-volatile memory, and may include database components, object code components, script components, or any other type of information structure for supporting the various activities and information structures described in the present disclosure. According to an exemplary embodiment, the memory is communicably connected to the processor via a processing circuit and includes computer code for executing (e.g., by the processing circuit or the processor) the one or more processes described herein.

[0088] The present disclosure contemplates methods, systems, and program products on any machine-readable media for accomplishing various operations. The embodiments of the present disclosure may be implemented using existing computer processors, or by a special purpose computer processor for an appropriate system, incorporated for this or another purpose, or by a hardwired system. Embodiments within the scope of the present disclosure include program products comprising machine-readable media for carrying or having machine-executable instructions or data structures stored thereon. Such machine-readable media can be any available media that can be accessed by a general purpose or special purpose computer or other machine with a processor. By way of example, such machine-readable media can comprise RAM, ROM, EPROM, EEPROM, or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to carry or store desired program code in the form of machine-executable instructions or data structures and which can be accessed by a general purpose or special purpose computer or other machine with a processor. Combinations of the above are also included within the scope of machine-readable media. Machine-executable instructions include, for example, instructions and data which cause a general purpose computer, special purpose computer, or special purpose processing machines to perform a certain function or group of functions.

[0089] Although the figures and description may illustrate a specific order of method steps, the order of such steps may differ from what is depicted and described, unless specified differently above. Also, two or more steps may be performed concurrently or with partial concurrence, unless specified differently above. Such variation may depend, for example, on the software and hardware systems chosen and on designer choice. All such variations are within the scope of the disclosure. Likewise, software implementations of the described methods could be accomplished with standard programming techniques with rule-based logic and other logic to accomplish the various connection steps, processing steps, comparison steps, and decision steps.

[0090] It is important to note that the construction and arrangement of the vehicle **10** and the systems and components thereof (e.g., the body **20**, the operator controls **40**, the driveline **50**, the suspension system **60**, the braking system **70**, the sensors **80**, the vehicle controller **90**, the transmission assembly **100**, the slip gear assembly **200**, etc.) as shown in the various exemplary embodiments is illustrative only. Additionally, any element disclosed in one embodiment may be incorporated or utilized with any other embodiment disclosed herein.

1. A slip gear assembly for transferring power between a prime mover and a tractive element of a snowmobile, the slip gear assembly comprising:

a first body configured to couple to a sprocket of the snowmobile coupled to the prime mover, the first body configured to rotate about an axis;

a second body configured to couple to a shaft of the snowmobile coupled to the tractive element, the second body configured to rotate about the axis;

one or more first pressure plates coupled to the first body and configured to rotate about the axis, the one or more first pressure plates comprising a first friction surface positioned on at least one side thereof; and

one or more second pressure plates coupled to the second body and configured to rotate about the axis, the one or more second pressure plates comprising a second friction surface positioned on at least one side thereof, the second friction surface forming a friction torque between the second friction surface and the first friction surface such that (a) the one or more second pressure plates are coupled to the one or more first pressure plates when a torque between the one or more first pressure plates and the one or more second pressure plates is less the friction torque and (b) the one or more second pressure plates and the one or more first pressure plates permit relative motion therebetween when the torque between the one or more first pressure plates and the one or more second pressure plates is greater than or equal to the friction torque.

2. The slip gear assembly of claim **1**, wherein the slip gear assembly is configured as a dry slip gear assembly that does not include a fluid lubricant positioned between the first friction surface and the second friction surface.

3. The slip gear assembly of claim **1**, wherein the first friction surface and the second friction surface extend perpendicular to the axis.

4. The slip gear assembly of claim **1**, further comprising a spring configured to apply a force on the one or more first pressure plates and the one or more second pressure plates, the force oriented parallel to the axis.

5. The slip gear assembly of claim **4**, wherein:
the spring is compressed between the first body and a first one of the one or more first pressure plates to apply the force on the one or more first pressure plates and the one or more second pressure plates; and
the slip gear assembly further comprises one or more shims positioned between the first body and the spring.

6. The slip gear assembly of claim **4**, further comprising:
a retainer ring coupled to the first body, the retainer ring configured to hold the second body, the first pressure plate, the second pressure plate, and the spring in positions between the retainer ring and the first body.

7. The slip gear assembly of claim **6**, wherein:
the one or more first pressure plates include a plurality of first pressure plates coupled to the first body;
the one or more second pressure plates include a plurality of second pressure plates coupled to the second body; and
the plurality of the first pressure plates and the plurality of the second pressure plates are arranged in an alternating pattern between the retainer ring and the spring.

8. The slip gear assembly of claim **1**, wherein:
the first pressure plate and the second pressure plate are positioned between the first body and the second body; and
the first pressure plate and the second pressure plate are fluidly coupled to an environment surrounding the slip gear assembly.

9. The slip gear assembly of claim **1**, further comprising:
an insert disc positioned between at least one of the one or more first pressure plates and at least one of the one or more second pressure plates, the insert disc comprising:
a first insert friction surface positioned on a first side of the insert disc, the first insert friction surface contacting the first friction surface of the at least one of the one or more first pressure plates to form a first insert friction torque, and
a second insert friction surface positioned on a second opposing side of the insert disc, the second insert friction surface contacting the second friction surface of the at least one of the one or more second pressure plates to form a second insert friction torque;
wherein the friction torque is equal to a lower of the first insert friction torque and the first insert friction torque.

10. The slip gear assembly of claim **1**, wherein:
the first body is coupled to the one or more first pressure plates via a first spline connection; and
the second body is coupled to the one or more second pressure plate via a second spline connection.

11. The slip gear assembly of claim **1**, further comprising the sprocket, wherein the first body is detachably coupled to the sprocket with a plurality of fasteners.

12. A vehicle comprising:
a frame;
a tractive assembly coupled to the frame;
a shaft coupled to the tractive assembly;
a prime mover configured to provide power to the tractive assembly to drive the tractive assembly; and
a transmission assembly configured to transfer the power from the prime mover to the tractive assembly, the transmission assembly comprising:
a belt assembly configured to receive the power from the prime mover, the belt assembly comprising:
a first sprocket configured to receive the power from the prime mover,
a second sprocket, and
a belt coupled to the first sprocket and the second sprocket, the belt configured to transfer the power between the first sprocket and the second sprocket; and
a slip gear assembly comprising:
a first body detachably coupled to the second sprocket,
a second body coupled to the shaft,
a first pressure plate coupled to the first body, and
a second pressure plate coupled to the second body, the second pressure plate contacting the first pressure plate to form a friction torque between the second pressure plate and the first pressure plate such that (a) the first pressure plate is coupled to the second pressure plate when a torque between the first pressure plate and the second pressure plate is less than the friction torque to allow for the power to be transferred from the prime mover to the tractive assembly and (b) the second pressure plate and the first pressure plate permit relative motion therebetween when the torque between the first pressure plate and the second pressure plate is greater than or equal to the friction torque.

13. The vehicle of claim **12**, wherein the slip gear assembly is configured as a dry slip gear assembly that does not include a fluid lubricant therein.

14. The vehicle of claim **12**, wherein the slip gear assembly further comprises a spring configured to apply a force on the first pressure plate and the second pressure plate.

15. The vehicle of claim **14**, wherein the slip gear assembly further comprises a retainer ring coupled to the first body, the retainer ring configured to hold the second body, the first pressure plate, the second pressure plate, and the spring in positions between the retainer ring and the first body.

16. The vehicle of claim **12**, wherein at least one of the first pressure plate or the second pressure plate includes a coating on at least one of a portion of the first pressure plate or a portion of the second pressure plate; and wherein a coefficient of friction between the first pressure plate and the second pressure plate when the at least one of the first pressure plate or the second pressure plate includes the coating is higher than if the at least one of the first pressure plate or the second pressure plate do not include the coating.

17. The vehicle of claim **12**, wherein:

the first body is coupled to the first pressure plate via a first spline connection; and

the second body is coupled to the second pressure plate via a second spline connection.

18. A transmission assembly for transmitting power between a prime mover and a tractive assembly of a snowmobile, the transmission assembly comprising:

a belt assembly configured to receive the power from the prime mover, the belt assembly comprising:

a first sprocket configured to receive the power from the prime mover,

a second sprocket, and

a belt coupled to the first sprocket and the second sprocket, the belt configured to transfer the power between the first sprocket and the second sprocket;

a shaft configured to provide the power to the tractive assembly; and

a slip gear assembly configured to transfer the power from the belt assembly to the shaft, the slip gear assembly comprising:

a first body removably coupled to the second sprocket,

a second body removably coupled to the shaft, the second body coupled to the first body when a torque between the first body and the second body is less than a torque threshold and the second body and the first body separately rotate when the torque between the first body and the second body is greater than or equal to the torque threshold.

19. The transmission assembly of claim **18**, wherein:

the second sprocket defines a plurality of first apertures; and

the first body defines a plurality of second apertures configured to align with the plurality of first apertures to receive fasteners to couple the first body to the second sprocket.

20. The transmission assembly of claim **18**, wherein:

the first body is formed from a first material; and

the second sprocket is formed from a second material with a lower density than the first material.

* * * * *