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(54) **CLUTCH GUARD**

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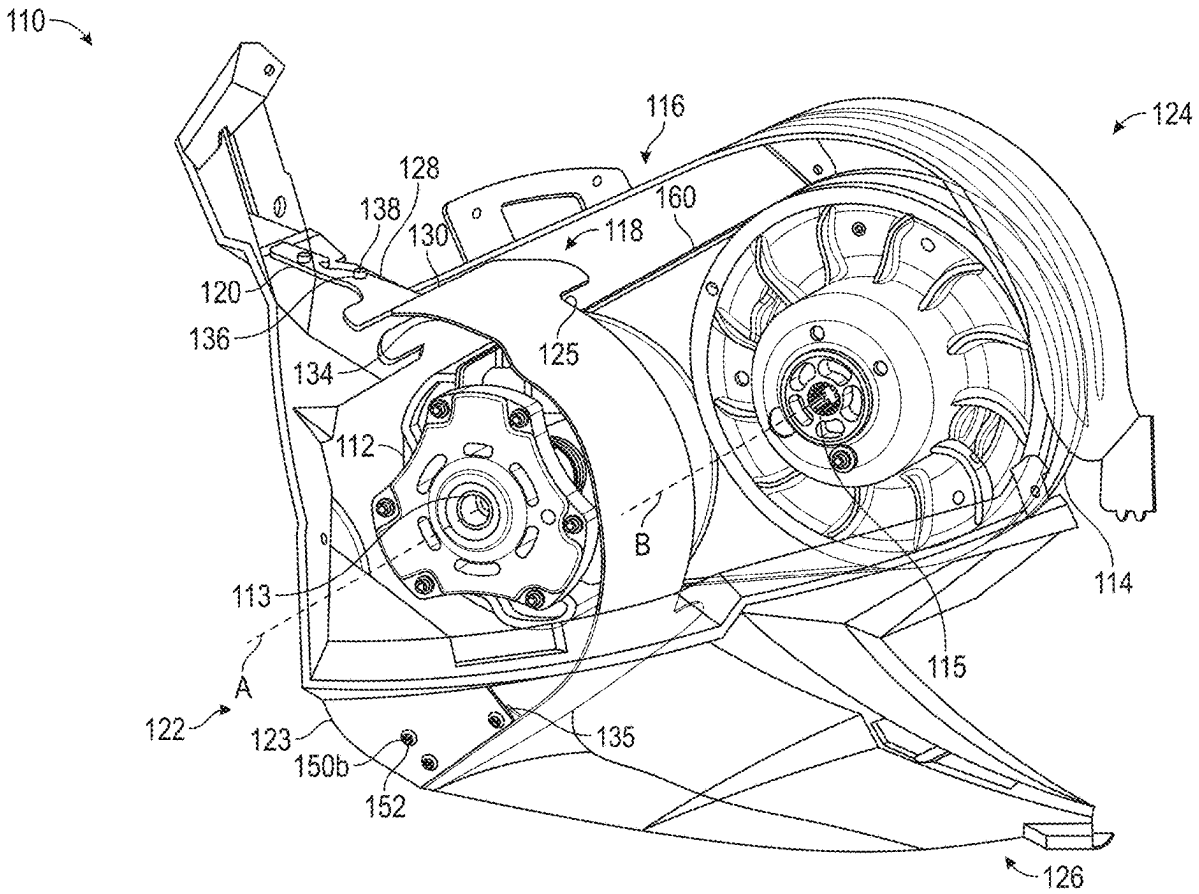
(52) **U.S. Cl.**

CPC ***F16D 21/08*** (2013.01); ***F16H 7/02*** (2013.01); *B62M 27/02* (2013.01); *F16D 2300/26* (2013.01)

(57) **ABSTRACT**

A clutch assembly includes a first clutch defining a central axis and configured to be coupled to a prime mover of a snowmobile, a second clutch coupled to the first clutch and configured to be coupled to a tractive assembly of the snowmobile, and a clutch guard positioned between the first clutch and the second clutch. The clutch guard includes a guard wall having a curved profile extending at least partially around the first clutch, a first mounting flange positioned at or proximate a first end of the guard wall where the first mounting flange is configured to couple to a first mounting interface, and a second mounting flange positioned at or proximate a second end of the guard wall where the second mounting flange is configured to couple to a second mounting interface. The first mounting flange and the second mounting flange are positioned longitudinally forward of the central axis.



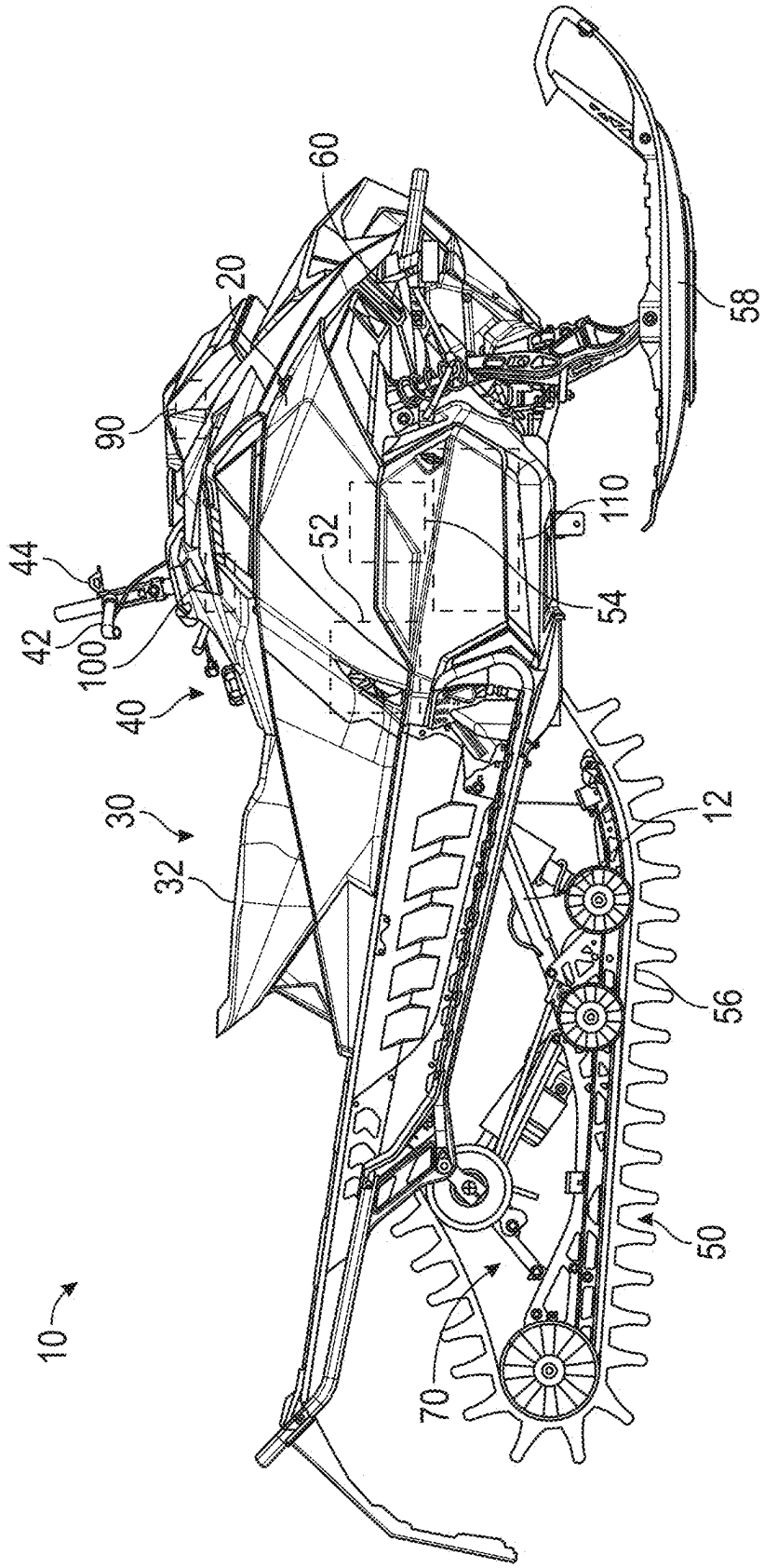
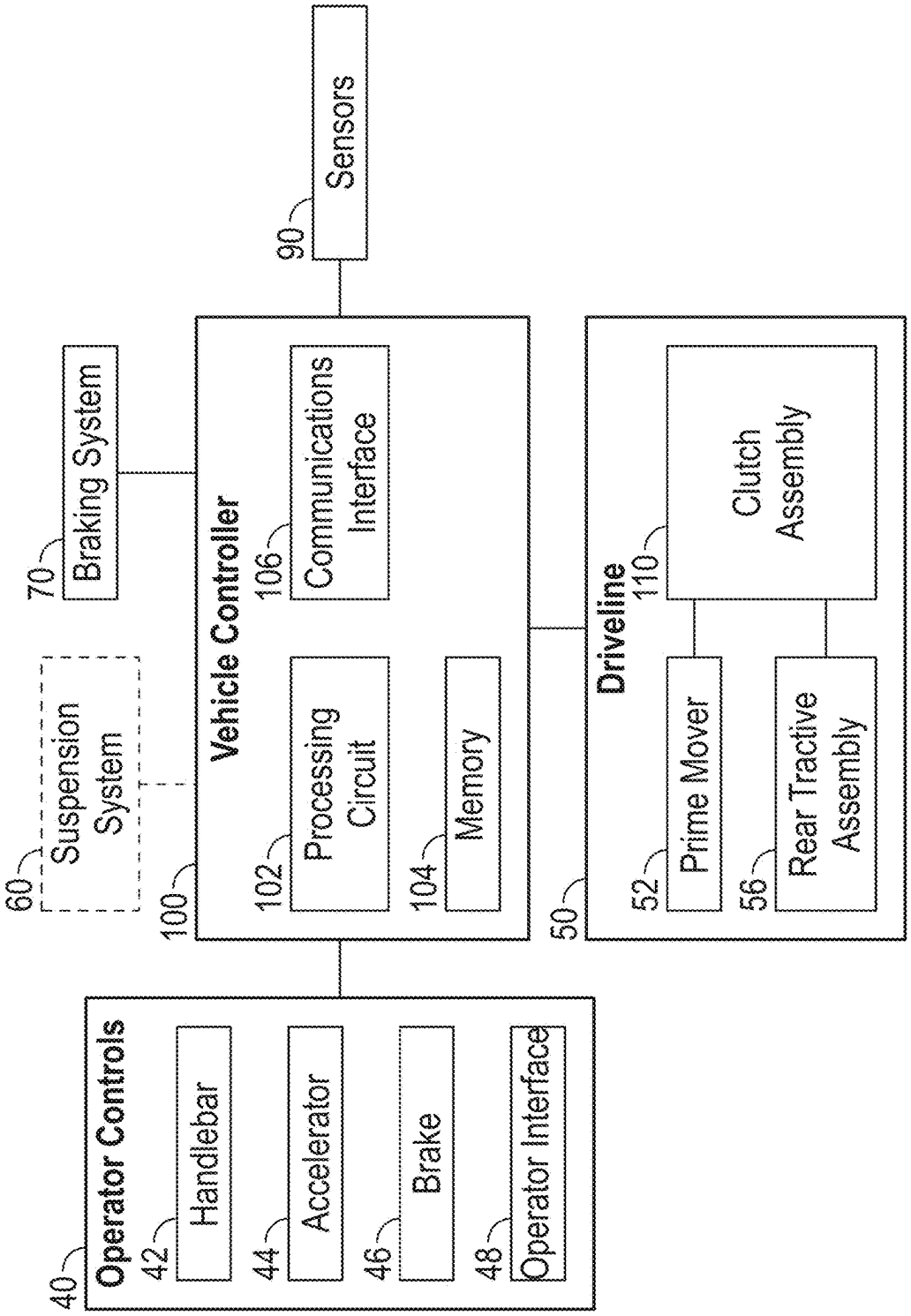


FIG. 1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Braking System
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Communications Interface
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Vehicle Controller
Suspension System
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Processing Circuit
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Memory
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Driveline
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Clutch Assembly
Prime Mover
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Rear Tractive Assembly
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Operator Controls
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Handlebar
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Accelerator
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Brake
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Operator Interface
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FIG. 2

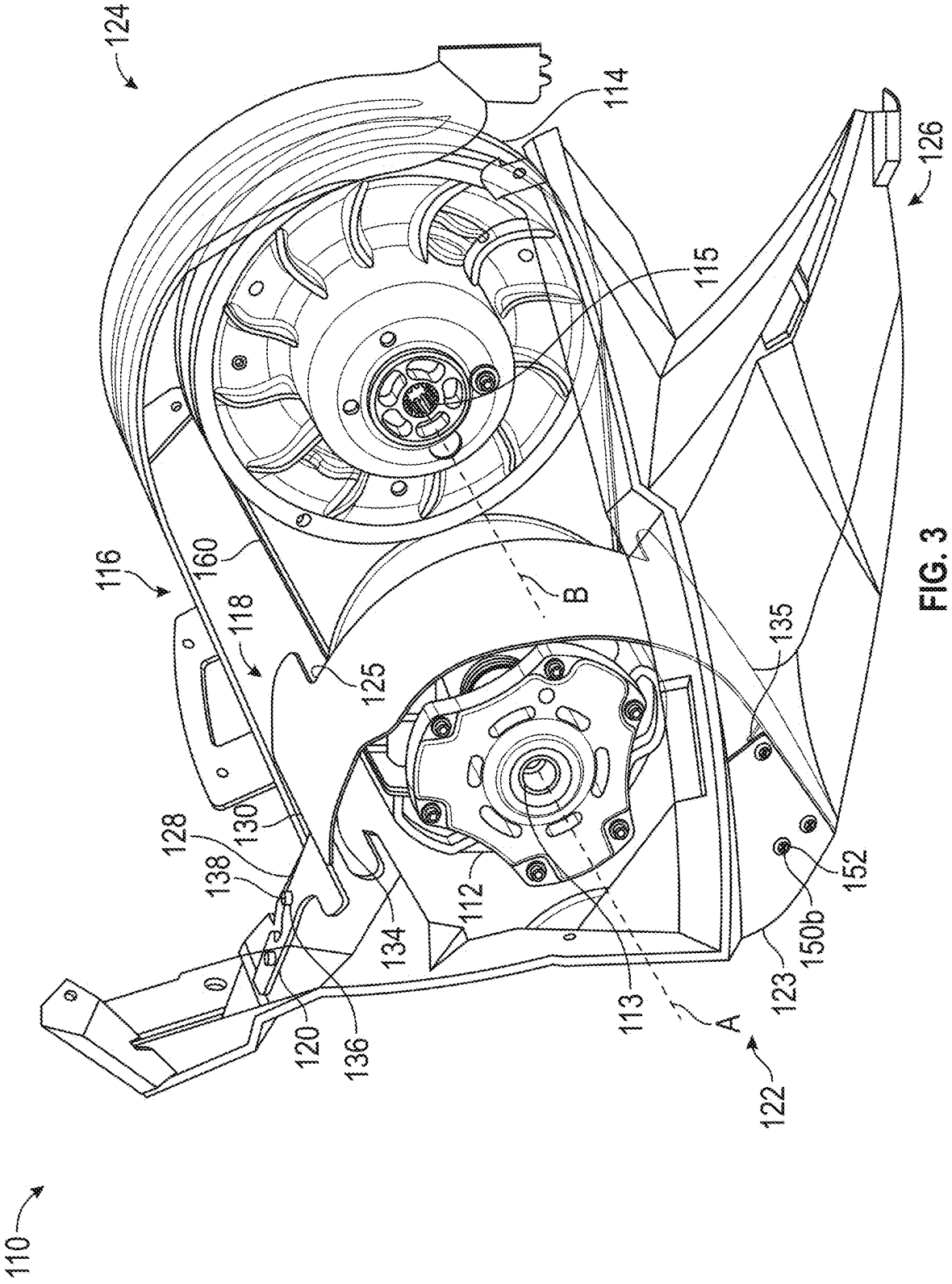
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FIG. 3

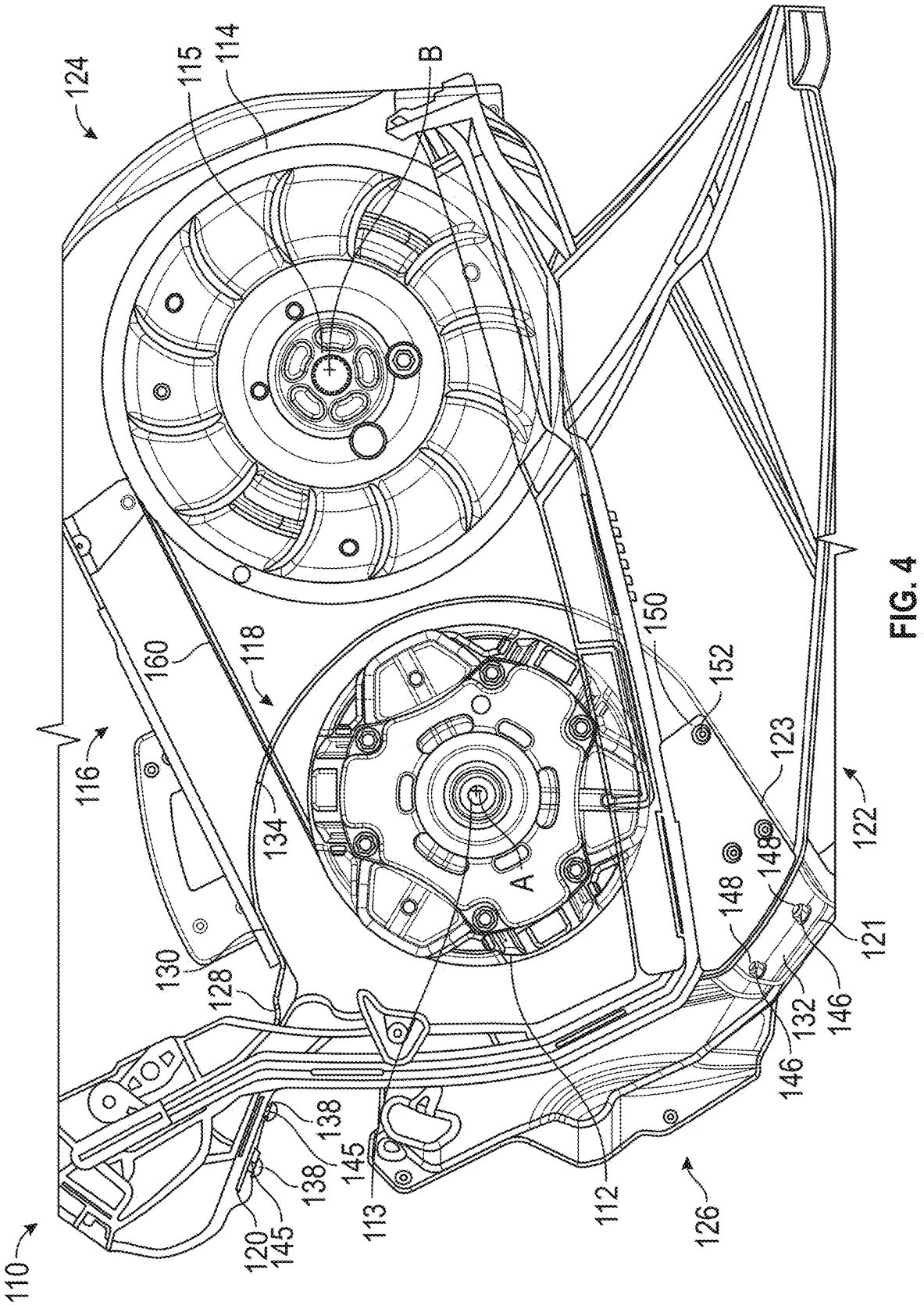
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FIG. 4

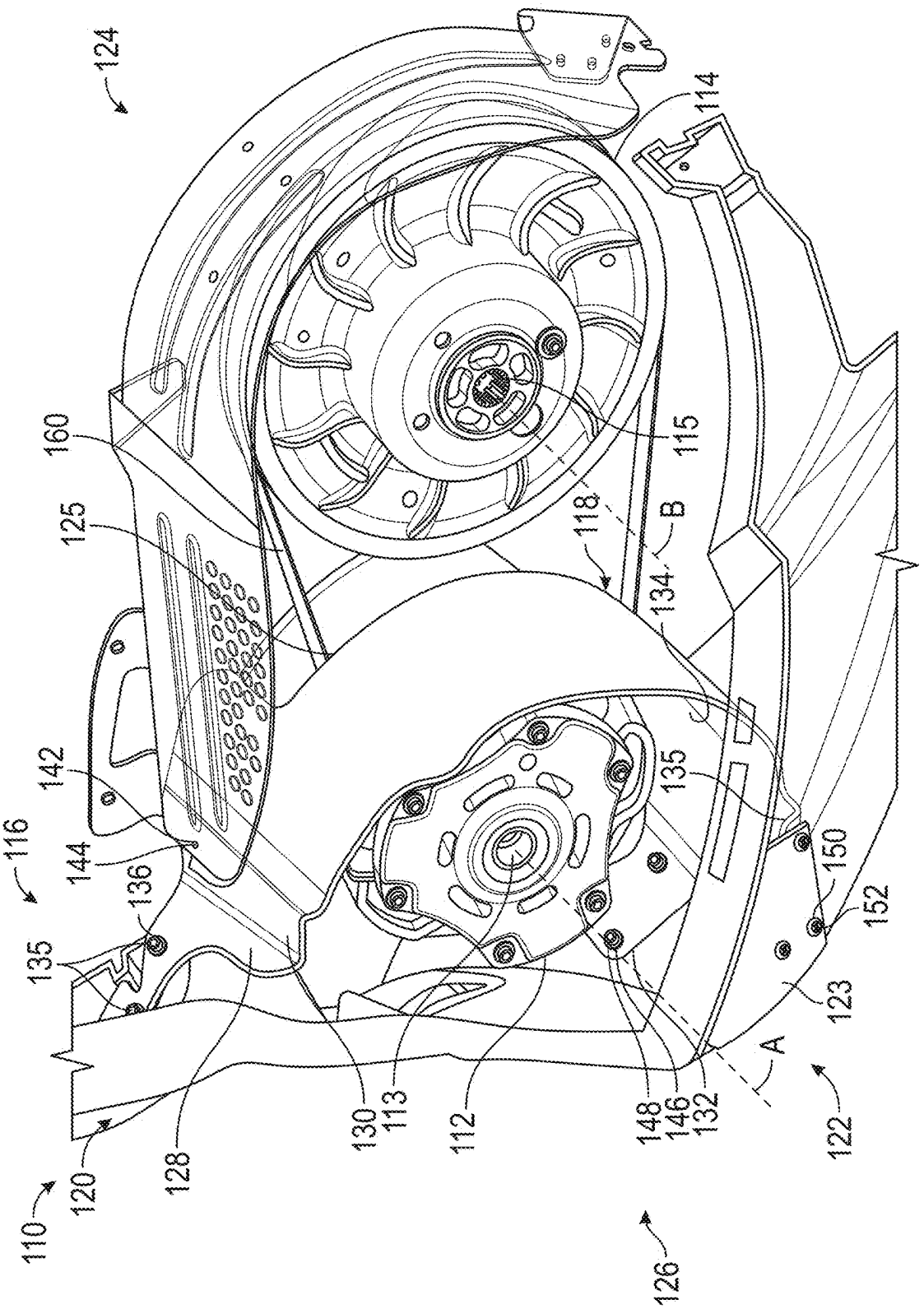
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FIG. 5

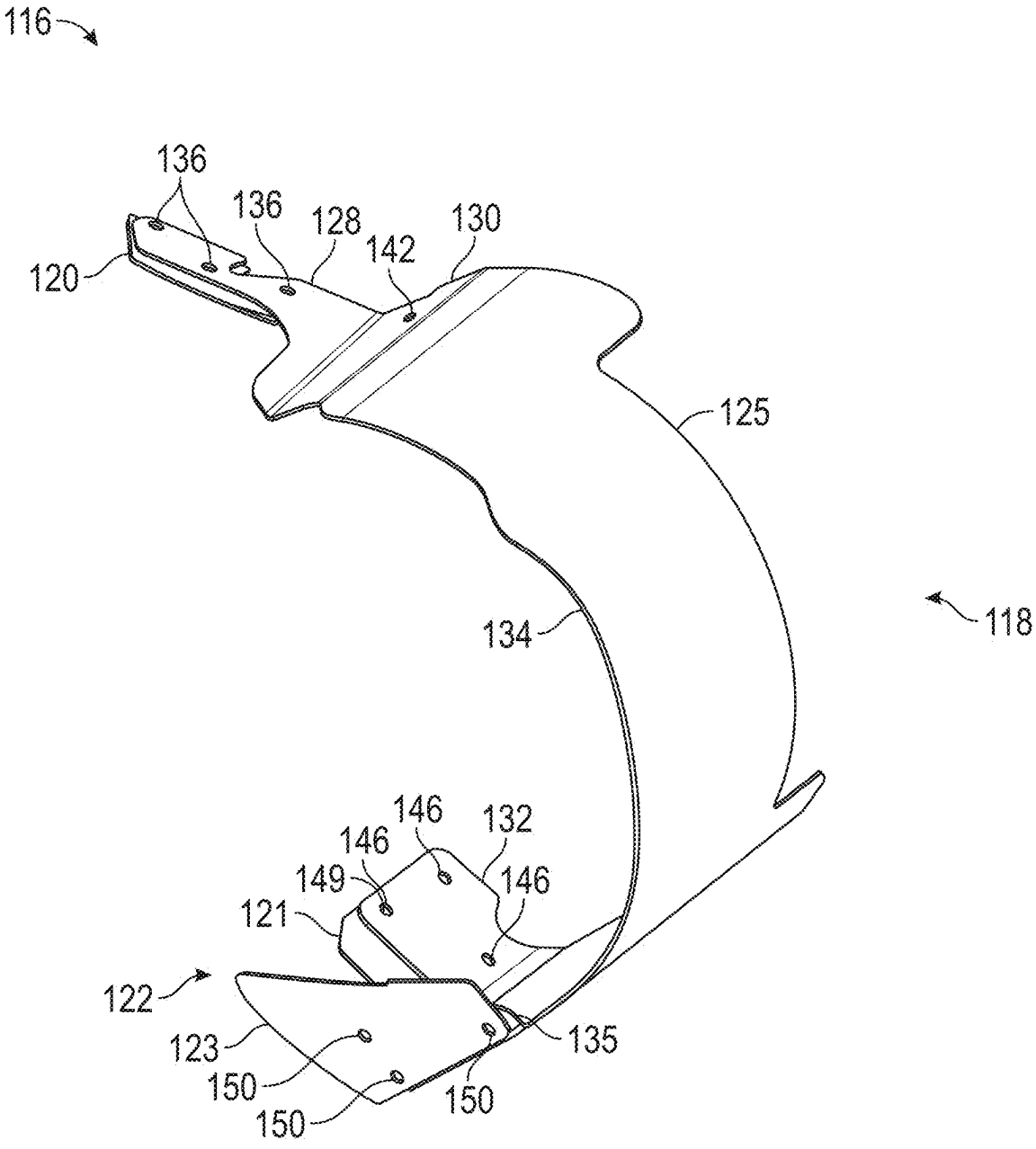
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FIG. 6A

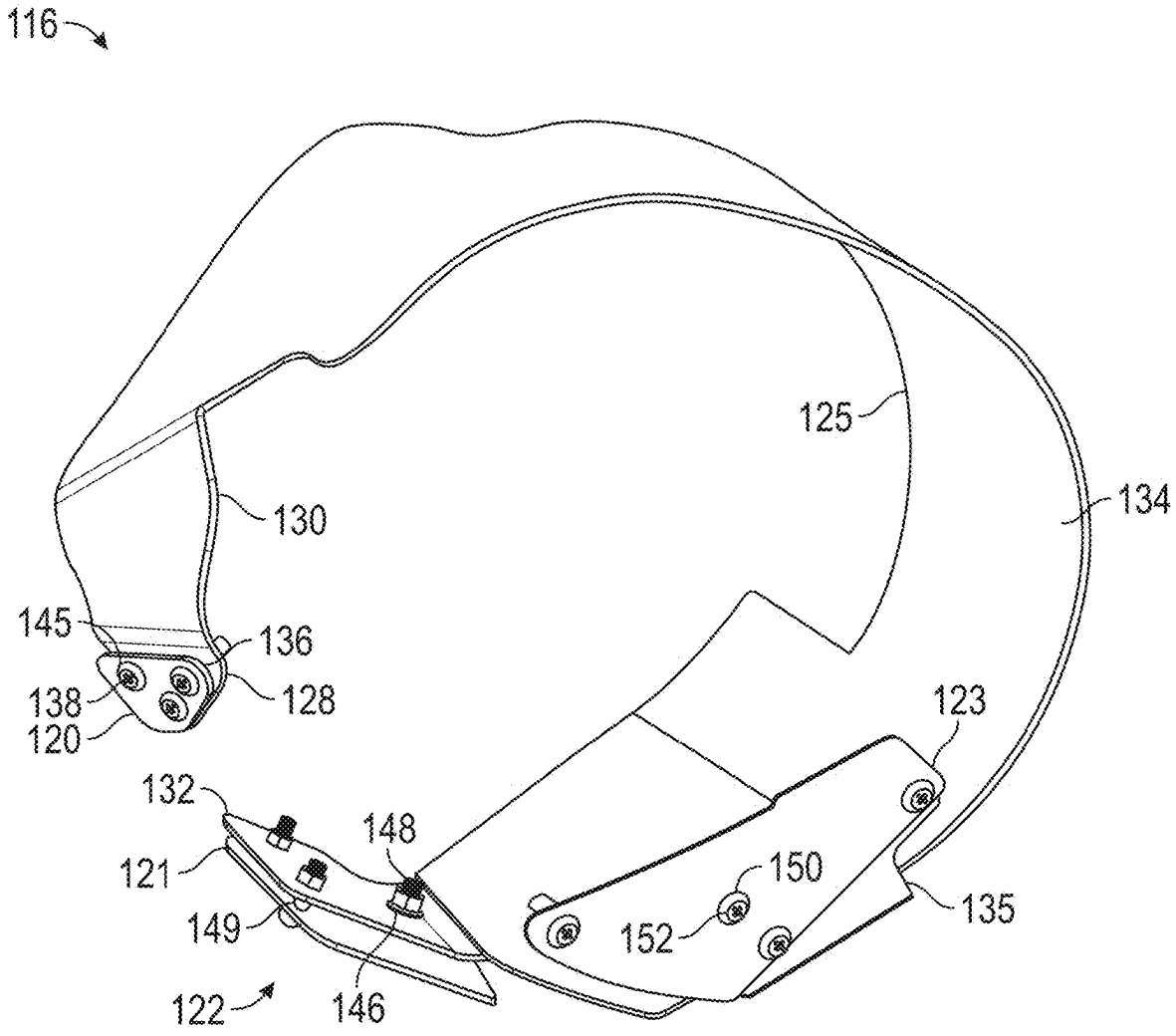
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FIG. 6B

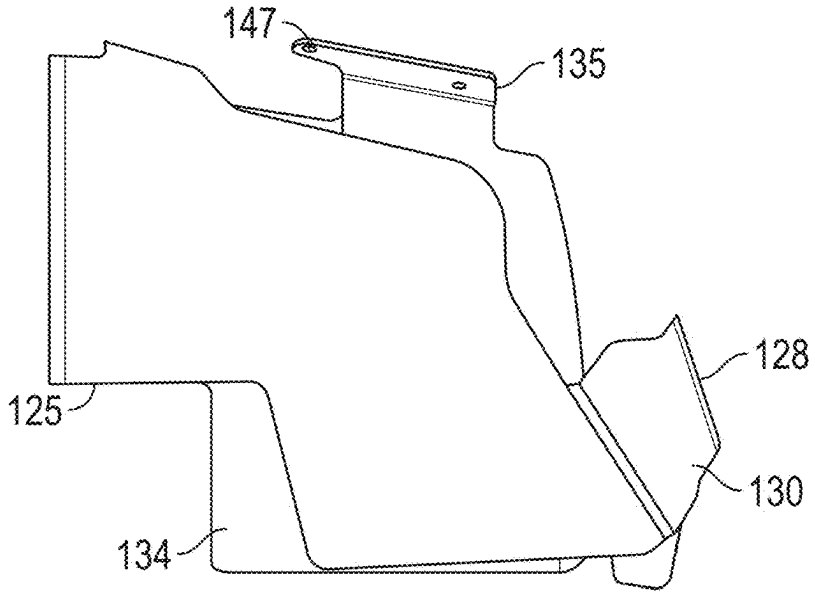

FIG. 6C

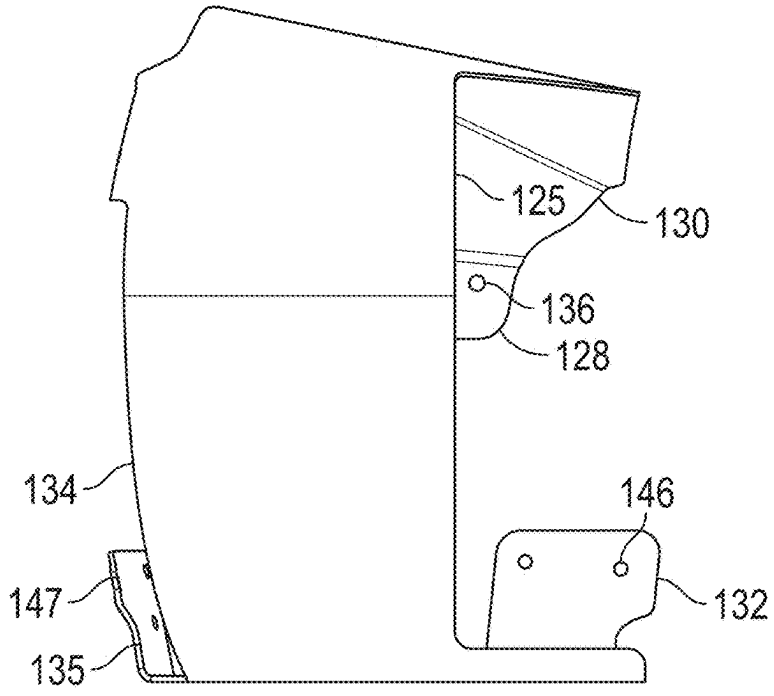

FIG. 6D

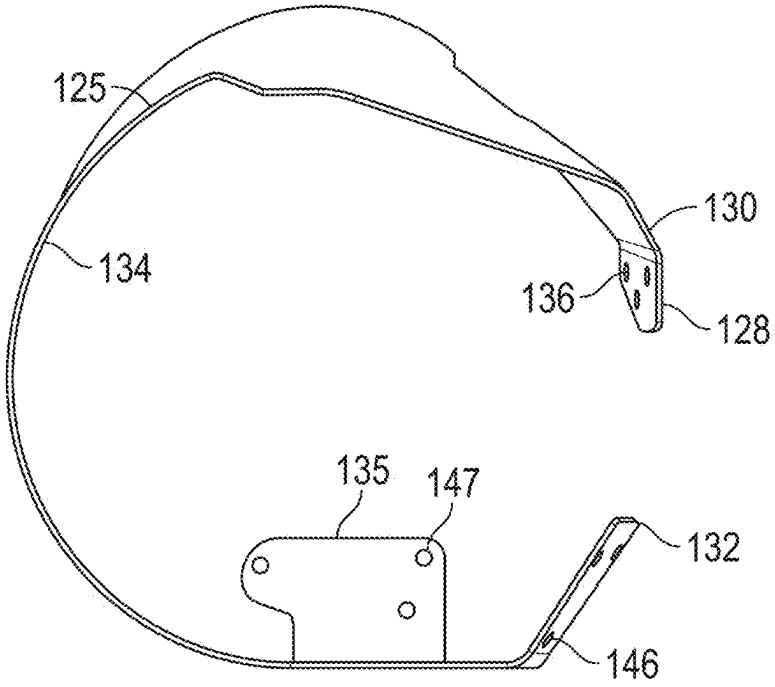
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FIG. 6E

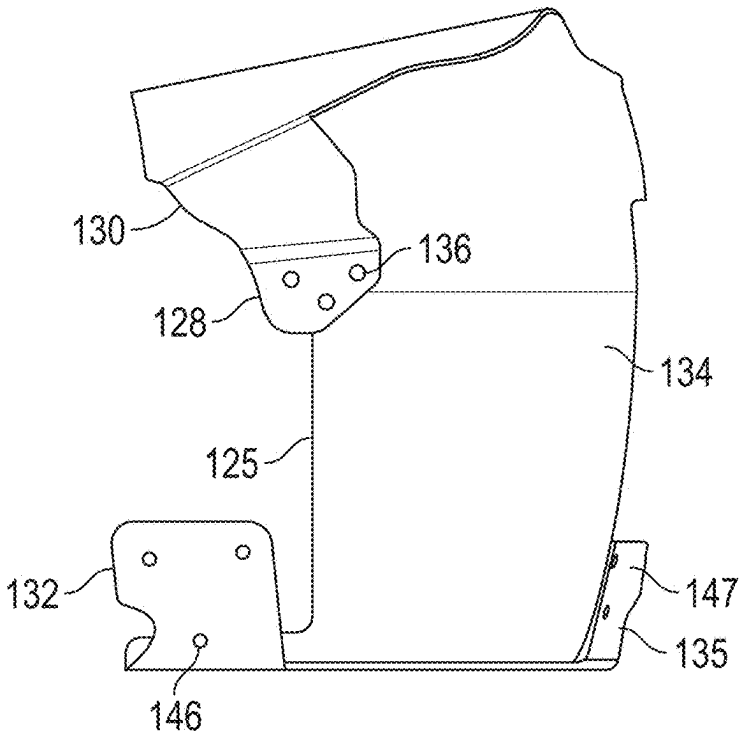
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FIG. 6F

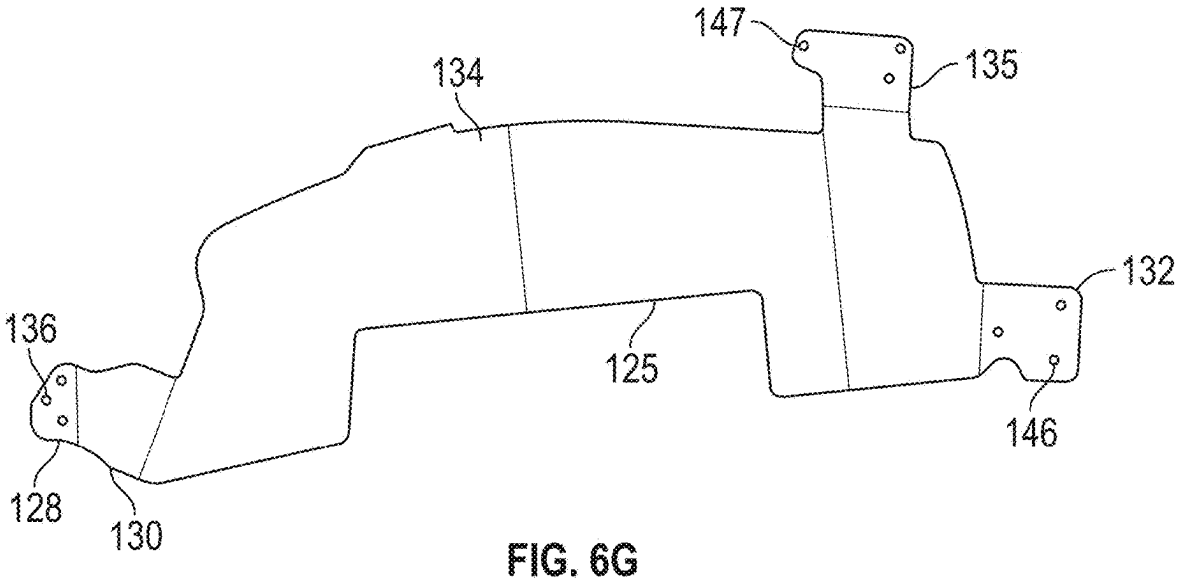

FIG. 6G

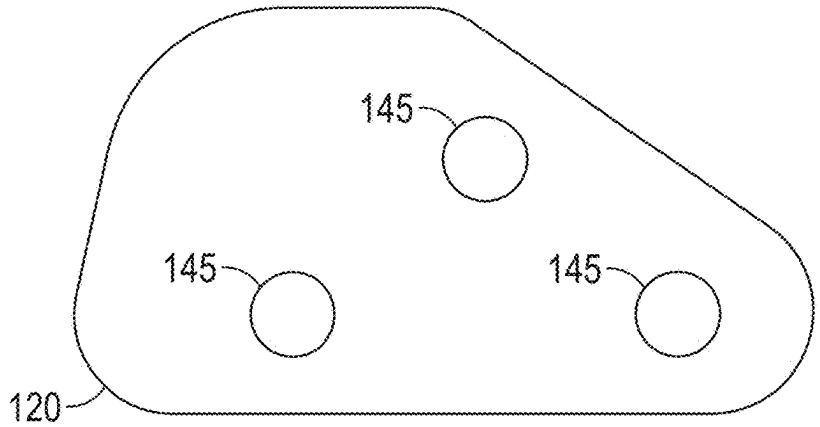

FIG. 6H

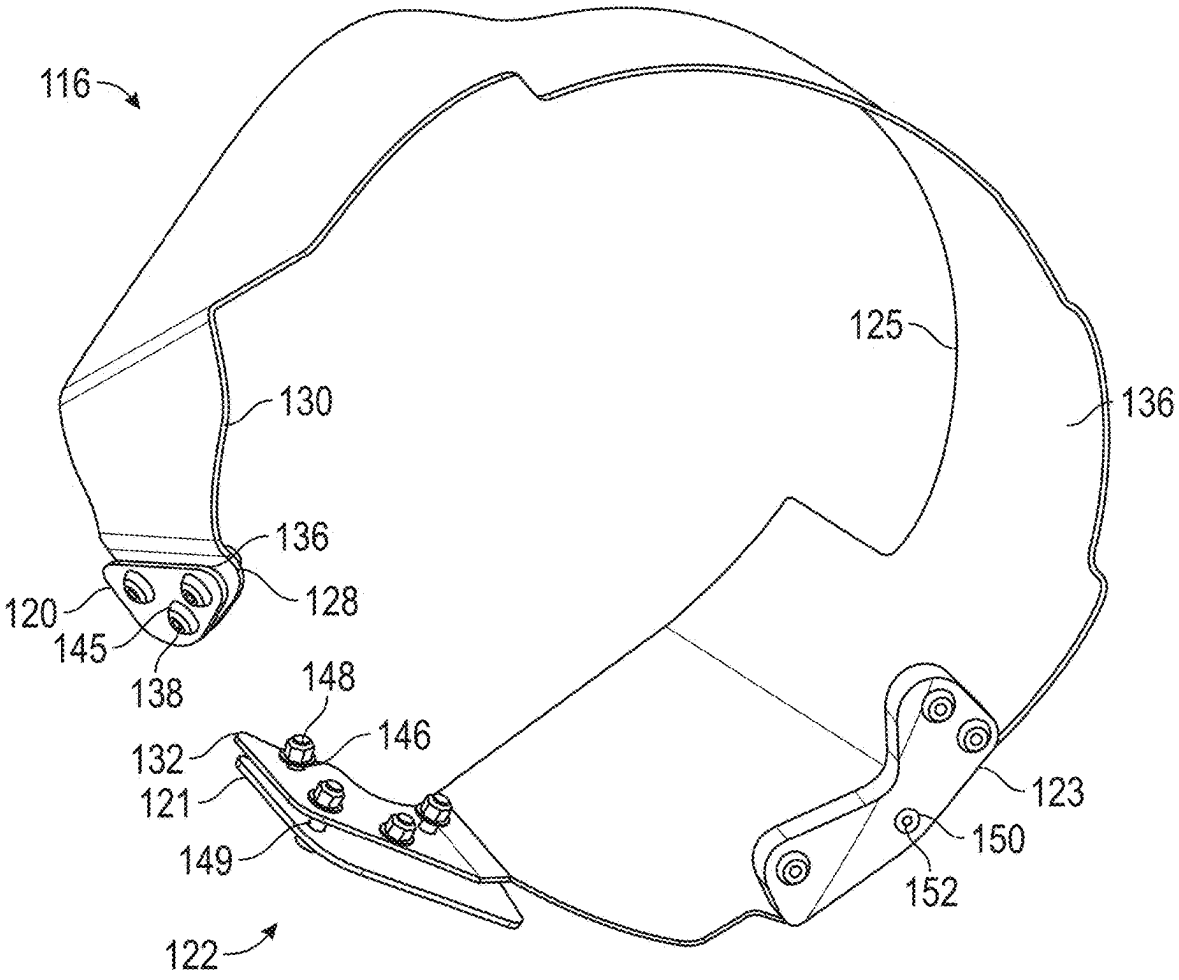
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FIG. 6I

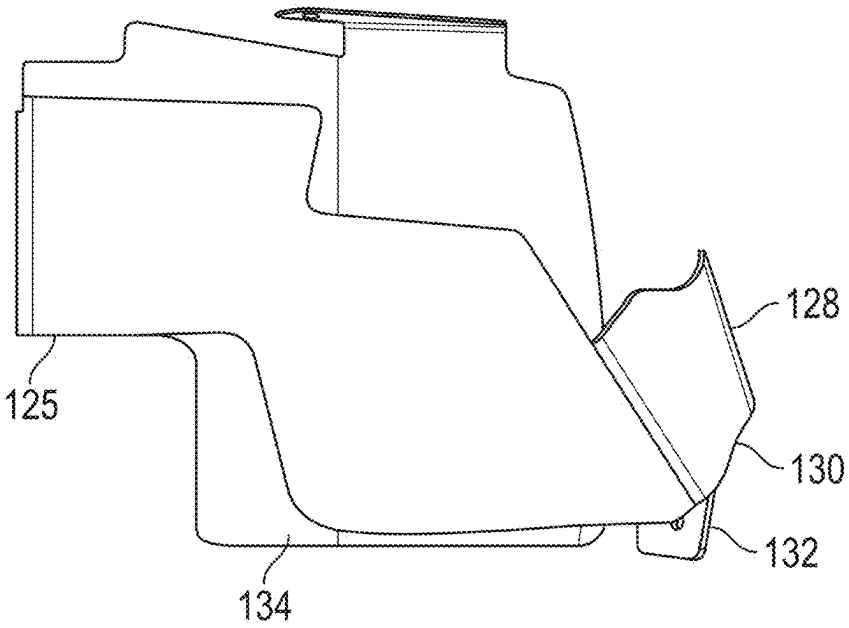

FIG. 6J

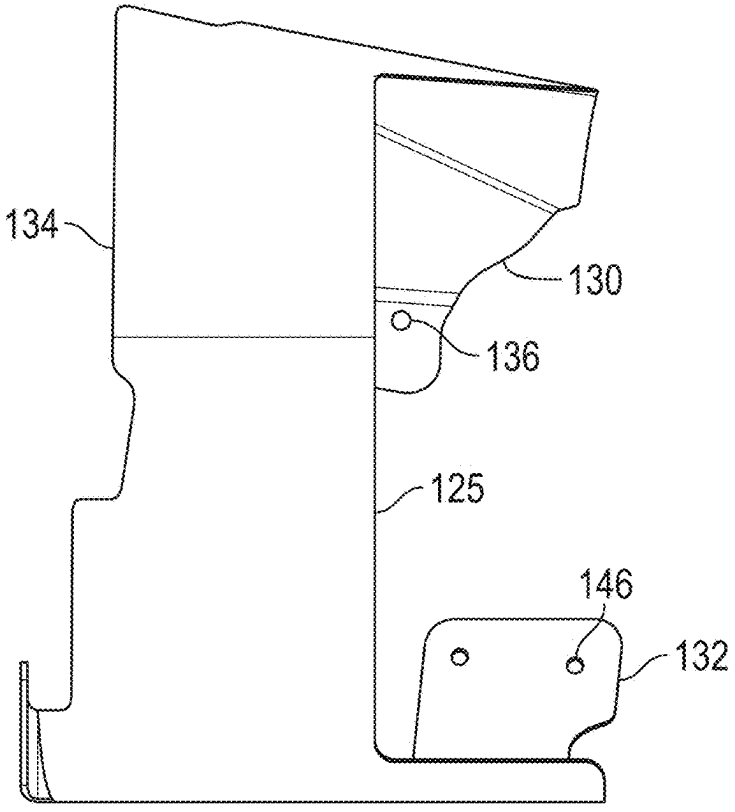

FIG. 6K

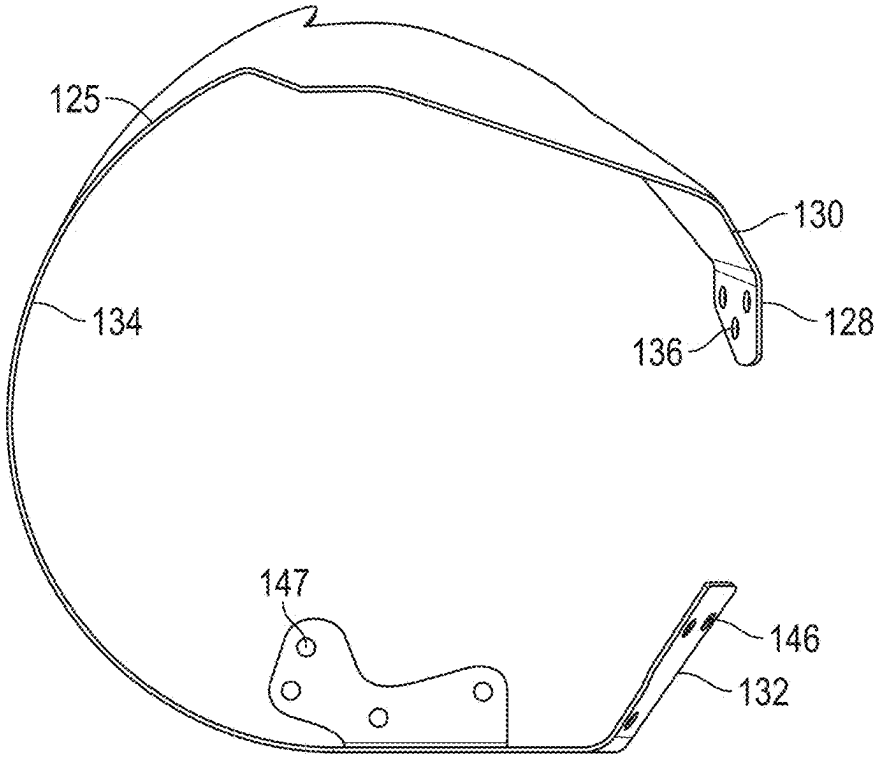

FIG. 6L

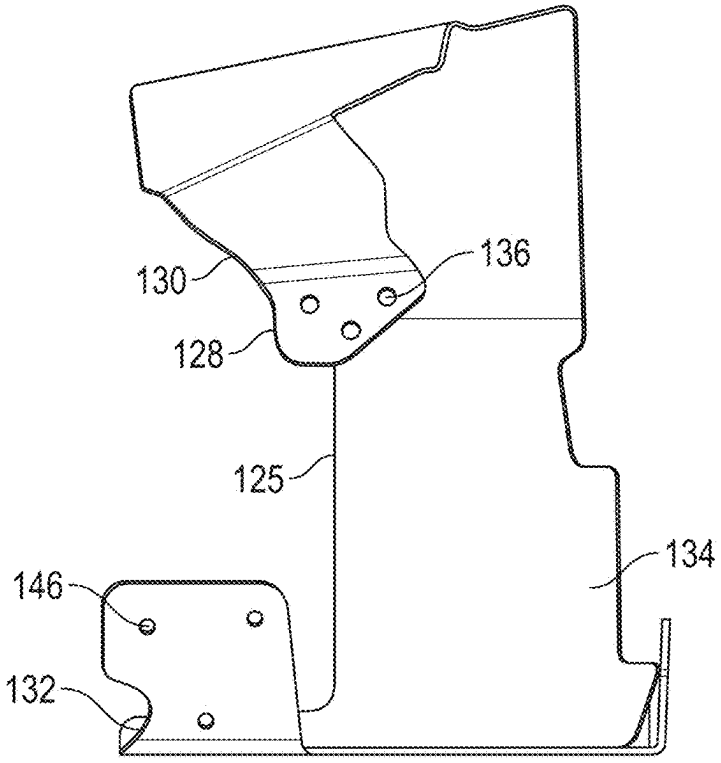

FIG. 6M

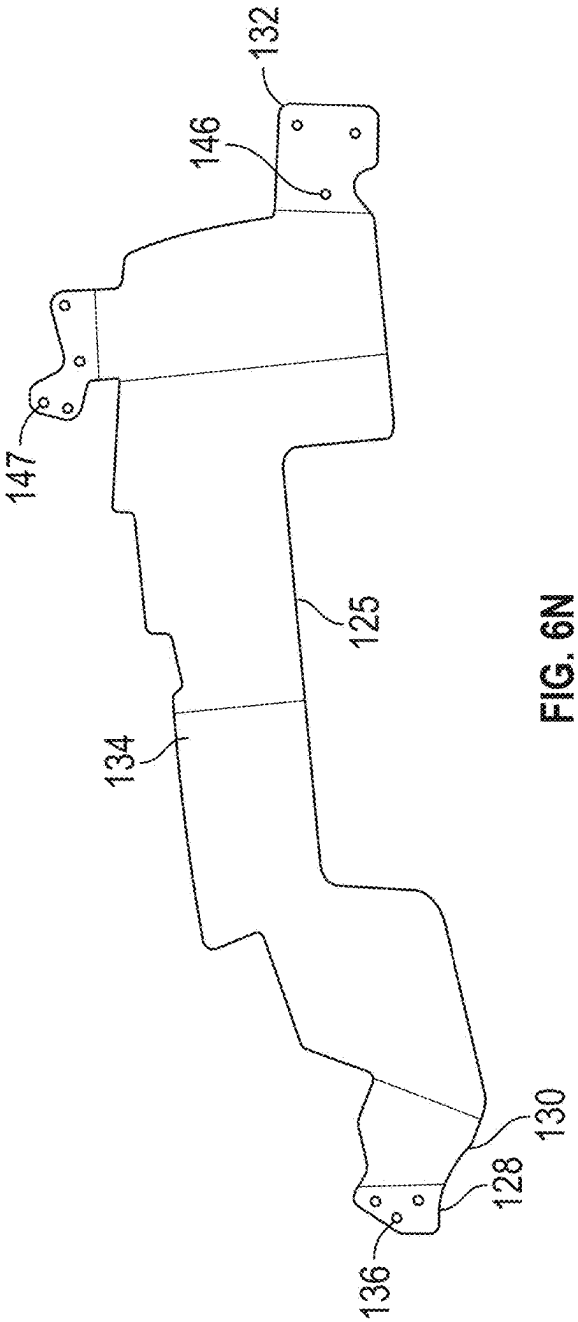

FIG. 6N

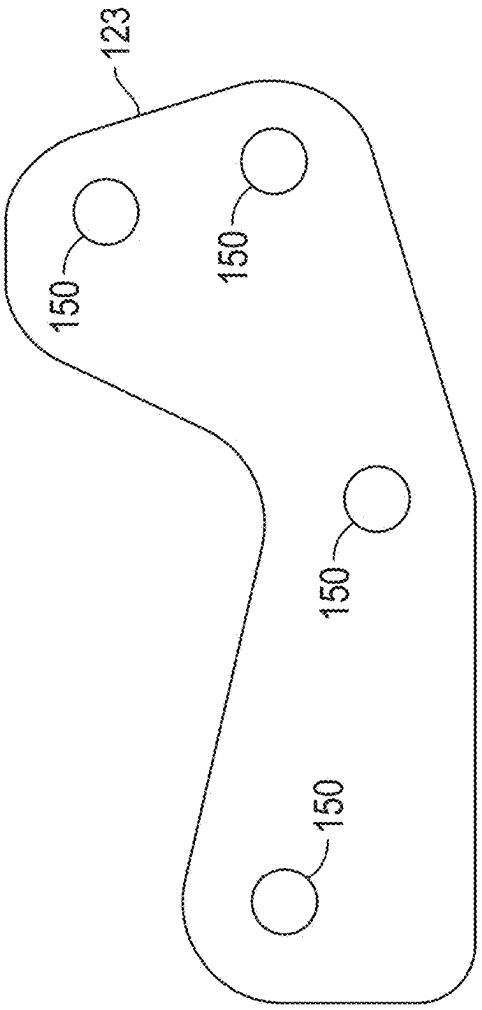

FIG. 6O

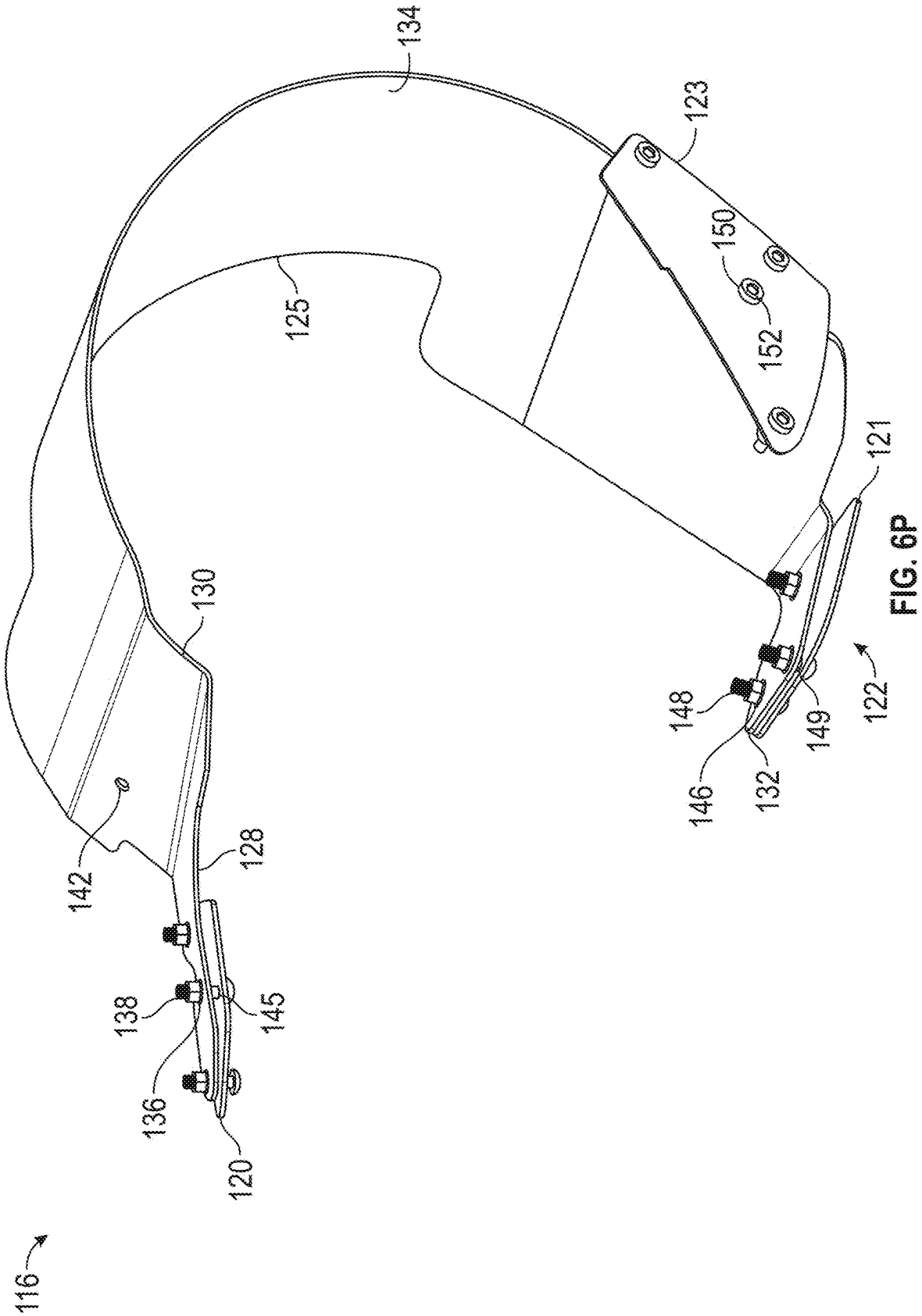
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FIG. 6P

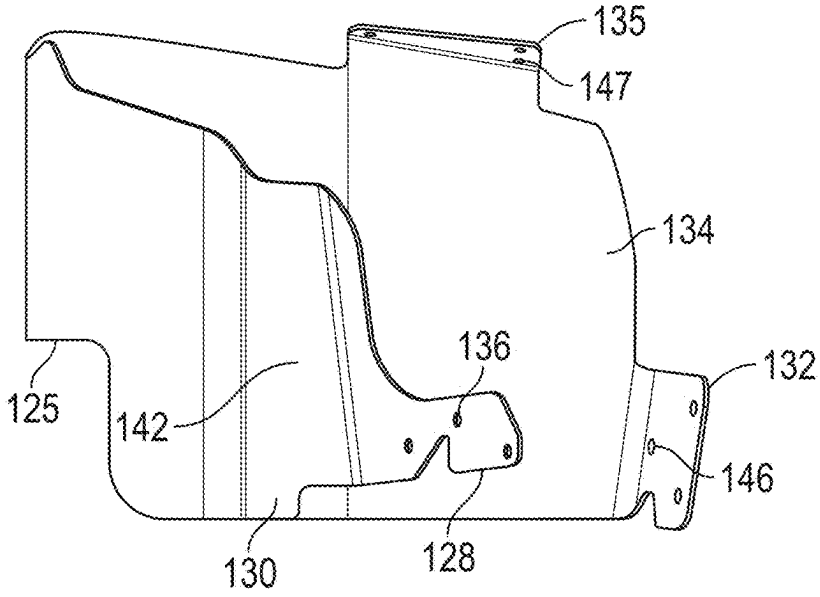
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FIG. 6Q

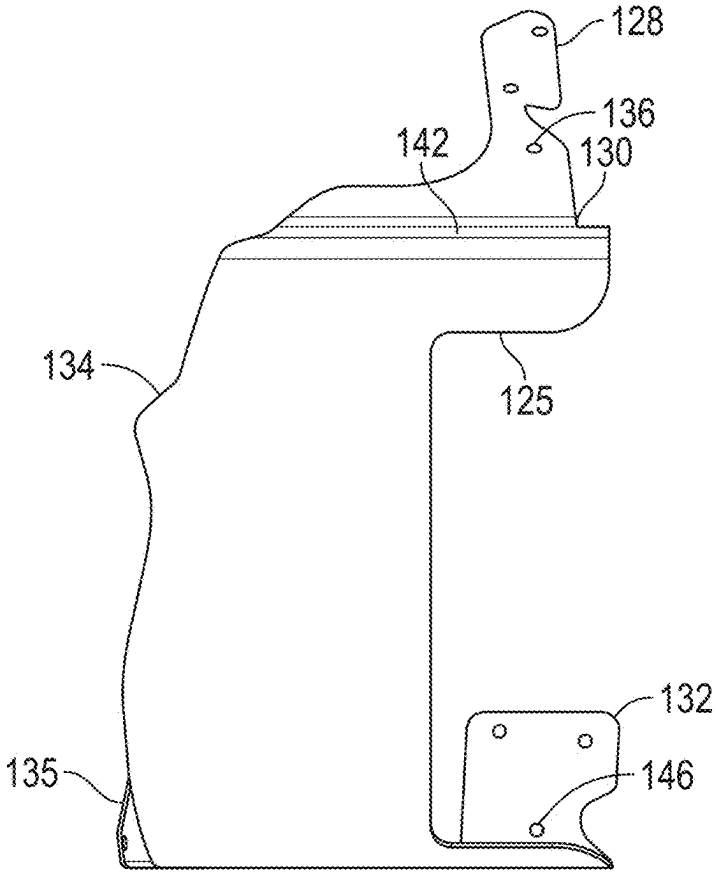
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FIG. 6R

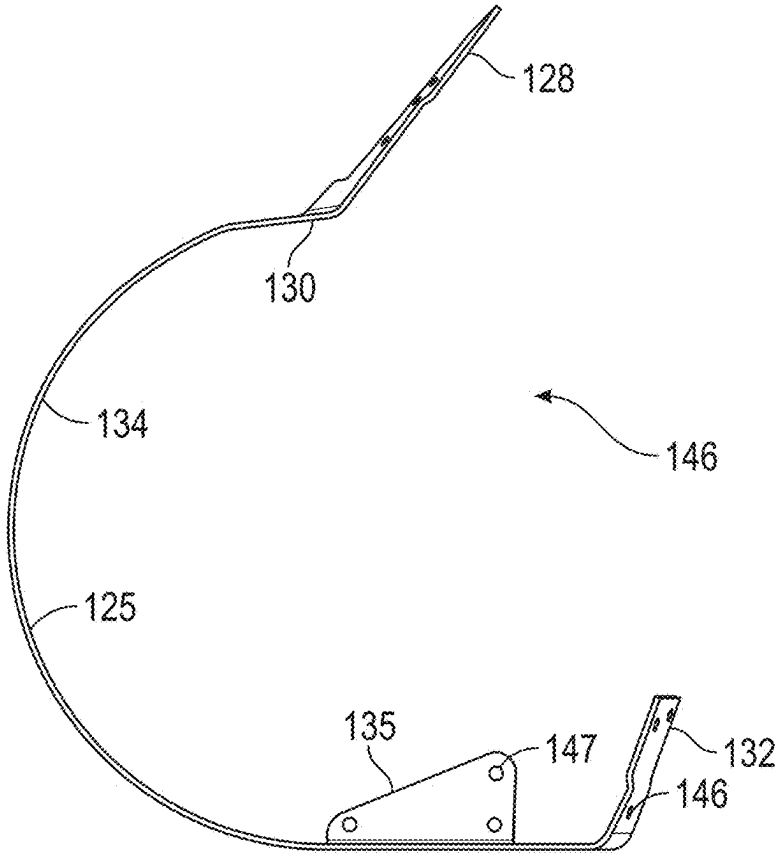
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FIG. 6S

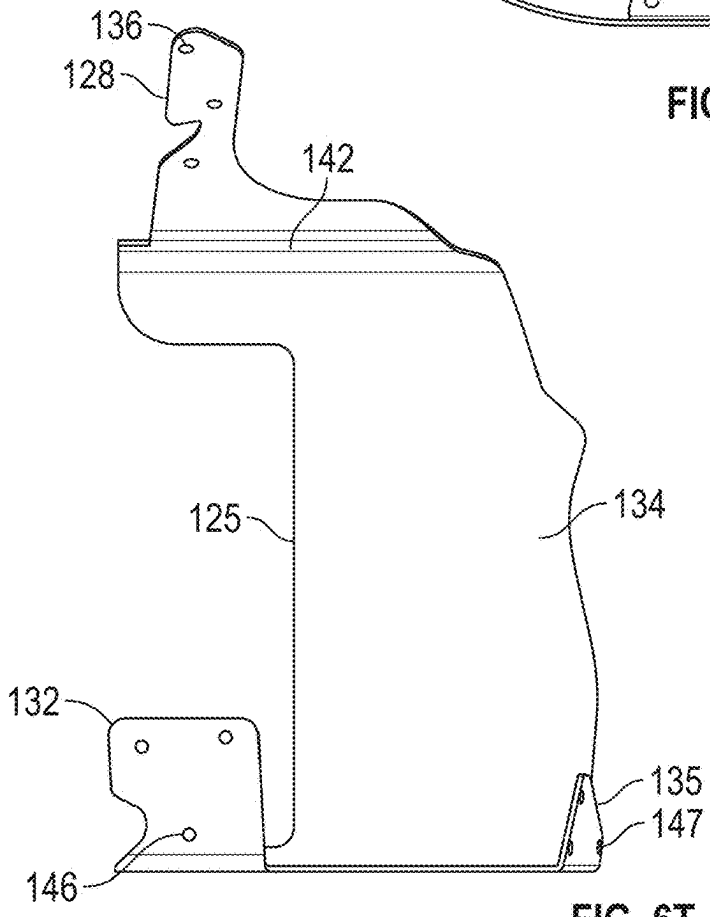
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FIG. 6T

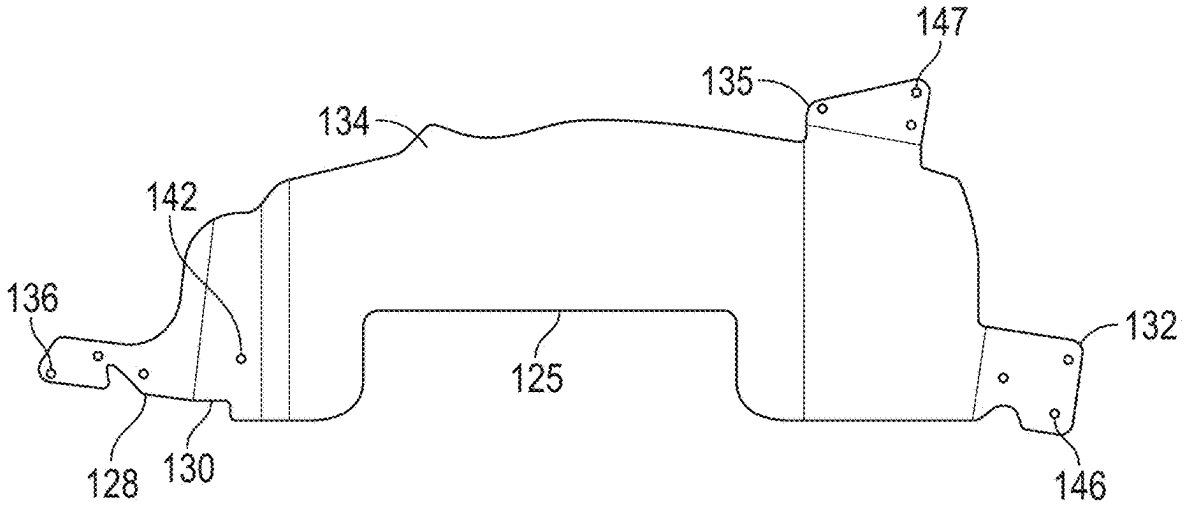

FIG. 6U

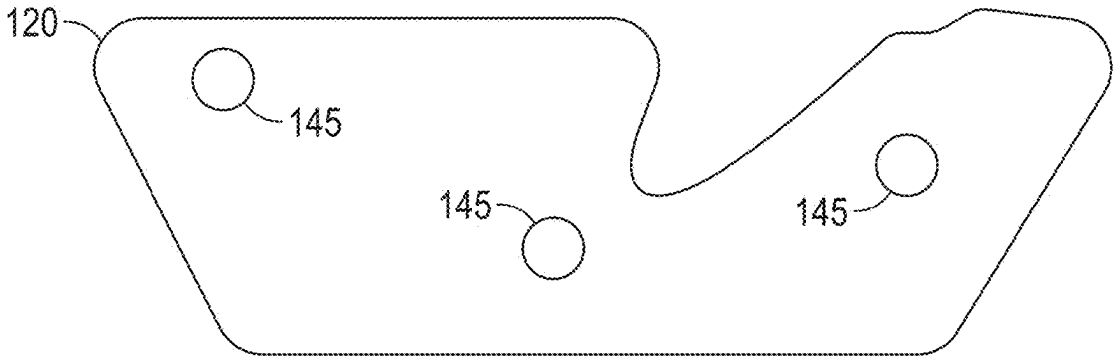

FIG. 6V

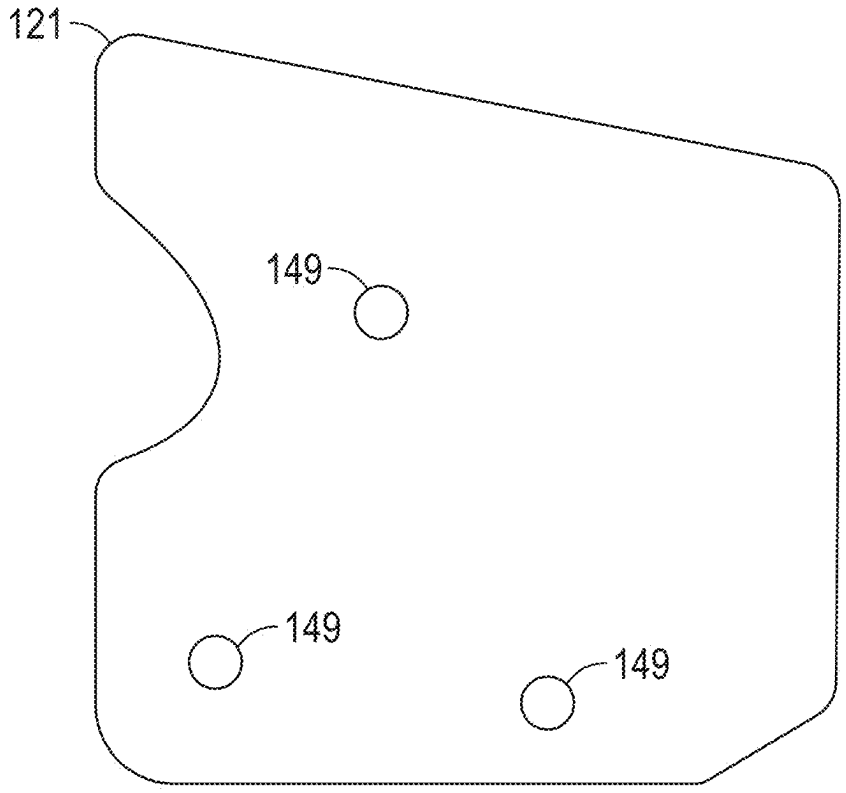

FIG. 6W

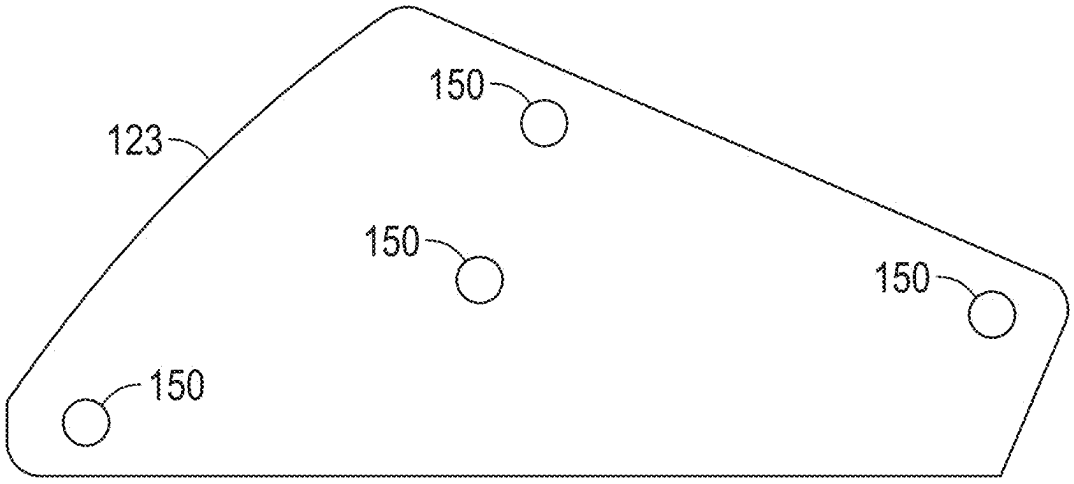

FIG. 6X

CLUTCH GUARD

CROSS-REFERENCE TO RELATED PATENT APPLICATION

[0001] This application claims the benefit of and priority to U.S. Provisional Patent Application No. 63/662,778, filed Jun. 21, 2024, which is incorporated herein by reference in its entirety.

BACKGROUND

[0002] The present application relates to a clutch assembly of a vehicle. More specifically, the present application relates to a clutch guard of a snowmobile.

SUMMARY

[0003] One embodiment relates to a clutch assembly for a snowmobile. The clutch assembly includes a first clutch defining a central axis and configured to be coupled to a prime mover of the snowmobile, a second clutch coupled to the first clutch and configured to be coupled to a tractive assembly of the snowmobile, and a clutch guard positioned between the first clutch and the second clutch. The clutch guard includes a guard wall having a curved profile extending at least partially around the first clutch, a first mounting flange positioned at or proximate a first end of the guard wall where the first mounting flange is configured to couple to a first mounting interface, and a second mounting flange positioned at or proximate a second end of the guard wall where the second mounting flange is configured to couple to a second mounting interface. The first mounting flange and the second mounting flange are positioned longitudinally forward of the central axis.

[0004] Another embodiment relates to a clutch assembly. The clutch assembly includes a first clutch, a second clutch, a clutch guard positioned between the first clutch and the second clutch, and a belt coupling the first clutch to the second clutch. The clutch guard has a curved profile extending at least partially around the first clutch. The curved profile defines a notch extending at least partially thereallong. The belt extends through the notch.

[0005] Still another embodiment relates to a clutch device. The clutch device includes a clutch guard configured to be positioned between (a) a first clutch coupled to a prime mover of an off-road vehicle and (b) a second clutch coupled to a tractive assembly of the off-road vehicle. The clutch guard has a curved profile configured to extend at least partially around the first clutch such that a first end and a second end of the curved profile are positioned longitudinally forward of a central axis of the first clutch. The curved profile defines a notch extending at least partially thereallong.

[0006] 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

[0007] FIG. **1** is a side view of a vehicle, according to an exemplary embodiment.

[0008] FIG. **2** is a schematic block diagram of the vehicle of FIG. **1**, according to an exemplary embodiment.

[0009] FIG. **3** is a perspective view of a clutch assembly of the vehicle of FIG. **1**, according to an exemplary embodiment.

[0010] FIG. **4** is a side view of the clutch assembly of FIG. **3**, according to an exemplary embodiment.

[0011] FIG. **5** is another perspective view of the clutch assembly of FIG. **3**, according to an exemplary embodiment.

[0012] FIG. **6**A-**6**X are various views of a clutch guard of the clutch assembly of FIG. **3**, according to an exemplary embodiment.

DETAILED DESCRIPTION

[0013] 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.

[0014] According to an exemplary embodiment, a vehicle (e.g., a snowmobile) includes a clutch assembly to transfer power from a prime mover to one or more tractive assemblies. The clutch assembly include a primary clutch, a secondary clutch, a belt coupling the primary clutch and the secondary clutch, and a clutch guard assembly. The clutch guard assembly includes one or more mounting interfaces, such as a first mounting interface, a second mounting interface, and/or a third mounting interface to couple the clutch guard assembly to one or more components of the vehicle. The clutch guard assembly includes a guard that defines an arc and/or a tangential path to direct debris along the arc and/or the tangential path in a direction way from a rider and/or operator of the vehicle.

Overall Vehicle

[0015] 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 **90**; and a vehicle control system, shown as vehicle controller **100**, coupled to the operator controls **40**, the driveline **50**, the suspension system **60**, the braking system **70**, and the sensors **90**. In some embodiments, the vehicle **10** includes more or fewer components.

[0016] 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.

[0017] 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.

[0018] 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 **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.

[0019] 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**, a second tractive assembly (e.g., skis, runners, slides, etc.), shown as front tractive assembly **58**, and a connection system, shown as clutch assembly **110**, selectively coupling the prime mover **52** to the rear tractive assembly **56**. 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.

[0020] 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 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.

[0021] 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"), 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).

[0022] 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.

[0023] 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**.

[0024] 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.

[0025] The sensors **90** 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 **90** 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 **90** 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.

[0026] The vehicle controller **100** 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 **100** includes a processing circuit **102**, a memory **104**, and a communications interface **106**. The processing circuit **102** 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 **102** is configured to execute computer code stored in the memory **104** to facilitate the activities described herein. The memory **104** 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 **104** includes computer code modules (e.g., executable code, object code, source code, script code, machine code, etc.) configured for execution by the processing circuit **102**. In some embodiments, the vehicle controller **100** may represent a collection of processing devices. In such cases, the processing circuit **102** represents the collective processors of the devices, and the memory **104** represents the collective storage devices of the devices.

[0027] In one embodiment, the vehicle controller **100** is configured to selectively engage, selectively disengage, control, or otherwise communicate with components of the vehicle **10** (e.g., via the communications interface **106**, a controller area network ("CAN") bus, etc.). According to an exemplary embodiment, the vehicle controller **100** is coupled to (e.g., communicably coupled to) components of the operator controls **40** (e.g., the handlebar **42**, the accelerator **44**, the brake **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 **90**. By way of example, the vehicle controller **100** 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 **90**, and/or remote systems or devices (via the communications interface **106** as described in greater detail herein).

Clutch Guard

[0028] As shown in FIGS. **3-5**, the clutch assembly **110** includes a first clutch, shown as primary clutch **112**, a second clutch, shown as secondary clutch **114**, and a guard assembly, shown as clutch guard assembly **116**. The primary clutch **112** defines a first central bore, shown as primary bore **113**, which defines a central, lateral, primary axis A and that facilitates coupling the primary clutch **112** to an output of the prime mover **52** (e.g., an output shaft thereof). The output of the prime mover **52** spins components of the primary clutch **112** about the primary axis A when the prime mover **52** is running. According to an exemplary embodiment, the primary clutch **112** is coupled to the secondary clutch **114** by a belt (e.g., a drive belt; a ribbed, rubber belt; etc.), shown as clutch belt **160**. The primary clutch **112**, when in an engaged configuration and when driven by the prime mover **52**, drives the secondary clutch **114** based on engagement of the clutch belt **160** with the primary clutch **112** and the secondary clutch **114**.

[0029] As shown in FIGS. **3-5**, the secondary clutch **114** defines a second central bore, shown secondary bore **115**, which defines a central, lateral, secondary axis B and that facilitates coupling the secondary clutch **114** to an input of the rear tractive assembly **56** (e.g., an input shaft thereof, a jackshaft, etc.). The clutch belt **160** of the clutch assembly **110** spins components of the secondary clutch **114** about the secondary axis B when the prime mover **52** is running and the primary clutch **112** is engaged. The secondary clutch **114**, when in an engaged configuration and when driven by the prime mover **52** and the primary clutch **112**, is configured to drive the rear tractive assembly **56**.

[0030] According to an exemplary embodiment, the clutch guard assembly **116** is configured to mount or couple to the body **20** and/or the frame **12** of the vehicle **10**. As shown in FIGS. **3-6X**, the clutch guard assembly **116** includes a curved plate or guard, shown as primary clutch guard **118**, a first mounting component, shown as upper mounting plate **120**, a second mounting component, shown as lower mounting plate **121**, a third mounting component, shown as side mounting plate **123**, a first housing portion (e.g., housing guard, secondary clutch guard, etc.), shown as upper housing **124**, and a second housing portion (e.g., a housing guard, a belly pan, a component of the body **20**, etc.), shown as lower housing **126**. As shown in FIGS. **3-5**, the upper housing **124** and the lower housing **126** are configured to

receive the primary clutch **112**, the secondary clutch **114**, and the primary clutch guard **118** within an interior cavity or chamber defined therebetween. The primary clutch guard **118** (a) is positioned between the primary clutch **112** and the secondary clutch **114** and (b) at least partially surrounds the primary clutch **112**. According to an exemplary embodiment, the clutch guard assembly **116** is configured to reduce the speed of moving debris and direct the moving debris away from a rider (e.g., in a direction away from the occupant seating area **30**).

[0031] As shown in FIGS. **3**-**6**G, **6**I-N, and **6**P-**6**U, the primary clutch guard **118** has (a) a first upper mounting interface, shown as first upper mounting flange **128**, positioned at an upper end of the primary clutch guard **118**, (b) a second upper mounting interface, shown as second upper mounting flange **130**, extending from the first upper mounting flange **128** at an upward angle, (c) a third lower mounting interface, shown as lower mounting flange **132**, positioned at a lower end of the primary clutch guard **118**, (d) a guard element (e.g., deflection wall, guard plate, curved portion, a curved plate, etc.), shown as guard wall **134**, extending between the second upper mounting flange **130** and the lower mounting flange **132** with a curved shape or profile, and (e) a fourth lower mounting interface, shown as side mounting flange **135**, extending laterally outward from (e.g., substantially perpendicular to, at an outward angle from) the guard wall **134**. As shown in FIGS. **3**, **5**, **6**A-**6**G, **6**I-**6**N, and **6**P-**6**U, the guard wall **134** has or defines a notched portion (e.g., opening, slot, aperture, etc.), shown as belt channel **125**, along at least a portion of a lateral edge thereof. According to an exemplary embodiment, the belt channel **125** is configured (e.g., positioned, sized, etc.) to receive the clutch belt **160** extending between the primary clutch **112** and the secondary clutch **114**.

[0032] As shown in FIGS. **3**, **5**-**6**G, **6**I-N, and **6**P-**6**U, the first upper mounting flange **128** defines one or more apertures, shown as first upper mounting flange apertures **136**, configured to receive one or more first fasteners (e.g., bolts, screws, rivets, etc.), shown as first mounting fasteners **138**, to couple the first upper mounting flange **128** to a first portion of the lower housing **126** (e.g., defining corresponding housing apertures). In some embodiments, the upper mounting plate **120** is configured to be positioned along the first portion of the lower housing **126** (e.g., on an opposing side as the first upper mounting flange **128**). As shown in FIGS. **4**, **6**B-**6**N, and **6**P-**6**V, the upper mounting plate **120** defines one or more apertures, shown as upper mounting plate apertures **145**, configured (e.g., positioned, sized, etc.) to align with the first upper mounting flange apertures **136** and the receive the first mounting fasteners **138**. The first mounting fasteners **138** extend through the first upper mounting flange apertures **136** and the upper mounting plate apertures **145** to couple the upper end of the primary clutch guard **118** to the first portion of the lower housing **126**. In some embodiments, the upper mounting plate **120** is configured (e.g., shaped, includes corresponding apertures, etc.) based on the configuration (e.g., shape or geometry) of an upper end (e.g., first upper mounting flange **128**) of the primary clutch guard **118**.

[0033] As shown in FIGS. **5**-**6**G, **6**I-N, and **6**P-**6**U, the second upper mounting flange **130** defines one or more apertures, shown as second mounting flange aperture **142**, configured to receive one or more second fasteners (e.g., bolts, screws, rivets, etc.), shown as second mounting fastener **144**, to couple the second upper mounting flange **130** to a portion of the upper housing **124** (e.g., defining one or more corresponding housing apertures).

[0034] As shown in FIGS. **5**-**6**G, **6**I-N, and **6**P-**6**U, the lower mounting flange **132** defines one or more apertures, shown as lower mounting flange apertures **146**, configured to receive one or more third fasteners (e.g., bolts, screws, rivets, etc.), shown as third mounting fasteners **148**, to couple the lower mounting flange **132** to a second portion of the lower housing **126** (e.g., defining corresponding housing apertures). In some embodiments, the lower mounting plate **121** is configured to be positioned along the second portion of the lower housing **126** (e.g., on an opposing side as lower mounting flange **132**).

[0035] As shown in FIGS. **6**A, **6**B, **6**I, **6**P, and **6**W, the lower mounting plate **121** defines one or more apertures, shown as lower mounting plate apertures **149**, configured (e.g., positioned, sized, etc.) to align with the lower mounting flange apertures **146** and to receive the third mounting fasteners **148**. The third mounting fasteners **148** extend through the lower mounting flange apertures **146** and the lower mounting plate apertures **149** to couple the lower end (e.g., the lower mounting flange **132**) of the primary clutch guard **118** to the second portion of the lower housing **126**. In some embodiments, the lower mounting plate **121** is configured (e.g., shaped, includes corresponding apertures, etc.) based on the configuration (e.g., shape or geometry) of the lower mounting flange **132** of the primary clutch guard **118**.

[0036] As shown in FIGS. **5**-**6**G, **6**I-N, and **6**P-**6**U, the side mounting flange **135** defines one or more apertures, shown as side mounting flange apertures **147**, configured to receive one or more fourth fasteners (e.g., bolts, screws, rivets, etc.), shown as fourth mounting fasteners **152**, to couple the side mounting flange **135** to a third portion of the lower housing **126** (e.g., defining corresponding housing apertures). In some embodiments, the side mounting plate **123** is configured to be positioned along the third portion of the lower housing **126** (e.g., on opposing side as the side mounting flange **135**).

[0037] As shown in FIGS. **3**-**6**B, **6**I, **6**O, **6**P, and **6**X, the side mounting plate **123** defines one or more apertures, shown as side mounting plate apertures **150**, configured (e.g., positioned, sized, etc.) to align with the side mounting flange apertures **147** and to receive the fourth mounting fasteners **152**. The fourth mounting fasteners **152** extend through the side mounting flange apertures **147** and the side mounting plate apertures **150** to couple a side portion (e.g., the side mounting flange **135**) of the primary clutch guard **118** to the side mounting plate **123** and the third portion of the lower housing **126** (e.g., defining corresponding housing apertures). In some embodiments, the side mounting plate **123** is configured (e.g., shaped, includes corresponding apertures, etc.) based on the configuration (e.g., shape or geometry) of the side mounting flange **135** of the primary clutch guard **118**.

[0038] In some embodiments, the lower mounting plate **121** and the side mounting plate **123** are integrally formed with one another to form a mounting bracket **122**. In some embodiments, the lower mounting plate **121** and the side mounting plate **123** are separate from one another (e.g., individual components of the mounting bracket **122**).

[0039] As shown in FIGS. **3**-**5**, the primary clutch guard **118** is configured (e.g., sized, shaped, etc.) to at least partially surround the primary clutch **112**. More specifically,

the guard wall **134** defines an arc that extends (e.g., wraps) around the primary axis A of the primary clutch **112** and the outer housing thereof. As shown in FIGS. **4** and **5**, the first upper mounting flange **128** and the lower mounting flange **132** are mounted to the lower housing **126** longitudinally forward of the primary axis A such that the arc of the primary clutch guard **118** curves in a direction opposite the occupant seating area **30** and extends at least partially longitudinally forward of the primary axis (i.e., more than one-half of the primary clutch **112** is surrounded by the primary clutch guard **118**).

[0040] According to an exemplary embodiment, the primary clutch guard **118** is positioned and configured to redirect objects debris within the interior cavity or chamber of the clutch guard assembly **116** to travel along a path (e.g., a tangential path) defined by the arc of the guard wall **134** of the primary clutch guard **118** between the second upper mounting flange **130** and the lower mounting flange **132** (i.e., in a direction away from the occupant seating area **30**). Accordingly, the path defined by the primary clutch guard **118** is configured to capture the debris as the debris engages with the guard wall **134** to slow the movement (e.g., energy) of and/or redirect the debris. According to an exemplary embodiment, the primary clutch guard **118** is configured (e.g., positioned, shaped, structured, designed, etc.) to direct the debris in a direction away from the occupant seating area **30**. In some embodiments, the primary clutch guard **118** is made of metal, such as steel, or other material with material properties that allow the primary clutch guard **118** to sufficiently deflect the debris.

[0041] 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.

[0042] 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).

[0043] 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.

[0044] 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.

[0045] 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.

[0046] 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.

[0047] 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.

[0048] 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 **90**, the vehicle controller **100**, the clutch assembly **110**, etc.) as shown in the various exemplary embodiments is illustrative only. Additionally, any clement disclosed in one embodiment may be incorporated or utilized with any other embodiment disclosed herein.

1. A clutch assembly for a snowmobile, the clutch assembly comprising:

a first clutch defining a central axis, the first clutch configured to be coupled to a prime mover of the snowmobile;

a second clutch coupled to the first clutch, the second clutch configured to be coupled to a tractive assembly of the snowmobile; and

a clutch guard positioned between the first clutch and the second clutch, the clutch guard including:

a guard wall having a curved profile extending at least partially around the first clutch;

a first mounting flange positioned at or proximate a first end of the guard wall, the first mounting flange configured to couple to a first mounting interface; and

a second mounting flange positioned at or proximate a second end of the guard wall, the second mounting flange configured to couple to a second mounting interface;

wherein the first mounting flange and the second mounting flange are positioned longitudinally forward of the central axis.

2. The clutch assembly of claim **1**, further comprising a belt coupling the first clutch and the second clutch together.

3. The clutch assembly of claim **2**, wherein the guard wall defines a notch extending at least partially between the first end and the second end, wherein the belt extends through the notch.

4. The clutch assembly of claim **1**, wherein the clutch guard includes a third mounting flange positioned along the guard wall between the first mounting flange and the second mounting flange, the third mounting flange configured to couple to a third mounting interface.

5. The clutch assembly of claim **4**, wherein the clutch guard includes a fourth mounting flange positioned along the guard wall between the first mounting flange and the third mounting flange, the fourth mounting flange configured to couple to a fourth mounting interface.

6. The clutch assembly of claim **5**, wherein the fourth mounting interface is on a different component of the snowmobile than the first mounting interface, the second mounting interface, and the third mounting interface.

7. The clutch assembly of claim **4**, wherein the third mounting flange extends from an edge of the guard wall, wherein the first mounting flange extends from the first end of the guard wall, and wherein the second mounting flange extends from the second end of the guard wall.

8. The clutch assembly of claim **1**, further comprising a housing at least partially surrounding the first clutch and the second clutch, the housing including a first housing portion and a second housing portion separate from the first housing portion, wherein the first mounting interface and the second mounting interface are disposed along the first housing portion.

9. The clutch assembly of claim **8**, wherein the clutch guard includes a third mounting flange positioned along the guard wall between the first mounting flange and the second mounting flange, wherein the third mounting flange is configured to couple to a third mounting interface, and wherein the third mounting interface is disposed along the second housing portion.

10. A clutch assembly comprising:

a first clutch;

a second clutch;

a clutch guard positioned between the first clutch and the second clutch, the clutch guard having a curved profile extending at least partially around the first clutch, the curved profile defining a notch extending at least partially therealong; and

a belt coupling the first clutch to the second clutch, the belt extending through the notch.

11. The clutch assembly of claim **10**, wherein the first clutch defines a central axis, the second clutch is positioned longitudinally rearward of the first clutch, and wherein a first end and a second end of the curved profile are positioned longitudinally forward of the central axis.

12. The clutch assembly of claim **10**, wherein the clutch guard includes a first mounting interface positioned at or proximate a first end thereof, a second mounting interface positioned at or proximate a second end thereof, and a third mounting interface positioned between the first mounting interface and the second mounting interface, wherein the first mounting interface and the second mounting interface are configured to couple to a first component of a vehicle, and wherein the third mounting interface is configured to couple to a second component of the vehicle.

13. The clutch assembly of claim **10**, further comprising a housing at least partially surrounding the first clutch and

the second clutch, the housing including a first housing portion and a second housing portion separate from the first housing portion, wherein the clutch guard includes a first mounting interface coupled to the first housing portion and a second mounting interface coupled to the second housing portion.

14. The clutch assembly of claim **13**, wherein the clutch guard includes a third mounting interface coupled to the first housing portion.

15. The clutch assembly of claim **14**, wherein the second mounting interface is positioned between the first mounting interface and the third mounting interface, and wherein the notch is positioned between the second mounting interface and the third mounting interface.

16. The clutch assembly of claim **10**, wherein the notch is positioned along a first edge of the clutch guard, and wherein the clutch guard includes a mounting flange extending from an opposing second edge thereof.

17. A clutch device comprising:

a clutch guard configured to be positioned between (a) a first clutch coupled to a prime mover of an off-road vehicle and (b) a second clutch coupled to a tractive assembly of the off-road vehicle;

wherein:

the clutch guard having a curved profile configured to extend at least partially around the first clutch such that a first end and a second end of the curved profile are positioned longitudinally forward of a central axis of the first clutch; and

the curved profile defines a notch extending at least partially therealong.

18. The clutch device of claim **17**, wherein the clutch guard includes a first mounting interface positioned at or proximate the first end, a second mounting interface positioned at or proximate the second end, and a third mounting interface positioned between the first mounting interface and the second mounting interface.

19. The clutch device of claim **18**, wherein the first mounting interface and the second mounting interface are configured to couple to a first component of the off-road vehicle, and wherein the third mounting interface is configured to couple to a second component of the off-road vehicle.

18. The clutch device of claim **18**, wherein the notch is positioned between the second mounting interface and the third mounting interface.

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