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FIRE APPARATUS

Abstract

A mid-mount fire apparatus includes a chassis, a body assembly coupled to the chassis, a front cabin coupled to the chassis forward of the body assembly, a front axle coupled to the chassis, a rear axle coupled to the chassis, a stability system including a single set of outriggers positioned between the front axle and the rear axle, and a ladder assembly including a base ladder section and a plurality of extensible ladder sections. The base ladder section has a proximal end that is coupled to the chassis rearward of the front cabin and between the front axle and the rear axle. The ladder assembly has a horizontal reach of at least 88 feet.

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Background/Summary

CROSS-REFERENCE TO RELATED PATENT APPLICATIONS [0001] This application (a) is a continuation of U.S. patent application Ser. No. 18/123,726, filed Mar. 20, 2023, which is a continuation of U.S. patent application Ser. No. 17/244,023, filed Apr. 29, 2021, which is a continuation of U.S. patent application Ser. No. 16/653,377, filed Oct. 15, 2019, which is a continuation of U.S. patent application Ser. No. 16/389,570, filed Apr. 19, 2019, which claims the benefit of U.S. Provisional Patent Application No. 62/661,384, filed Apr. 23, 2018, and (b) is related to (i) U.S. patent application Ser. No. 16/389,630, filed Apr. 19, 2019, which claims the benefit of U.S. Provisional Patent Application No. 62/661,382, filed Apr. 23, 2018, (ii) U.S. Pat. No. 16,389,653, filed Apr. 19, 2019, which claims the benefit of U.S. Provisional Patent Application No. 62/661,420, filed Apr. 23, 2018, (iii) U.S. patent application Ser. No. 16/389,600, filed Apr. 19, 2019, which claims the benefit of U.S. Provisional Patent Application No. 62/661,414, filed Apr. 23, 2018, (iv) U.S. patent application Ser. No. 16/389,143, filed Apr. 19, 2019, which claims the benefit of U.S. Provisional Patent Application No. 62/661,419, filed Apr. 23, 2018, (v) U.S. patent application Ser. No. 16/389,176, filed Apr. 19, 2019, which claims the benefit of U.S. Provisional Patent Application No. 62/661,426, filed Apr. 23, 2018, (vi) U.S. patent application Ser. No. 16/389,029, filed Apr. 19, 2019, which claims the benefit of U.S. Provisional Patent Application No. 62/661,335, filed Apr. 23, 2018, and U.S. Provisional Patent Application No. 62/829,922, filed Apr. 5, 2019, and (vii) U.S. patent application Ser. No. 16/389,072, filed Apr. 19, 2019, which claims the benefit of U.S. Provisional Patent Application No. 62/661,330, filed Apr. 23, 2018, all of which are incorporated herein by reference in their entireties.

BACKGROUND

[0002] Fire apparatuses may be configured as rear-mount aerial fire apparatuses or mid-mount aerial fire apparatuses. Further, such fire apparatuses may be configured as quint configuration fire apparatuses including an aerial ladder, a water tank, a water pump, ground ladder storage, and hose storage. Typically, such fire apparatuses may also include outriggers. However, the outriggers extend directly horizontal from a body of the fire apparatuses and prevent the aerial ladder from being continuously operable at a depression angle without being impeded by the extended outriggers.

SUMMARY

[0003] One embodiment relates to a mid-mount fire apparatus. The mid-mount fire apparatus includes a chassis, a body assembly coupled to the chassis, a front cabin coupled to the chassis forward of the body assembly, a front axle coupled to the chassis, a rear axle coupled to the chassis, a stability system including a single set of outriggers positioned between the front axle and the rear axle, and a ladder assembly including a base ladder section and a plurality of extensible ladder sections. The base ladder section has a proximal end that is coupled to the chassis rearward of the front cabin and between the front axle and the rear axle. The ladder assembly has a horizontal reach of at least 88 feet.

[0004] Another embodiment relates to a mid-mount fire apparatus. The mid-mount fire apparatus includes a body assembly, a cabin, a front axle, a rear axle, a stability system, and a ladder assembly having a proximal end positioned between the front axle and the rear axle. The ladder assembly has a horizontal reach of at least 88 feet. An overall length of the mid-mount fire apparatus is less than or equal to 502 inches.
[0005] Still another embodiment relates to a mid-mount fire apparatus. The mid-mount fire apparatus includes a body assembly, a cabin, a front axle, a single rear axle, a stability system including a single set of outriggers positioned between the front axle and the single rear axle, and a ladder assembly having a proximal end positioned between the front axle and the single rear axle. The ladder assembly has a horizontal reach of at least 88 feet and a vertical reach of at least 95 feet. An overall length of the mid-mount fire apparatus is less than or equal to 502 inches.
[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.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0007] FIG. **1** is a left side view of a mid-mount fire apparatus, according to an exemplary embodiment.
[0008] FIG. **2** is a right side view of the mid-mount fire apparatus of FIG. **1**, according to an exemplary embodiment.
[0009] FIG. **3** is a top view of the mid-mount fire apparatus of FIG. **1**, according to an exemplary embodiment.
[0010] FIG. **4** is a bottom view of the mid-mount fire apparatus of FIG. **1**, according to an exemplary embodiment.
[0011] FIG. **5** is a rear view of the mid-mount fire apparatus of FIG. **1**, according to an exemplary embodiment.
[0012] FIG. **6** is a rear view of the mid-mount fire apparatus of FIG. **1** having outriggers in an extended configuration, according to an exemplary embodiment.
[0013] FIG. **7** is a front view of the mid-mount fire apparatus of FIG. **1** having outriggers in an extended configuration, according to an exemplary embodiment.
[0014] FIG. **8** is a side view of the mid-mount fire apparatus of FIG. **1** relative to a traditional mid-mount fire apparatus, according to an exemplary embodiment.
[0015] FIG. **9** is a side view of the mid-mount fire apparatus of FIG. **1** relative to a traditional rear-mount fire apparatus, according to an exemplary embodiment.
[0016] FIG. **10** is a rear perspective view of a rear assembly of the mid-mount fire apparatus of FIG. **1**, according to an exemplary embodiment.
[0017] FIG. **11** is detailed rear perspective view of the rear assembly of FIGS. **10**, according to an exemplary embodiment.
[0018] FIG. **12** is another rear perspective view of the rear assembly of FIG. **10** without a ladder assembly, according to an exemplary embodiment.
[0019] FIG. **13** is a top view of the rear assembly of FIG. **12**, according to an exemplary embodiment.
[0020] FIG. **14** is a perspective view of a torque box of the mid-mount fire apparatus of FIG. **1**, according to an exemplary embodiment.
[0021] FIG. **15** is a side view of the torque box of FIG. **14**, according to an exemplary embodiment.
[0022] FIG. **16** is a perspective view of an aerial ladder assembly and turntable of the mid-mount

fire apparatus of FIG. **1**, according to an exemplary embodiment.
[0023] FIG. **17** is a side view of a pump housing of the mid-mount fire apparatus of FIG. **1** in a first configuration, according to an exemplary embodiment.
[0024] FIG. **18** is a side perspective view of a pump system within the pump housing of FIG. **17** in a second configuration, according to an exemplary embodiment.
[0025] FIG. **19** is a side perspective view of the pump system of FIG. **18** with a platform in a deployed configuration, according to an exemplary embodiment.
[0026] FIGS. **20** and **21** are opposing side views of the pump system of FIG. **18**, according to an exemplary embodiment.
[0027] FIG. **22** is a detailed perspective view of an aerial assembly recess of the mid-mount fire apparatus of FIG. **1**, according to an exemplary embodiment.
[0028] FIGS. **23** and **24** are various perspective views of a scrub area of an aerial assembly of the mid-mount fire apparatus of FIG. **1**, according to an exemplary embodiment.
[0029] FIG. **25** is a rear view of the mid-mount fire apparatus of FIG. **1** having an aerial assembly at a negative depression angle, according to an exemplary embodiment.
[0030] FIG. **26** is a front view of an aerial assembly of the mid-mount fire apparatus of FIG. **1** in a plurality of configurations, according to an exemplary embodiment.
[0031] FIG. **27** is a block diagram of a control system of the mid-mount fire apparatus of FIG. **1**, according to an exemplary embodiment.
[0032] FIG. **28** is a perspective view of a front downrigger assembly of the mid-mount fire apparatus of FIG. **1**, according to an exemplary embodiment.
[0033] FIG. **29** is a front view of the front downrigger assembly of FIG. **28**, according to an exemplary embodiment.
[0034] FIG. **30** is a top view of the front downrigger assembly of FIG. **28**, according to an exemplary embodiment.
[0035] FIG. **31** is a perspective front view of the front downrigger assembly of FIG. **28**, according to an exemplary embodiment.
[0036] FIG. **32** is a perspective view of a front downrigger assembly of the of the mid-mount fire apparatus of FIG. **1** in a first orientation, according to another exemplary embodiment.
[0037] FIG. **33** is a perspective view of the front downrigger assembly of FIG. **32** in a second orientation, according to an exemplary embodiment.
[0038] FIG. **34** is a perspective view of a cab of the mid-mount fire apparatus of FIG. **1** pivoted with the front downrigger assembly of FIG. **32** in the second orientation, according to an exemplary embodiment.
[0039] FIGS. **35-37** are various views of a rear downrigger assembly of the mid-mount fire apparatus of FIG. **1**, according to an exemplary embodiment.
[0040] FIGS. **38-40** are various views of an outrigger assembly of the mid-mount fire apparatus of FIG. **1**, according to an exemplary embodiment.
[0041] FIG. **41** is a detailed schematic rear view of an outrigger housing of the outrigger assembly of FIGS. **38-40**, according to an exemplary embodiment.
[0042] FIG. **42** is a detailed view of a collar for the outrigger housing of the outrigger assembly of FIG. **41**, according to an exemplary embodiment.

DETAILED DESCRIPTION

[0043] 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.
[0044] According to an exemplary embodiment, a vehicle includes various components that improve performance relative to traditional systems. In one embodiment, the vehicle is a mid-

mount quint configuration fire apparatus that includes a water tank, an aerial ladder, hose storage, ground ladder storage, and a water pump. The fire apparatus includes a stability system including front downriggers coupled to a front end of the fire apparatus, rear downriggers coupled to a rear end of the fire apparatus, and outriggers coupled to the fire apparatus rearward of a vertical pivot axis of the aerial ladder. In some embodiments, the front downriggers are selectively pivotable to facilitate pivoting a front cabin of the fire apparatus. In some embodiments, the outriggers extend laterally from a body of the fire apparatus at an angle (e.g., a negative angle, a depression angle, etc.).

Overall Vehicle

[0045] According to the exemplary embodiment shown in FIGS. **1-21**, a vehicle, shown as fire apparatus **10**, is configured as a mid-mount quint fire truck having a tandem rear axle. A “quint” fire truck as used herein may refer to a fire truck that includes a water tank, an aerial ladder, hose storage, ground ladder storage, and a water pump. In other embodiments, the fire apparatus **10** is configured as a mid-mount quint fire truck having a single rear axle. A tandem rear axle may include two solid axle configurations or may include two pairs of axles (e.g., two pairs of half shafts, etc.) each having a set of constant velocity joints and coupling two differentials to two pairs of hub assemblies. A single rear axle chassis may include one solid axle configuration or may include one pair of axles each having a set of constant velocity joints and coupling a differential to a pair of hub assemblies, according to various alternative embodiments. In still other embodiments, the fire apparatus **10** is configured as a non-quint mid-mount fire truck having a single rear axle or a tandem rear axle. In yet other embodiments, the fire apparatus **10** is configured as a rear-mount, quint or non-quint, single rear axle or tandem rear axle, fire truck.

[0046] As shown in FIGS. **1-7**, **10-13**, **17**, and **18**, the fire apparatus **10** includes a chassis, shown as frame **12**, having longitudinal frame rails that define an axis, shown as longitudinal axis **14**, that extends between a first end, shown as front end **2**, and an opposing second end, shown as rear end **4**, of the fire apparatus **10**; a first axle, shown as front axle **16**, coupled to the frame **12**; one or more second axles, shown as rear axles **18**, coupled to the frame **12**; a first assembly, shown as front cabin **20**, coupled to and supported by the frame **12** and having a bumper, shown as front bumper **22**; a prime mover, shown as engine **60**, coupled to and supported by the frame **12**; and a second assembly, shown as rear assembly **100**, coupled to and supported by the frame **12**.

[0047] As shown in FIGS. **1-7**, **10**, and **12**, the front axle **16** and the rear axles **18** include tractive assemblies, shown as wheel and tire assemblies **30**. As shown in FIGS. **1-4**, the front cabin **20** is positioned forward of the rear assembly **100** (e.g., with respect to a forward direction of travel for the fire apparatus **10** along the longitudinal axis **14**, etc.). According to an alternative embodiment, the cab assembly may be positioned behind the rear assembly **100** (e.g., with respect to a forward direction of travel for the fire apparatus **10** along the longitudinal axis **14**, etc.). The cab assembly may be positioned behind the rear assembly **100** on, by way of example, a rear tiller fire apparatus. In some embodiments, the fire apparatus **10** is a ladder truck with a front portion that includes the front cabin **20** pivotally coupled to a rear portion that includes the rear assembly **100**.

[0048] According to an exemplary embodiment, the engine **60** receives fuel (e.g., gasoline, diesel, etc.) from a fuel tank and combusts the fuel to generate mechanical energy. A transmission receives the mechanical energy and provides an output to a drive shaft. The rotating drive shaft is received by a differential, which conveys the rotational energy of the drive shaft to a final drive (e.g., the front axle **16**, the rear axles **18**, the wheel and tire assemblies **30**, etc.). The final drive then propels or moves the fire apparatus **10**. According to an exemplary embodiment, the engine **60** is a compression-ignition internal combustion engine that utilizes diesel fuel. In alternative embodiments, the engine **60** is another type of prime mover (e.g., a spark-ignition engine, a fuel cell, an electric motor, etc.) that is otherwise powered (e.g., with gasoline, compressed natural gas, propane, hydrogen, electricity, etc.).

[0049] As shown in FIGS. **1-7**, **10-13**, and **17-19**, the rear assembly **100** includes a body assembly, shown as body **110**, coupled to and supported by the frame **12**; a fluid driver, shown as pump system **200**, coupled to and supported by the frame **12**; a chassis support member, shown as torque box **300**, coupled to and supported by the frame **12**; a fluid reservoir, shown as water tank **400**, coupled to the body **110** and supported by the torque box **300** and/or the frame **12**; and an aerial assembly, shown as aerial assembly **500**, pivotally coupled to the torque box **300** and supported by the torque box **300** and/or the frame **12**. In some embodiments, the rear assembly **100** does not include the water tank **400**. In some embodiments, the rear assembly **100** additionally or alternatively includes an agent or foam tank (e.g., that receives and stores a fire suppressing agent, foam, etc.).

[0050] As shown in FIGS. **1**, **2**, and **10-12**, the sides of the body **110** define a plurality of compartments, shown as storage compartments **112**. The storage compartments **112** may receive and store miscellaneous items and gear used by emergency response personnel (e.g., helmets, axes, oxygen tanks, hoses, medical kits, etc.). As shown in FIGS. **5**, **6**, and **10-12**, the rear end **4** of the body **110** defines a longitudinal storage compartment that extends along the longitudinal axis **14**, shown as ground ladder compartment **114**. The ground ladder compartment **114** may receive and store one or more ground ladders. As shown in FIGS. **3**, **5**, and **10-13**, a top surface, shown as top platform **122**, of the body **110** defines a cavity, shown as hose storage platform **116**, and a channel, shown as hose chute **118**, extending from the hose storage platform **116** to the rear end **4** of the body **110**. The hose storage platform **116** may receive and store one or more hoses (e.g., up to 1000 feet of 5 inch diameter hose, etc.), which may be pulled from the hose storage platform **116** though the hose chute **118**.

[0051] As shown in FIGS. **1-6** and **10-13**, the rear end **4** of the body **110** has notched or clipped corners, shown as chamfered corners **120**. In other embodiments, the rear end **4** of the body **110** does not have notched or clipped corners (e.g., the rear end **4** of the body **110** may have square corners, etc.). According to an exemplary embodiment, the chamfered corners **120** provide for increased turning clearance relative to fire apparatuses that have non-notched or non-clipped (e.g., square, etc.) corners. As shown in FIGS. **1-3**, **5**, **6**, and **10-13**, the rear assembly **100** includes a first selectively deployable ladder, shown as rear ladder **130**, coupled to each of the chamfered corners **120** of the body **110**. According to an exemplary embodiment, the rear ladders **130** are hingedly coupled to the chamfered corners **120** and repositionable between a stowed position (see, e.g., FIGS. **1-3**, **5**, **12**, **13**, etc.) and a deployed position (see, e.g., FIGS. **6**, **10**, **11**, etc.). The rear ladders **130** may be selectively deployed such that a user may climb the rear ladder **130** to access the top platform **122** of the body **110** and/or one or more components of the aerial assembly **500** (e.g., a work basket, an implement, an aerial ladder assembly, the hose storage platform **116**, etc.). In other embodiments, the body **110** has stairs in addition to or in place of the rear ladders **130**.

[0052] As shown in FIGS. **1**, **12**, **17**, and **18**, the rear assembly **100** includes a second selectively deployable ladder, shown as side ladder **132**, coupled to a side (e.g., a left side, a right side, a driver's side, a passenger's side, etc.) of the body **110**. In some embodiments, the rear assembly **100** includes two side ladders **132**, one coupled to each side of the body **110**. According to an exemplary embodiment, the side ladder **132** is hingedly coupled to the body **110** and repositionable between a stowed position (see, e.g., FIGS. **1**, **2**, **17**, **18**, etc.) and a deployed position. The side ladder **132** may be selectively deployed such that a user may climb the side ladder **132** to access one or more components of the aerial assembly **500** (e.g., a work platform, an aerial ladder assembly, a control console, etc.).

[0053] As shown in FIGS. **1**, **2**, **12** and **13**, the body **110** defines a recessed portion, shown as aerial assembly recess **140**, positioned (i) rearward of the front cabin **20** and (ii) forward of the water tank **400** and/or the rear axles **18**. The aerial assembly recess **140** defines an aperture, shown as pedestal opening **142**, rearward of the pump system **200**.

[0054] According to an exemplary embodiment the water tank **400** is coupled to the frame **12** with a superstructure (e.g., disposed along a top surface of the torque box **300**, etc.). As shown in FIGS.

1, **2**, **12**, and **13**, the water tank **400** is positioned below the aerial ladder assembly **700** and forward of the hose storage platform **116**. As shown in FIGS. **1**, **2**, **12** and **13**, the water tank **400** is positioned such that the water tank **400** defines a rear wall of the aerial assembly recess **140**. In one embodiment, the water tank **400** stores up to 300 gallons of water. In another embodiment, the water tank **400** stores more than or less than 300 gallons of water (e.g., **100**, **200**, **250**, **350**, **400**, **500**, etc. gallons). In other embodiments, fire apparatus **10** additionally or alternatively includes a second reservoir that stores another firefighting agent (e.g., foam, etc.). In still other embodiments, the fire apparatus **10** does not include the water tank **400** (e.g., in a non-quint configuration, etc.).

[0055] As shown in FIGS. **1-3**, **5-7**, **10**, **17**, and **18**, the aerial assembly **500** includes a turntable assembly, shown as turntable **510**, pivotally coupled to the torque box **300**; a platform, shown work platform **550**, coupled to the turntable **510**; a console, shown as control console **600**, coupled to the turntable **510**; a ladder assembly, shown as aerial ladder assembly **700**, having a first end (e.g., a base end, a proximal end, a pivot end, etc.), shown as proximal end **702**, pivotally coupled to the turntable **510**, and an opposing second end (e.g., a free end, a distal end, a platform end, an implement end, etc.), shown as distal end **704**; and an implement, shown as work basket **1300**, coupled to the distal end **704**.

[0056] As shown in FIGS. **1**, **2**, **4**, **14**, and **15**, the torque box **300** is coupled to the frame **12**. In one embodiment, the torque box **300** extends laterally the full width between the lateral outsides of the frame rails of the frame **12**. As shown in FIGS. **14** and **15**, the torque box **300** includes a body portion, shown as body **302**, having a first end, shown as front end **304**, and an opposing second end, shown as rear end **306**. As shown in FIGS. **12**, **14**, and **15**, the torque box **300** includes a support, shown as pedestal **308**, coupled (e.g., attached, fixed, bolted, welded, etc.) to the front end **304** of the torque box **300**. As shown in FIG. **12**, the pedestal **308** extends through the pedestal opening **142** into the aerial assembly recess **140** such that the pedestal **308** is positioned (i) forward of the water tank **400** and the rear axles **18** and (ii) rearward of pump system **200**, the front axle **16**, and the front cabin **20**.

[0057] According to the exemplary embodiment shown in FIGS. **1**, **2**, and **12**, the aerial assembly **500** (e.g., the turntable **510**, the work platform **550**, the control console **600**, the aerial ladder assembly **700**, the work basket **1300**, etc.) is rotatably coupled to the pedestal **308** such that the aerial assembly **500** is selectively repositionable into a plurality of operating orientations about a vertical axis, shown as vertical pivot axis **40**. As shown in FIGS. **12**, **14**, and **15**, the torque box **300** includes a pivotal connector, shown as slewing bearing **310**, coupled to the pedestal **308**. The slewing bearing **310** is a rotational rolling-element bearing with an inner element, shown as bearing element **312**, and an outer element, shown as driven gear **314**. The bearing element **312** may be coupled to the pedestal **308** with a plurality of fasteners (e.g., bolts, etc.).

[0058] As shown in FIGS. **14** and **15**, a drive actuator, shown as rotation actuator **320**, is coupled to the pedestal **308** (e.g., by an intermediate bracket, etc.). The rotation actuator **320** is positioned to drive (e.g., rotate, turn, etc.) the driven gear **314** of the slewing bearing **310**. In one embodiment, the rotation actuator **320** is an electric motor (e.g., an alternating current (AC) motor, a direct current motor (DC), etc.) configured to convert electrical energy into mechanical energy. In other embodiments, the rotation actuator **320** is powered by air (e.g., pneumatic, etc.), a fluid (e.g., a hydraulic cylinder, etc.), mechanically (e.g., a flywheel, etc.), or still another power source.

[0059] As shown in FIGS. **14** and **15**, the rotation actuator **320** includes a driver, shown as drive pinion **322**. The drive pinion **322** is mechanically coupled with the driven gear **314** of the slewing bearing **310**. In one embodiment, a plurality of teeth of the drive pinion **322** engage a plurality of teeth on the driven gear **314**. By way of example, when the rotation actuator **320** is engaged (e.g., powered, turned on, etc.), the rotation actuator **320** may provide rotational energy (e.g., mechanical energy, etc.) to an output shaft. The drive pinion **322** may be coupled to the output shaft such that the rotational energy of the output shaft drives (e.g., rotates, etc.) the drive pinion **322**. The rotational energy of the drive pinion **322** may be transferred to the driven gear **314** in response to the engaging teeth of both the drive pinion **322** and the driven gear **314**. The driven gear **314** thereby rotates about the vertical pivot axis **40**, while the bearing element **312** remains in a fixed position relative to the driven gear **314**.

[0060] As shown in FIGS. **1**, **2**, and **16-18**, the turntable **510** includes a first portion, shown as rotation base **512**, and a second portion, shown as side supports **514**, that extend vertically upward from opposing lateral sides of the rotation base **512**. According to an exemplary embodiment, (i) the work platform **550** is coupled to the side supports **514**, (ii) the aerial ladder assembly **700** is pivotally coupled to the side supports **514**, (iii) the control console **600** is coupled to the rotation base **512**, and (iv) the rotation base **512** is disposed within the aerial assembly recess **140** and interfaces with and is coupled to the driven gear **314** of slewing bearing **310** such that (i) the aerial assembly **500** is selectively pivotable about the vertical pivot axis **40** using the rotation actuator **320**, (ii) at least a portion of the work platform **550** and the aerial ladder assembly **700** is positioned below the roof of the front cabin **20**, and (iii) the turntable **510** is coupled rearward of the front cabin **20** and between the front axle **16** and the tandem rear axles **18** (e.g., the turntable **510** is coupled to the frame **12** such that the vertical pivot axis **40** is positioned rearward of a centerline of the front axle **16**, forward of a centerline of the tandem rear axle **18**, rearward of a rear edge of a tire of the front axle **16**, forward of a front edge of a wheel of the front axle of the tandem rear axles **18**, rearward of a front edge of a tire of the front axle **16**, forward of a rear edge of a wheel of the rear axle of the tandem rear axles **18**, etc.). Accordingly, loading from the work basket **1300**, the aerial ladder assembly **700**, and/or the work platform **550** may transfer through the turntable **510** into the torque box **300** and the frame **12**.

[0061] As shown in FIG. **12**, the rear assembly **100** includes a rotation swivel, shown as rotation swivel **316**, that includes a conduit. According to an exemplary embodiment, the conduit of the rotation swivel **316** extends upward from the pedestal **308** and into the turntable **510**. The rotation swivel **316** may couple (e.g., electrically, hydraulically, fluidly, etc.) the aerial assembly **500** with other components of the fire apparatus **10**. By way of example, the conduit may define a passageway for water to flow into the aerial ladder assembly **700**. Various lines may provide electricity, hydraulic fluid, and/or water to the aerial ladder assembly **700**, actuators, and/or the control console **600**.

[0062] According to an exemplary embodiment, the work platform **550** provides a surface upon which operators (e.g., fire fighters, rescue workers, etc.) may stand while operating the aerial assembly **500** (e.g., with the control console **600**, etc.). The control console **600** may be communicably coupled to various components of the fire apparatus **10** (e.g., actuators of the aerial ladder assembly **700**, rotation actuator **320**, water turret, etc.) such that information or signals (e.g., command signals, fluid controls, etc.) may be exchanged from the control console **600**. The information or signals may relate to one or more components of the fire apparatus **10**. According to an exemplary embodiment, the control console **600** enables an operator (e.g., a fire fighter, etc.) of the fire apparatus **10** to communicate with one or more components of the fire apparatus **10**. By way of example, the control console **600** may include at least one of an interactive display, a touchscreen device, one or more buttons (e.g., a stop button configured to cease water flow through a water nozzle, etc.), joysticks, switches, and voice command receivers. An operator may use a joystick associated with the control console **600** to trigger the actuation of the turntable **510** and/or the aerial ladder assembly **700** to a desired angular position (e.g., to the front, back, or side of fire apparatus **10**, etc.). By way of another example, an operator may engage a lever associated with the control console **600** to trigger the extension or retraction of the aerial ladder assembly **700**.

[0063] As shown in FIG. **16**, the aerial ladder assembly **700** has a plurality of nesting ladder sections that telescope with respect to one another including a first section, shown as base section **800**; a second section, shown as lower middle section **900**; a third ladder section, shown as middle section **1000**; a fourth section, shown as upper middle section **1100**; and a fifth section, shown as fly section **1200**. As shown in FIGS. **16** and **17**, the side supports **514** of the turntable **510** define a first interface, shown as ladder interface **516**, and a second interface, shown as actuator interface **518**. As shown in FIG. **16**, the base section **800** of the aerial ladder assembly **700** defines first interfaces, shown as pivot interfaces **802**, and second interfaces, shown as actuator interfaces **804**. As shown in FIGS. **16** and **17**, the ladder interfaces **516** of the side supports **514** of the turntable **510** and the pivot interfaces **802** of the base section **800** are positioned to align and cooperatively receive a pin, shown as heel pin **520**, to pivotally couple the proximal end **702** of the aerial ladder assembly **700** to the turntable **510**. As shown in FIG. **17**, the aerial ladder assembly **700** includes first ladder actuators (e.g., hydraulic cylinders, etc.), shown as pivot actuators **710**. Each of the pivot actuators **710** has a first end, shown as end **712**, coupled to a respective actuator interface **518** of the side supports **514** of the turntable **510** and an opposing second end, shown as end **714**, coupled to a respective actuator interface **804** of the base section **800**. According to an exemplary embodiment, the pivot actuators **710** are kept in tension such that retraction thereof lifts and rotates the distal end **704** of the aerial ladder assembly **700** about a lateral axis, shown as lateral pivot axis **42**, defined by the heel pin **520**. In other embodiments, the pivot actuators **710** are kept in compression such that extension thereof lifts and rotates the distal end **704** of the aerial ladder assembly **700** about the lateral pivot axis **42**. In an alternative embodiment, the aerial ladder assembly only includes one pivot actuator **710**.

[0064] As shown in FIG. **16**, the aerial ladder assembly **700** includes one or more second ladders actuators, shown as extension actuators **720**. According to an exemplary embodiment, the extension actuators **720** are positioned to facilitate selectively reconfiguring the aerial ladder assembly **700** between an extended configuration and a retracted/stowed configuration (see, e.g., FIGS. **1-3**, **16**, etc.). In the extended configuration (e.g., deployed position, use position, etc.), the aerial ladder assembly **700** is lengthened, and the distal end **704** is extended away from the proximal end **702**. In the retracted configuration (e.g., storage position, transport position, etc.), the aerial ladder assembly **700** is shortened, and the distal end **704** is withdrawn towards the proximal end **702**.

[0065] According to the exemplary embodiment shown in FIGS. **1-3** and **16**, the aerial ladder assembly **700** has over-retracted ladder sections such that the proximal ends of the lower middle section **900**, the middle section **1000**, the upper middle section **1100**, and the fly section **1200** extend forward of (i) the heel pin **520** and (ii) the proximal end of the base section **800** along the longitudinal axis **14** of the fire apparatus **10** when the aerial ladder assembly **700** is retracted and stowed. According to an exemplary embodiment, the distal end **704** of the aerial ladder assembly **700** (e.g., the distal end of the fly section **1200**, etc.) is extensible to the horizontal reach of at least 88 fect (e.g., 93 feet, etc.) and/or or a vertical reach of at least 95 feet (e.g., 100 feet, etc.). According to an exemplary embodiment, the aerial ladder assembly **700** is operable below grade (e.g., at a negative depression angle relative to a horizontal, etc.) within an aerial work envelope or scrub area. In one embodiment, the aerial ladder assembly **700** is operable in the scrub area such that it may pivot about the vertical pivot axis **40** up to 50 degrees (e.g., 20 degrees forward and 30 degrees rearward from a position perpendicular to the longitudinal axis **14**, etc.) on each side of the body **110** while at a negative depression angle (e.g., up to negative 15 degrees, more than negative 15 degrees, up to negative 20 degrees, etc. below level, below a horizontal defined by the top platform **122** of the body **110**, etc.).

[0066] According to an exemplary embodiment, the work basket **1300** is configured to hold at least one of fire fighters and persons being aided by the fire fighters. As shown in FIGS. **3**, **5**, and **10**, the work basket **1300** includes a platform, shown as basket platform **1310**; a support, shown as railing **1320**, extending around the periphery of the basket platform **1310**; and angled doors, shown as basket doors **1330**, coupled to the corners of the railing **1320** proximate the rear end **4** of the fire apparatus **10**. According to an exemplary embodiment, the basket doors **1330** are angled to correspond with the chamfered corners **120** of the body **110**.

[0067] In other embodiments, the aerial assembly **500** does not include the work basket **1300**. In some embodiments, the work basket **1300** is replaced with or additionally includes a nozzle (e.g., a deluge gun, a water cannon, a water turret, etc.) or other tool. By way of example, the nozzle may be connected to a water source (e.g., the water tank **400**, an external source, etc.) with a conduit extending along the aerial ladder assembly **700** (e.g., along the side of the aerial ladder assembly **700**, beneath the aerial ladder assembly **700**, in a channel provided in the aerial ladder assembly **700**, etc.). By pivoting the aerial ladder assembly **700** into a raised position, the nozzle may be elevated to expel water from a higher elevation to facilitate suppressing a fire.

[0068] According to an exemplary embodiment, the pump system **200** (e.g., a pump house, etc.) is a mid-ship pump assembly. As shown in FIGS. **1**, **2**, **12**, **17**, and **18**, the pump system **200** is positioned along the rear assembly **100** behind the front cabin **20** and forward of the vertical pivot axis **40** (e.g., forward of the turntable **510**, the torque box **300**, the pedestal **308**, the slewing bearing **310**, the heel pin **520**, a front end of the body **110**, etc.) such that the work platform **550** and the over-retracted portions of the aerial ladder assembly **700** overhang above the pump system **200** when the aerial ladder assembly **700** is retracted and stowed. According to an exemplary embodiment, the position of the pump system **200** forward of the vertical pivot axis **40** facilitates case of install and serviceability. In other embodiments, the pump system **200** is positioned rearward of the vertical pivot axis **40**.

[0069] As shown in FIGS. **17-21**, the pump system **200** includes a housing, shown as pump house **202**. As shown in FIG. **17**, the pump house **202** includes a selectively openable door, shown as pump door **204**. As shown in FIGS. **18-21**, the pump system **200** includes a pumping device, shown as pump assembly **210**, disposed within the pump house **202**. By way of example, the pump assembly **210** may include a pump panel having an inlet for the entrance of water from an external source (e.g., a fire hydrant, etc.), a pump, an outlet configured to engage a hose, various gauges, etc. The pump of the pump assembly **210** may pump fluid (e.g., water, agent, etc.) through a hose to extinguish a fire (e.g., water received at an inlet of the pump house **202**, water stored in the water tank **400**, etc.). As shown in FIGS. **19-21**, the pump system **200** includes a selectively deployable (e.g., foldable, pivotable, collapsible, etc.) platform, shown as pump platform **220**, pivotally coupled to the pump house **202**. As shown in FIGS. **20** and **21**, the pump platform **220** is in a first configuration, shown as stowed configuration **222**, and as shown in FIG. **19**, the pump platform **220** is in a second configuration, shown as deployed configuration **224**.

[0070] As shown in FIGS. **1**, **2**, **4**, **6**, **7**, **10-12**, **14**, and **15**, the fire apparatus **10** includes a stability system, shown as stability assembly **1400**. As shown in FIGS. **1**, **2**, **4**, and **7**, the stability assembly **1400** includes first stabilizers, shown as front downriggers **1500**, coupled to each lateral side of the front bumper **22** at the front end **2** of the front cabin **20**. In other embodiments, the front downriggers **1500** are otherwise coupled to the fire apparatus **10** (e.g., to the front end **2** of the frame **12**, etc.). According to an exemplary embodiment, the front downriggers **1500** are selectively deployable (e.g., extendable, etc.) downward to engage a ground surface. As shown in FIGS. **1**, **2**, **4-6**, **10-12**, **14**, and **15**, the stability assembly **1400** includes second stabilizers, shown as rear downriggers **1600**, coupled to each lateral side of the rear end **4** of the frame **12** and/or the rear end **306** of the torque box **300**. According to an exemplary embodiment, the rear downriggers **1600** are selectively deployable (e.g., extendable, etc.) downward to engage a ground surface. As shown in FIGS. **1**, **2**, **4**, **6**, **7**, **10**, **12**, **14**, **15**, **17**, and **18**, the stability assembly **1400** includes third stabilizers, shown outriggers **1700**, coupled to the front end **304** of the torque box **300** between the pedestal **308** and the body **302**. As shown in FIGS. **6** and **7**, the outriggers **1700** are selectively deployable (e.g., extendable, etc.) outward from each of the lateral sides of the body **110** and/or downward to engage a ground surface. According to an exemplary embodiment, the outriggers **1700** are extendable up to a distance of eighteen feet (e.g., measured between the center of a pad of a first outrigger and the center of a pad of a second outrigger, etc.). In other embodiments, the outriggers **1700** are extendable up to a distance of less than or greater than eighteen feet.

[0071] According to an exemplary embodiment, the front downriggers **1500**, the rear downriggers **1600**, and the outriggers **1700** are positioned to transfer the loading from the aerial ladder assembly

700 to the ground. For example, a load applied to the aerial ladder assembly **700** (e.g., a fire fighter at the distal end **704**, a wind load, etc.) may be conveyed into to the turntable **510**, through the pedestal **308** and the torque box **300**, to the frame **12**, and into the ground through the front downriggers **1500**, the rear downriggers **1600**, and/or the outriggers **1700**. When the front downriggers **1500**, the rear downriggers **1600**, and/or the outriggers **1700** engage with a ground surface, portions of the fire apparatus **10** (e.g., the front end **2**, the rear end **4**, etc.) may be elevated relative to the ground surface. One or more of the wheel and tire assemblies **30** may remain in contact with the ground surface, but may not provide any load bearing support. While the fire apparatus **10** is being driven or not in use, the front downriggers **1500**, the rear downriggers **1600**, and the outriggers **1700** may be retracted into a stored position.

[0072] According to an exemplary embodiment, with (i) the front downriggers **1500**, the rear downriggers **1600**, and/or the outriggers **1700** extended and (ii) the aerial ladder assembly **700** fully extended (e.g., at a horizontal reach of 88 feet, at a vertical reach of 95 feet, etc.), the fire apparatus **10** withstands a rated tip load (e.g., rated meaning that the fire apparatus **10** can, from a design-engineering perspective, withstand a greater tip load, with an associated factor of safety of at least two, meets National Fire Protection Association ("NFPA") requirements, etc.) of at least 1,000 pounds applied to the work basket **1300**, in addition to the weight of the work basket **1300** itself (e.g., approximately 700 pounds, etc.). In embodiments where the aerial assembly **500** does not include the work basket **1300**, the fire apparatus **10** may have a rated tip load of more than 1,000 pounds (e.g., 1,250 pounds, etc.) when the aerial ladder assembly **700** is fully extended.

[0073] According to an exemplary embodiment, the tandem rear axles **18** have a gross axle weight rating of up to 48,000 pounds and the fire apparatus **10** does not exceed the 48,000 pound tandem-rear axle rating. The front axle **16** may have a 24,000 pound axle rating. Traditionally, mid-mount fire trucks have greater than a 48,000 pound loading on the tandem rear-axles thereof. However, some state regulations prevent vehicles having such a high axle loading, and, therefore, the vehicles are unable to be sold and operated in such states. Advantageously, the fire apparatus **10** of the present disclosure has a gross axle weight loading of at most 48,000 pounds on the tandem rear axles **18**, and, therefore, the fire apparatus **10** may be sold and operated in any state of the United States.

[0074] As shown in FIGS. **5** and **9**, the fire apparatus **10** has a height H. According to an exemplary embodiment, the height H of the fire apparatus **10** is at most 128 inches (i.e., 10 feet, 8 inches). In other embodiments, the fire apparatus **10** has a height greater than 128 inches. As shown in FIGS. **8** and **9**, the fire apparatus **10** has a longitudinal length L. According to an exemplary embodiment, the longitudinal length L of the fire apparatus **10** is at most 502 inches (i.e., 41 feet, 10 inches). In other embodiments, the fire apparatus **10** has a length L greater than 502 inches. As shown in FIGS. **8** and **9**, the fire apparatus **10** has a distance D.sub.1 between the rear end **4** of the body **110** and the middle of the tandem rear axles **18** (e.g., a body rear overhang portion, etc.). According to an exemplary embodiment, the distance D.sub.1 of the fire apparatus **10** is at most 160 inches (i.e., 13 feet, 4 inches). In other embodiments, the fire apparatus **10** has a distance D.sub.1 greater than 160 inches. As shown in FIGS. **8** and **9**, the fire apparatus **10** has a distance D.sub.2 between the front end **2** of the front cabin **20** (excluding the front bumper **22**) and the middle of the tandem rear axles **18**. According to an exemplary embodiment, the distance D.sub.2 of the fire apparatus **10** is approximately twice or at least twice that of the distance D.sub.1 (e.g., approximately 321 inches, approximately 323 inches, at least 320 inches, etc.).

[0075] As shown in FIG. **8**, the longitudinal length L of the fire apparatus **10** is compared to the longitudinal length L′ of a traditional mid-mount fire apparatus **10′**. As shown in FIG. **8**, when the front axles of the fire apparatus **10** and the fire apparatus **10′** are aligned, the fire apparatus **10′** extends beyond the longitudinal length L of the fire apparatus **10** a distance Δ′. The distance Δ′ may be approximately the same as the amount of the body **110** rearward of the tandem rear axles **18** of the fire apparatus **10** such that the amount of body rearward of the tandem rear axle of the fire apparatus **10′** is approximately double that of the fire apparatus **10**. Decreasing the amount of the body **110** rearward of the tandem rear axles **18** improves drivability and maneuverability, and substantially reduces the amount of damage that fire departments may inflict on public and/or private property throughout a year of operating their fire trucks.

[0076] One solution to reducing the overall length of a fire truck is to configure the fire truck as a rear-mount fire truck with the ladder assembly overhanging the front cabin (e.g., in order to provide a ladder assembly with comparable extension capabilities, etc.). As shown in FIG. **9**, the longitudinal length L of the fire apparatus **10** is compared to the longitudinal length L′ of a traditional rear-mount fire apparatus **10″**. As shown in FIG. **9**, when the front axles of the fire apparatus **10** and the fire apparatus **10″** are aligned, the ladder assembly of the fire apparatus **10″** extends beyond the longitudinal length L of the fire apparatus **10** a distance Δ″ such that the ladder assembly overhangs past the front cabin. Overhanging the ladder assembly reduces driver visibility, as well as rear-mount fire trucks do not provide as much freedom when arriving at a scene on where and how to position the truck, which typically requires the truck to be reversed into position to provide the desired amount of reach (e.g., which wastes valuable time, etc.). Further, the height H″ of the fire apparatus **10″** is required to be higher than the height H of the fire apparatus **10** (e.g., by approximately one foot, etc.) so that the ladder assembly of the fire apparatus **10″** can clear the front cabin thereof.

Aerial Configuration

[0077] As shown in FIGS. **1-3**, the over-retracted portions of the aerial ladder assembly **700** (e.g., the proximal ends of the lower middle section **900**, the middle section **1000**, the upper middle section **1100**, the fly section **1200**, etc.) extend forward of (i.e., past) (i) the lateral pivot axis **42** defined by the heel pin **520** and (ii) the proximal end of the base section **800** (i.e., the portion of the base section **800** that is coupled to the heel pin **520**) along the longitudinal axis **14** of the fire apparatus **10** when the aerial ladder assembly **700** is retracted and stowed (e.g., such that at least one of the lower middle section **900**, the middle section **1000**, the upper middle section **1100**, the fly section **1200**, etc. spans across the lateral pivot axis **42** when the aerial ladder assembly **700** is retracted and stowed). Such over-retraction disposes the over-retracted portions of the aerial ladder assembly **700** to extend over the pump house **202** adjacent (i.e., rearward of) a rearmost wall of the front cabin **20**. In other embodiments, at least a portion of the over-retracted portions of the aerial ladder assembly **700** extend past and forward of the rearmost wall of the front cabin **20** (e.g., in an embodiment where the rearmost cab wall is angled, notched, etc.). As shown in FIGS. **1** and **2**, at least a portion of the plurality of nesting ladders sections (e.g., at least a base rail of the base section **800**, the lower middle section **900**, the middle section **1000**, the upper middle section **1100**, the fly section **1200**, etc.) of the aerial ladder assembly **700** is positioned below the top (i.e., roof) of the front cabin **20** (e.g., when the aerial ladder assembly **700** is not pivoted/raised about the lateral pivot axis **42**, etc.).

[0078] As shown in FIGS. **22-25**, (i) the body **110** of the rear assembly **100** within the aerial assembly recess **140** is shaped, (ii) the pump house **202** adjacent the aerial assembly recess **140** is shaped, (iii) the water tank **400** adjacent the aerial assembly recess **140** is shaped, and/or (iv) the outriggers **1700** extend at negative depression angle γ from the body **110** to facilitate a substantial aerial work envelope of the aerial ladder assembly **700**, shown as scrub area **730**. Such component configurations facilitate operation of the aerial ladder assembly **700** at a negative depression angle below grade (e.g., below horizontal, etc.) of up to an angle θ. According to an exemplary embodiment, the angle θ is approximately negative fifteen degrees. In other embodiments, the angle θ is greater than fifteen degrees (e.g., eighteen, twenty, etc. degrees) or less than fifteen degrees (e.g., ten, twelve, fourteen, etc. degrees). In some embodiments, the angle θ is at least greater than eight degrees.

[0079] As shown in FIG. **22**, the body **110** of the rear assembly **100** includes first angled portions, shown as angled body panels **144**, extending at a negative, downward angle within the aerial assembly recess **140**. The pump house **202** of the pump system **200** includes second angled portions, shown as angled pump house panels **206**, extending at a negative, downward angle within the aerial assembly recess **140**. As shown in FIGS. **22** and **24**, the water tank **400** has a wall, shown as frontmost wall **402**, adjacent the aerial assembly recess **140**. The frontmost wall **402** includes a pair of third angled portions, shown as angled wall portions **406**, extending from a wall portion perpendicular to the longitudinal axis **14**, shown as perpendicular wall portion **404**, at a rearward angle (e.g., towards the rear end **4** of the fire apparatus **10**, etc.). According to an exemplary embodiment, the angle γ of the outriggers **1700** is approximately in the range of negative eight to negative twelve degrees relative to a horizontal axis. In other embodiments, the angle γ is greater than twelve degrees (e.g., fifteen degrees, etc.) or less than eight degrees (e.g., five degrees, zero degrees, etc.).

[0080] According to an exemplary embodiment, the angled body panels **144** of the body **110**, the angled pump house panels **206** of the pump house **202**, the angled wall portions **406** of the water tank **400**, and/or the angle γ of the outriggers **1700** facilitate operating the aerial ladder assembly within the scrub area **730** up to the angle θ. As shown in FIGS. **23** and **24**, the aerial ladder assembly **700** is operable within the scrub area **730** below grade (e.g., at any angle below zero degrees up to angle θ, etc.) about the vertical pivot axis **40** up to (i) an angle α forward of the aerial ladder assembly **700** being perpendicular to the longitudinal axis **14** and (ii) an angle β rearward of the aerial ladder assembly **700** being perpendicular to the longitudinal axis **14**. According to an exemplary embodiment, the angle α is approximately twenty degrees. In other embodiments, the angle α is greater than twenty degrees (e.g., twenty-two, twenty-five, thirty, etc. degrees) or less than twenty degrees (e.g., ten, fifteen, eighteen, etc. degrees). According to an exemplary embodiment, the angle β is approximately thirty degrees. In other embodiments, the angle β is greater than thirty degrees (e.g., thirty-two, thirty-five, etc. degrees) or less than thirty degrees (e.g., fifteen, twenty, twenty-five, etc. degrees). The scrub area **730** may therefore have a total sweep angle (e.g., the aggregate of the angle α and the angle β, etc.) of approximately fifty degrees. In other embodiments, the sweep angle of the scrub area **730** is at least more than fifteen degrees. In still other embodiments, the sweep angle of the scrub area **730** is at least more than thirty degrees.

[0081] As shown in FIG. **25**, the aerial ladder assembly **700** is oriented to extend perpendicularly from the body **110** of the rear assembly **100** (e.g., the aerial ladder assembly **700** is perpendicular relative to the longitudinal axis **14**, etc.) and is positioned below grade at the angle θ (e.g., negative fifteen degrees, etc.). When configured in such a position, the aerial ladder assembly **700** extends from the side of the body **110** a distance D.sub.3, and the basket platform **1310** of the work basket **1300** is positioned at a height h above a ground surface while none of the plurality of nesting ladder sections (e.g., the lower middle section **900**, the middle section **1000**, the upper middle section **1100**, the fly section **1200**, etc.) are extended (e.g., the lower middle section **900**, the middle section **1000**, the upper middle section **1100**, and the fly section **1200** are over-retracted relative to the base section **800** and the heel pin **520**, etc.). According to an exemplary embodiment, being able to operate at the angle θ and the over-retracting configuration of the plurality of nesting ladder sections of the aerial ladder assembly **700** facilitate accessing the work basket **1300** from the ground surface without requiring the extension of the aerial ladder assembly **700**. The height h of the basket platform **1310** is at most 20.3 inches, according to an exemplary embodiment (e.g., meeting the maximum step height limit as set by NFPA regulations, without requiring extension of the aerial ladder assembly **700**, etc.). In some embodiments, the height h is less than 20.3 inches (e.g., in embodiments where the stability assembly **1400** of the fire apparatus **10** has a leaning capability, etc.). According to an exemplary embodiment, the distance D.sub.3 is approximately 19.5 feet. In other embodiments, the distance D.sub.3 is greater than 19.5 feet (e.g., 20 feet, 22 feet, in embodiments with a longer aerial ladder assembly **700**, etc.) or less than 19.5 feet (e.g., 19 feet, 18.5 feet, etc.).

[0082] As shown in FIG. **26**, the aerial ladder assembly **700** is pivotable about the lateral pivot axis

42 to reposition the aerial ladder assembly **700** at a plurality of different positions including a horizontal position, shown as horizontal set-back configuration **740**, a below grade position, shown as blitz configuration **742**, and a plurality of above grade positions, shown as raised configurations **744**. As shown in FIG. **26**, when the aerial ladder assembly **700** is arranged in the horizontal set-back configuration **740** and the longitudinal axis **14** of the fire apparatus **10** is positioned parallel or substantially parallel with a fire scene (e.g., a house, a building, an apartment, etc.), the aerial ladder assembly **700** extends from the side of the body **110** a set-back distance D.sub.4. According to an exemplary embodiment, the set-back distance D.sub.4 is approximately twenty feet. In other embodiments, the set-back distance D.sub.4 is greater than twenty feet (e.g., twenty-seven feet, in an embodiment where the aerial ladder assembly **700** includes a side-mounted e-trac versus a rung-mounted e-trac, etc.) or less than twenty feet (e.g., in embodiments where the fire apparatus **10** includes a shorter aerial ladder assembly **700**, in embodiments where the aerial ladder assembly **700** does not include the work basket **1300**, etc.; fifteen, sixteen, seventeen, eighteen, nineteen, etc. fect).

[0083] As shown in FIG. **26**, when the aerial ladder assembly **700** is arranged in the blitz configuration **742**, the aerial ladder assembly **700** is oriented at a negative depression angle (e.g., up to the angle θ, etc.) such that the work basket **1300** is positioned substantially close to the ground surface and adjacent the fire scene (e.g., the first level of a building, a store front, etc.). In the blitz configuration **742**, the work basket **1300** may be extended from the rear assembly **100** by pivoting the aerial ladder assembly **700** about the vertical pivot axis **40** toward the fire scene and then pivoting aerial ladder assembly **700** about the lateral pivot axis **42** such that the work basket **1300** clears any obstacles **750** (e.g., cars, etc.) positioned in front of the fire scene. A turret, shown as water turret **1340**, that is coupled to the work basket **1300** may be manipulated (e.g., using a user input device of the fire apparatus **10**, the control console **600**, etc.) to expel water or another fire surprising agent from the water tank **400** or other source (e.g., a fire hydrant, an agent tank, etc.) into the first level of the fire scene upward at the ceiling thereof to expel a fire therein (e.g., to prevent a fire from spreading to the upper levels of the building, etc.). In other embodiments, the water turret **1340** is otherwise positioned (e.g., coupled to the distal end of the fly section **1200**, in embodiments where the aerial ladder assembly **700** does not include the work basket **1300**, etc.).

[0084] As shown in FIG. **26**, when the aerial ladder assembly **700** is arranged in the raised configurations **744**, the aerial ladder assembly **700** is oriented at a positive angle such that the work basket **1300** is positioned above the fire apparatus **10**. To extend further in the vertical direction, the plurality of nesting sections of the aerial ladder assembly **700** may begin to be extended. In order to un-bed the aerial ladder assembly **700** (e.g., pivot the aerial ladder assembly **700** upward, etc.), the over-retracted portions of the aerial ladder assembly **700** may need to be extended past the heel pin **520**. Such may require that the fire apparatus **10** be set back a distance slightly further than the set-back distance D.sub.4 (e.g., twenty-four fect, etc.).

[0085] According to the exemplary embodiment shown in FIG. **27**, a control system, shown as fire apparatus control system **2000**, for the fire apparatus **10** includes a controller **2010**. In one embodiment, the controller **2010** is configured to selectively engage, selectively disengage, control, and/or otherwise communicate with components of the fire apparatus **10**. As shown in FIG. **27**, the controller **2010** is coupled to the rotation actuator **320**, the pivot actuator(s) **710**, the extension actuator(s) **720**, the water turret **1340**, basket actuator(s) **1350** positioned to manipulate the work basket **1300** (e.g., a rotation actuator, a pivot actuator, a lift actuator, an extension actuator, etc.) relative to the distal end of the fly section **1200** of the aerial ladder assembly **700**, and a user input/output ("I/O") device **2020**. In other embodiments, the controller **2010** is coupled to more or fewer components (e.g., the stability assembly **1400**, etc.). By way of example, the controller **2010** may send and/or receive signals with the rotation actuator **320**, the pivot actuator(s) **710**, the extension actuator(s) **720**, the water turret **1340**, the basket actuator(s) **1350**, and/or the user I/O device **2020**.

[0086] The controller **2010** 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. **27**, the controller **2010** includes a processing circuit **2012** and a memory **2014**. The processing circuit **2012** 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 **2012** is configured to execute computer code stored in the memory **2014** to facilitate the activities described herein. The memory **2014** may be any volatile or non-volatile computer-readable storage medium capable of storing data or computer code relating to the activities described herein. According to an exemplary embodiment, the memory **2014** includes computer code modules (e.g., executable code, object code, source code, script code, machine code, etc.) configured for execution by the processing circuit **2012**. In some embodiments, controller **2010** represents a collection of processing devices (e.g., servers, data centers, etc.). In such cases, the processing circuit **2012** represents the collective processors of the devices, and the memory **2014** represents the collective storage devices of the devices.

[0087] In one embodiment, the user I/O device **2020** includes a display and an operator input. The display may be configured to display a graphical user interface, an image, an icon, and/or still other information. In one embodiment, the display includes a graphical user interface configured to provide general information about the fire apparatus **10** (e.g., vehicle speed, fuel level, warning lights, battery level, etc.). The graphical user interface may also be configured to display a current position of the aerial ladder assembly **700**, a current position of the work basket **1300**, a current position of the turntable **510**, an orientation of the fire apparatus **10** (e.g., an angle relative to a ground surface, etc.), and/or still other information relating to the fire apparatus **10** and/or the aerial assembly **500**. The user I/O device **2020** may be or include the control console **600**, a user interface within the front cabin **20**, a user interface in the work basket **1300**, a user interface on the side of the body **110**, and/or a portable device wirelessly connected to the controller **2010** (e.g., a mobile device, a smartphone, a tablet, etc.).

[0088] The operator input may be used by an operator to provide commands to at least one of the rotation actuator **320**, the pivot actuator(s) **710**, the extension actuator(s) **720**, the water turret **1340**, and the basket actuator(s) **1350**. The operator input may include one or more buttons, knobs, touchscreens, switches, levers, joysticks, pedals, a steering wheel, or handles. The operator input may facilitate manual control of some or all aspects of the operation of the fire apparatus **10**. It should be understood that any type of display or input controls may be implemented with the systems and methods described herein.

[0089] According to an exemplary embodiment, the controller **2010** is configured to prevent or limit activation of the pivot actuators **710** while the proximal ends of the plurality of nesting ladder sections of the aerial ladder assembly **700** are over-retracted beyond the heel pin **520**. By way of example, the controller **2010** may be configured to automatically extend the plurality of nesting ladder sections forward until the proximal ends of each extends along the base section **800** beyond the heel pin **520** (e.g., in response to a lift command while the ladder sections are over-retracted), and then begin pivoting the aerial ladder assembly about the lateral pivot axis **42** and/or continue extending the plurality of nesting ladder sections (e.g., if an extension command is being provided by an operator using the user I/O device **2020**, to prevent the over-retracted portions from pivoting into the work platform **550**, etc.).

Stability Assembly

[0090] According to an exemplary embodiment, the front downriggers **1500**, the rear downriggers **1600**, and the outriggers **1700** of the stability assembly **1400** are configured to assist in providing the horizontal and vertical reach capabilities of the aerial ladder assembly **700** and facilitate leveling the fire apparatus **10** when on uneven ground.

[0091] As shown in FIGS. **28-31**, the front downriggers **1500** include a first downrigger, shown as first front downrigger **1510**, and a second downrigger, shown second front downrigger **1520**. In an alternative embodiment, the front downriggers **1500** are replaced with a single front stability foot or the fire apparatus **10** does not include the front downriggers **1500**. As shown in FIGS. **28-31**, each of the first front downrigger **1510** and the second front downrigger **1520** includes a first actuator assembly, shown as front actuator assembly **1530**. According to an exemplary embodiment, the front actuator assemblies **1530** are or include hydraulic actuators. In other embodiments, the front actuator assemblies **1530** are or include pneumatic actuators, electric actuators, and/or mechanically-driven actuators. As shown in FIGS. **28**, **29**, and **31**, each of the front actuator assemblies **1530** includes a front extension actuator having a first portion, shown as cylinder housing **1532**, and a second portion, shown as rod **1534**, with a plate, shown as foot plate **1536**, coupled to an end of the rod **1534**. According to an exemplary embodiment, the rods **1534** are selectively extendable from the cylinder housings **1532** such that the foot plates **1536** and/or ground pads coupled thereto engage a ground surface.

[0092] As shown in FIGS. **28-32**, the front bumper **22** has a first lateral end, shown as left end **24**, and an opposing second lateral end, shown as right end **26**. As shown in FIGS. **28**, **29**, and **31**, the front bumper **22** include a coupler, shown as bracket **28**, coupled to each of the left end **24** and the right end **26** of the front bumper **22**. A first bracket **28** couples the first front downrigger **1510** to the left end **24** of the front bumper **22** and a second bracket **28** couples the second front downrigger **1520** to the right end **26** of the front bumper **22**.

[0093] As shown in FIGS. **32-34**, the front downriggers **1500** are pivotally coupled to the frame **12** of the fire apparatus **10**. Specifically, the first front downrigger **1510** is pivotally coupled to a first frame rail **13** of the frame **12** and the second front downrigger is pivotally coupled to a second frame rail **15** of the frame **12**. As shown in FIGS. **32-34**, the first frame rail **13** has a plate, shown as coupling plate **32**, coupled to the front end **2** thereof. A housing, shown as bracket housing **34**, is coupled to the coupling plate **32**. A bracket, shown as pivotal bracket **36**, is received by and pivotally coupled to the bracket housing **34**. The pivotal bracket **36** is coupled to the front actuator assembly **1530** of the first front downrigger **1510** such that the first front downrigger **1510** is selectively pivotable therewith between an extension orientation (see, e.g., FIG. **32**) and a pivoted orientation (see, e.g., FIGS. **33** and **34**). An actuator, shown as pivoting actuator **1540**, is positioned to facilitate selectively actuating the first front downrigger **1510** between the extension orientation and the pivoted orientation (e.g., automatically, etc.). In other embodiments, the first front downrigger **1510** is manually pivotable between the extension orientation and the pivoted orientation. According to an exemplary embodiment, the second front downrigger **1520** is similarly coupled to and pivotable relative to the second frame rail **15**.

[0094] As shown in FIG. **34**, the front cabin **20** is pivotable about the front end **2** of the frame **12** when the front downriggers **1500** are pivoted into the pivoted orientation. According to an exemplary embodiment, the first front downrigger **1510** and the second front downrigger **1520** are configured to automatically pivot into the pivoted orientation when the front cabin **20** is pivoted upward about the front end **2** of the frame **12** (e.g., such that the front downriggers **1500** do not impede the lifting of the front cabin **20**, etc.). By way of example, the pivoting actuators **1540** positioned to pivot the front downriggers **1500** and an actuator that is positioned to pivot the front cabin **20** may be linked (e.g., hydraulically coupled, fluidly coupled, etc.) such that activation of one activates the other or both are driven by a common source. By way of another example, the controller **2010** may be configured to prevent or limit pivoting of the front cabin **20** until the pivoting actuators **1540** have been engaged to pivot the front downriggers **1500** into the pivoted orientation.

[0095] According to an exemplary embodiment, the pivoting capability of the front downriggers

1500 facilitates raising the front downriggers **1500** higher up the front the front cabin **20** relative to a ground surface (e.g., compared to the arrangement in FIGS. **28-31** coupled to the front bumper **22**, etc.), effectively increasing the ground clearance of the fire apparatus **10** and thereby the angle of inclines that the fire apparatus **10** may traverse (e.g., increasing drivability, maneuverability, etc. of the fire apparatus **10**).

[0096] As shown in FIGS. **35-37**, the rear downriggers **1600** include a third downrigger, shown as first rear downrigger **1610**, and a fourth downrigger, shown second rear downrigger **1620**. In an alternative embodiment, the rear downriggers **1600** are replaced with a single rear stability foot. As shown in FIGS. **35-37**, each of the first rear downrigger **1610** and the second rear downrigger **1620** includes a second actuator assembly, shown as rear actuator assembly **1630**. Each of the rear actuator assemblies **1630** includes a housing, shown as rear actuator receiver **1632**, defining an internal cavity that receives an actuator, shown as rear extension actuator **1634**. According to an exemplary embodiment, the rear extension actuators **1634** are or include hydraulic actuators. In other embodiments, the rear extension actuators **1634** are or include pneumatic actuators, electric actuators, and/or mechanically-driven actuators. As shown in FIGS. **35** and **36**, each of the rear actuator assemblies **1630** includes a foot, shown as rear foot **1636**, coupled to an end of the rear extension actuator **1634** and a pad, shown as rear ground pad **1638**, coupled to the rear foot **1636**. According to an exemplary embodiment, the rear extension actuators **1634** are selectively extendable from the rear actuator receivers **1632** such that the rear ground pads **1638** engage a ground surface.

[0097] As shown in FIGS. **35-37**, each of the rear actuator assemblies **1630** includes a bracket, shown as rear bracket **1640**, extending laterally from each of the rear actuator receivers **1632**. The rear brackets **1640** are configured to couple the first rear downrigger **1610** and the second rear downrigger **1620**, respectively, to opposing lateral sides of a support, shown as rear downrigger support **1602**, coupled the rear end **4** of the frame **12**, beneath the body **302** of the torque box **300**, and forward of the rear end **306** of the torque box **300**. The rear downrigger support **1602** is therefore configured to secure the rear downriggers **1600** to the frame **12**, rearward of the rear axles **18**.

[0098] As shown in FIGS. **7** and **38-42**, the outrigger assembly of the outriggers **1700** includes a housing, shown as outrigger housing **1702**; a pair of first actuator assemblies, shown as lateral actuator assemblies **1740**, having components thereof slidably coupled within and selectively laterally extendable from the outrigger housing **1702** and the body **110**; and a pair of second actuator assemblies, shown as vertical actuator assemblies **1750**, coupled to distal ends of lateral actuator assemblies **1740**. As shown in FIGS. **38** and **39**, the outrigger housing **1702** is coupled the frame **12**, rearward of the vertical pivot axis **40** defined by the pedestal **308** (e.g., not forward of the turntable **510**, etc.). As shown in FIG. **39**, at least a portion of the outrigger housing **1702** (e.g., a front tube thereof, etc.) extends at least partially through the pedestal **308** (e.g., a rear portion thereof, etc.).

[0099] As shown in FIGS. **38-42**, the outrigger housing **1702** includes a first tube, shown as first track **1710**, and a second tube, shown as second track **1720**. According to the exemplary embodiment shown in FIGS. **38-42**, the first track **1710** is positioned longitudinally forward of the second track **1720**. In other embodiments, the first track **1710** is positioned longitudinally rearward of the second track **1720**. As shown in FIG. **41**, the first track **1710** has a first end, shown as left end **1712**, and an opposing second end, shown as right end **1714**. The first track **1710** defines a first internal cavity, shown as first internal slot **1716**, and a first lateral axis, shown as first lateral extension axis **1718**. The second track **1720** has a first end, shown as right end **1722**, and an opposing second end, shown as left end **1724**. The second track **1720** defines a second internal cavity, shown as second internal slot **1726**, and a second lateral axis, shown as second lateral extension axis **1728**.

[0100] According to an exemplary embodiment, the first track **1710** and the second track **1720** extend laterally across the body **110** of the fire apparatus **10**. As shown in FIGS. **40-42**, the left end **1712** of the first track **1710** is elevated relative the right end **1714** of the first track **1710** such that the first lateral extension axis **1718** of the first track **1710** is oriented with a negative slope (e.g., when viewed from the rear, etc.) having the angle γ (e.g., five to fifteen degrees below a horizontal, eight to twelve degree below a horizontal, etc.). The right end **1722** of the second track **1720** is elevated relative the left end **1724** of the second track **1720** such that the second lateral extension axis **1728** of the second track **1720** is oriented with a positive slope (e.g., when viewed from the rear, etc.) having the angle γ.

[0101] As shown in FIGS. **40-42**, the outrigger housing **1702** includes a first connector, shown as first collar **1730**, and a second connector, shown as second collar **1732**. The first collar **1730** is positioned to secure the left end **1724** of the second track **1720** to the left end **1712** of the first track **1710** that is elevated relative to the second track **1720** (i.e., because of the opposite slopes thereof). The second collar **1732** is positioned to secure the right end **1714** of the first track **1710** to the right end **1722** of the second track **1720** that is elevated relative to the first track **1710** (i.e., because of the opposite slopes thereof). As shown in FIG. **42**, the first collar **1730** and the second collar **1732** have a z-shaped structure with a first vertical leg, shown as upper leg **1734**; a horizontal leg, shown as connector **1736**, extending horizontally from a lower end of the upper leg **1734**; and a second vertical leg, shown as lower leg **1738**, extending vertically downward from an end of the connector **1736** opposite the upper leg **1734**. The upper leg **1734** of the first collar **1730** is configured to be secured (e.g., fastened, welded, etc.) to a sidewall of the first track **1710**, the connector **1736** of the first collar **1730** is configured to be secured to a top surface of the second track **1720**, and the lower leg **1738** of the first collar **1730** is configured to be secured to a sidewall of the second track **1720**. The upper leg **1734** of the second collar **1732** is configured to be secured to a sidewall of the second track **1720**, the connector **1736** of the second collar **1732** is configured to be secured to a top surface of the first track **1710**, and the lower leg **1738** of the second collar **1732** is configured to be secured to a sidewall of the first track **1710**.

[0102] As shown in FIGS. **7** and **38-40**, each of the lateral actuator assemblies **1740** includes an arm, shown as telescoping arm **1742**, and an actuator, shown as lateral extension actuator **1744**. One of the telescoping arms **1742** is slidably received within the first internal slot **1716** of the first track **1710** and the other of the telescoping arms **1742** is slidably received within the second internal slot **1726** of the second track **1720**. The lateral extension actuators **1744** are positioned to facilitate selectively extending the telescoping arms **1742** from the first track **1710** and the second track **1720** along the first lateral extension axis **1718** and the second lateral extension axis **1728**, respectively, at the angle γ. According to an exemplary embodiment, the lateral extension actuators **1744** are or include hydraulic actuators. In other embodiments, the lateral extension actuators **1744** are or include pneumatic actuators, electric actuators, and/or mechanically-driven actuators. According to an exemplary embodiment, the angle γ at which the telescoping arms **1742** extend from the first track **1710** and the second track **1720** facilitates pivoting the aerial ladder assembly **700** continuously to a side of the fire apparatus **10** at the maximum depression angle θ without requiring the aerial ladder assembly **700** to be lifted over the telescoping arms **1742** as the aerial ladder assembly **700** passes thereover.

[0103] As shown in FIGS. **7** and **38-40**, each of the vertical actuator assemblies **1750** includes a housing, shown as vertical actuator receiver **1752**, coupled to a distal end of one of the telescoping arms **1742** and defines an internal cavity that receives an actuator, shown as vertical extension actuator **1754**. According to an exemplary embodiment, the vertical extension actuators **1754** are or include hydraulic actuators. In other embodiments, the vertical extension actuators **1754** are or include pneumatic actuators, electric actuators, and/or mechanically-driven actuators. As shown in FIGS. **38-40**, each of the vertical actuator assemblies **1750** includes a foot, shown as outrigger foot **1756**, coupled to an end of each of the vertical extension actuators **1754**. According to an exemplary embodiment, the vertical extension actuators **1754** are selectively extendable from the vertical actuator receivers **1752** such that the outrigger feet **1756** and/or ground pads coupled thereto engage a ground surface.

[0104] According to an exemplary embodiment, each of the front actuator assemblies **1530** (i.e., the front extension actuators thereof), each of the rear extension actuators **1634**, each of the lateral extension actuators **1744**, and/or each of the vertical extension actuators **1754** are independently controllable (e.g., by the controller **2010**, etc.) to level the fire apparatus **10** (e.g., during use of the aerial ladder assembly **700**, etc.). The front actuator assemblies **1530**, the rear extension actuators **1634**, the lateral extension actuators **1744**, and/or the vertical extension actuators **1754** may be actively controllable (e.g., by the controller **2010**, etc.) as the aerial ladder assembly **700** is pivoted about the vertical pivot axis **40**, as the aerial ladder assembly **700** is pivoted about the lateral pivot axis **42**, and/or as the plurality of nesting ladder sections of the aerial ladder assembly **700** are extended or retracted to maintain stability of the fire apparatus **10**. If a scenario were to arise where the aerial ladder assembly **700** is moved into a position that approaches a limit of the aerial ladder assembly **700** and/or the fire apparatus **10**, the controller **2010** may (i) prevent or limit further extension and/or pivoting of the aerial ladder assembly **700**, (ii) retract the plurality of nesting ladder sections, and/or (iii) dynamically adjust the front downriggers **1500**, the rear downriggers **1600**, and/or the outriggers **1700** to increase the current capability of the aerial ladder assembly **700** and/or the fire apparatus **10**.

[0105] As utilized herein, the terms “approximately,” “about,” “substantially”, and similar terms 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. It should be understood by those of skill in the art who review this disclosure that these terms are intended to allow a description of certain features described and claimed without restricting the scope of these features to the precise numerical ranges provided. 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.

[0106] 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).

[0107] 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.

[0108] The term “or,” as used herein, is used in its inclusive sense (and not in its exclusive sense) so that when used to connect a list of elements, the term “or” means one, some, or all of the elements in the list. Conjunctive language such as the phrase “at least one of X, Y, and Z,” unless specifically stated otherwise, is understood to convey that an element may be either X; Y; Z; X and Y; X and Z; Y and Z; or X, Y, and Z (i.e., any combination of X, Y, and Z). Thus, such conjunctive language is not generally intended to imply that certain embodiments require at least one of X, at least one of Y, and at least one of Z to each be present, unless otherwise indicated.

[0109] 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.

[0110] 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.

[0111] 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.

[0112] 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.

[0113] It is important to note that the construction and arrangement of the fire apparatus **10** and the systems and components thereof 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. Although only one example of an element from one embodiment that can be incorporated or utilized in another embodiment has been described above, it should be appreciated that other elements of the various embodiments may be incorporated or utilized with any of the other embodiments disclosed herein.

Claims

1. A mid-mount fire apparatus comprising: a chassis; a body assembly coupled to the chassis; a front cabin coupled to the chassis forward of the body assembly; a front axle coupled to the chassis; a rear axle coupled to the chassis; a stability system including a single set of outriggers positioned between the front axle and the rear axle; and a ladder assembly including a base ladder section and a plurality of extensible ladder sections, the base ladder section having a proximal end that is coupled to the chassis rearward of the front cabin and between the front axle and the rear axle; wherein the ladder assembly has a horizontal reach of at least 88 feet.
2. The mid-mount fire apparatus of claim 1, wherein the horizontal reach is greater than 90 feet.
3. The mid-mount fire apparatus of claim 1, wherein the stability system includes at least one of: one or more front downriggers positioned forward of the front axle; or one or more rear downriggers positioned rearward of the rear axle.
4. The mid-mount fire apparatus of claim 1, further comprising a control system configured to: control the stability system to level the mid-mount fire apparatus; and enable the stability system to lean the mid-mount fire apparatus when an operational capability of the ladder assembly is at a limit thereof while the mid-mount fire apparatus is level to effectively improve the operational capability relative to when the mid-mount fire apparatus is level.
5. The mid-mount fire apparatus of claim 4, wherein the operational capability is the horizontal reach of the ladder assembly, and wherein the control system is configured to enable the stability system to lean the mid-mount fire apparatus when a reach limit of the ladder assembly is reached while the mid-mount fire apparatus is level to increase the horizontal reach of the ladder assembly.
6. The mid-mount fire apparatus of claim 4, wherein the control system is configured to derate the operational capability of the ladder assembly in response to the stability system leaning the mid-mount fire apparatus more than a threshold amount.
7. The mid-mount fire apparatus of claim 1, wherein a distal end of the ladder assembly is positionable less than or equal to about 20.3 inches above a ground surface without extending the ladder assembly.
8. The mid-mount fire apparatus of claim 1, wherein the ladder assembly includes a basket, and wherein the ladder assembly is repositionable such that a platform of the basket is accessible from a ground surface with the ladder assembly fully retracted.
9. The mid-mount fire apparatus of claim 1, wherein an overall length of the mid-mount fire apparatus is less than or equal to 502 inches.
10. The mid-mount fire apparatus of claim 1, further comprising a pump positioned rearward of the front cabin and at least partially forward of an axis about which the ladder assembly rotates.
11. The mid-mount fire apparatus of claim 1, wherein the rear axle is a single rear axle.
12. The mid-mount fire apparatus of claim 1, further comprising a water tank having about a 300 gallon capacity.
13. The mid-mount fire apparatus of claim 1, wherein the ladder assembly is extensible to a vertical reach of at least 95 feet.
14. The mid-mount fire apparatus of claim 1, wherein a distal end of the ladder assembly does not extend beyond a rear end of the body assembly when fully retracted and stowed.

15. A mid-mount fire apparatus comprising: a body assembly; a cabin; a front axle; a rear axle; a stability system; and a ladder assembly having a proximal end positioned between the front axle and the rear axle; wherein the ladder assembly has a horizontal reach of at least 88 feet; and wherein an overall length of the mid-mount fire apparatus is less than or equal to 502 inches.

16. The mid-mount fire apparatus of claim 15, wherein the stability system includes a single set of outriggers.

17. The mid-mount fire apparatus of claim 15, wherein the rear axle is a single rear axle.

18. The mid-mount fire apparatus of claim 15, wherein the ladder assembly is extensible to a vertical reach of at least 95 feet.

19. The mid-mount fire apparatus of claim 15, wherein a distal end of the ladder assembly does not extend beyond a rear end of the body assembly when fully retracted and stowed.

20. A mid-mount fire apparatus comprising: a body assembly; a cabin; a front axle; a single rear axle; a stability system including a single set of outriggers positioned between the front axle and the single rear axle; and a ladder assembly having a proximal end positioned between the front axle and the single rear axle; wherein the ladder assembly has a horizontal reach of at least 88 feet and a vertical reach of at least 95 feet; and wherein an overall length of the mid-mount fire apparatus is less than or equal to 502 inches.