| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| | [0041] There can be a plurality of flow dividers and or combination of flow divider manifolds 140 and 142 to regulate and distribute flow in the hydraulic lines 136A and 136B and 138A and 138B, respectively, to motors 124 and 126 on an equalized basis. Operably interposed between the flow dividers 140 and 142, pumps 132 and 134, and motors 124 and 126 are flushing valves 146 for flushing hydraulic fluid to aid in fluid cooling and excess fluid.<br><br>[0042] FIGS. 5-7 depict half of the hydraulic system and thus it is understood that components not mentioned here are likewise operatively disposed in the vehicle 100. Recirculation valves 150 can be operably interposed between the wheel motors 124 and 126 and high speed shift valves 154 operably connect to one flow divider and or combination of flow divider manifolds 140. A second speed valve 156 and brake valve 157 can be operably interposed between pump 130 and one of each of the wheel motors 124 and 126.<br><br>[0045] Importantly, the ability to control the power system provides for counter rotation of wheels 120 and 122 (e.g. left) rotate and or drive in forward motion while wheels 120 and 122 (e.g., right) rotate and or drive in reverse motion or vice versa, skid steering where one side (e.g. left) of wheels 120 and 122 are precluded from moving and the other side (e.g., right) wheels 120 and 122 are under power of movement, as well as forward and reverse movement of wheels 120 and 122 and turn steer capabilities where as wheels 120 and 122 (e.g., left) rotate or drive forward at full power and wheels 120 and 122 (e.g., right) rotate or drive at a reduced power or vice versa which creates a slow, smooth gradual | |

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| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| | turning like that of an automobile. Preferably, a joy stick 164 can be operably connected to the control processor 160 and be equipped with contact switches such that actuation of the joy stick in a predetermined quadrant direction or part thereof will initiate one of the aforementioned operations of the control processor. For example, the forward movement of the stick 164 moves the vehicle 100 forward, backward movement moves vehicle 100 back, left or right movement produces a turn steer and or skid steer of one or the other side wheels 120 or 122 to effect a turn based on the position of the joy stick at the moment (e.g. from the point of neutral, half way through the axis of side travel of the joystick the vehicle will be in turn steer mode. As the operator or driver passes the half way axis point the vehicle 100 transitions into the skid steer mode then onto the counter-rotation mode), a diagonal movement produces a turn steer mode of the wheels disposed on opposite sides of the vehicle 100. The vehicle 100 includes more than four wheels, such as six and preferably eight wheels but could be of even a greater number of wheels which are connected to the vehicle and powered by independent hydraulic and or other propel means wheel motors.<br><br>**[0054]** It is contemplated that a direct drive system can be employed wherein one or more wheels is driven by a drive shaft with suitable yoke connections, a hydrostatic drive transmission or via a hydraulic system as is known in the art. One or more drive systems can be employed on the vehicle 100 providing the user with multiple drive mechanism options. | |
| | | |
| 17. The vehicle of claim 16, wherein the wheels are operable at | **[0025]** A transmission pump operably interconnects the hydraulic motors and engine via hydraulic lines and prefer-ably connects to a flow divider and or a combination of flow divider manifolds to regulate hydraulic flow to the wheel motors and other hydraulic | |

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| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| variable speed by the hydraulic motor. | components. There can be a plu-rality of flow dividers and or flow divider manifolds to regu-late and distribute flow in the hydraulic lines to each wheel motor on an equalized basis. Isolation valves can be operably interposed between the wheel motors and aforesaid compo-nents. These valves could either manually or automatically be sensing pressure changes and isolate a damaged wheel motor from the rest of the hydraulic system preventing loss of power and hydraulic fluid from the rest of the hydraulic system. Additionally, sensors can be provided to detect when there is a pressure differential change in the connections and the system can preferably automatically as well as manually actuate the appropriate isolation valves in a manner to main-tain flow equilibration in the system. Thus, if there is a leak in one wheel motor or other hydraulic component, this can be stopped and hydraulic fluid redirected to the remaining wheel motors and other hydraulic components thereby providing drive and PTO (Power Take Off) for the remaining wheel motors and other hydraulic components. The vehicle thus enables a series of backup drive mechanisms. A central con-trol processor can be provided on the vehicle and is operably connected to the sensors and Isolation and speed shift valves and power system, such as that provided by the engine or separate battery, to control operation of each of the aforemen-tioned movable components. Importantly, this provides for counter rotation of wheels where one side of wheels turn in a forward motion while at the exact same time the other side of wheels tum in a reverse motion and vice versa depending on which direction the operator decides to execute the counter rotation e.g. (left or right, in forward or reverse), skid steering where one side of wheels are precluded from moving and the other side wheels are under power of movement tum steer like an automobile where one side receives less power than the other at the wheel motors thereby creating a | |

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| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| | smooth left or right turn, as well as forward and reverse movement of wheels. Preferably, a joy stick can be operably connected to the control processor and be equipped with contact switches such that actuation of the joy stick in a predetermined quad-rant direction or part thereof will initiate one of the aforementioned operations of the control processor thereof will initiate one of the aforementioned operations of the control processor.<br><br>**[0026]** In another embodiment of the invention, the vehicle includes more than four wheels, such as six and preferably eight wheels but can contain an even greater number of wheels which are connected to the vehicle and powered by independent hydraulic or other propulsion power such as electric, chain, belt drive, wheel motors. The wheel motors likewise operably connect to an engine on the vehicle via a transmission and or hydraulic pump, which is operably inter-connected to the hydraulic or other propel drive means to the wheel motors and engine via hydraulic lines and preferably connects to a flow divider and or combination flow divider manifolds to regulate hydraulic flow to the wheel motors and other hydraulic components. Similarly, there can be a plural-ity of flow dividers and or combination of flow divider mani-folds to regulate and distribute flow in the hydraulic lines to each motor on an equalized basis. Isolation valves can be operably interposed between the wheel motors and aforesaid components. Additionally, sensors can be provided to detect when there is a pressure differential change in the connections and the system can preferably automatically and or manually actuate the appropriate isolation valves in a manner to main-tain flow equilibration in the system. Stability can be accom-plished when traveling over rough ground and includes a frame having a sealed hull to provide the vehicle with buoy-ancy. A platform exists on the frame above the | |

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| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| | hull which includes a plurality of open surfaces through which a quick release connector may be inserted to secure a functional unit or aid unit to the platform.<br><br>**[0039]** Each of the first and second chassis 102 and 104 include a plurality of wheels 120 and 122, respectively, which can each preferably be operably connected to a hydraulic or other propel means wheel motor 124 and 126, respectively. The hydraulic or other propel means wheel motors 124 and 126 can preferably be of a direct wheel mount type, such as the Bosch Rexroth MCR5-380 which are operably connected a transmission and or hydraulic pump or a combination of pumps which are operably connected to an engine 130 which can preferably be operably connected to the first chassis 102 or optionally second chassis 104. The engine 130 can be a relatively low horsepower diesel unit, such as 166 horse power (124 KW) @3500 RPM FPT (Fiat Power Train) diesel engine.<br><br>**[0040]** Transmission and or tandem combination hydraulic pumps 132 and 134 can operably interconnect to the hydrau-lic ( and or other propel means) wheel motors 124 and 126 and engine 130 via hydraulic lines 136A and 136B and 138A and 138B, wherein lines 136A and 138A can preferably connect to flow divider 140 and 142 (and or combination of flow divider manifolds) to regulate hydraulic flow to the wheel motors 124 and 126 and lines 136B and 138B are return lines to the respective pumps 132 and 134.<br><br>**[0041]** There can be a plurality of flow dividers and or combination of flow divider manifolds 140 and 142 to regulate and distribute flow in the hydraulic lines 136A and 136B and 138A and 138B, respectively, to motors 124 and 126 on an | |

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| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| | equalized basis. Operably interposed between the flow dividers 140 and 142, pumps 132 and 134, and motors 124 and 126 are flushing valves 146 for flushing hydraulic fluid to aid in fluid cooling and excess fluid.<br><br>**[0042]** FIGS. 5-7 depict half of the hydraulic system and thus it is understood that components not mentioned here are likewise operatively disposed in the vehicle 100. Recirculation valves 150 can be operably interposed between the wheel motors 124 and 126 and high speed shift valves 154 operably connect to one flow divider and or combination of flow divider manifolds 140. A second speed valve 156 and brake valve 157 can be operably interposed between pump 130 and one of each of the wheel motors 124 and 126.<br><br>**[0045]** Importantly, the ability to control the power system provides for counter rotation of wheels 120 and 122 (e.g. left) rotate and or drive in forward motion while wheels 120 and 122 (e.g., right) rotate and or drive in reverse motion or vice versa, skid steering where one side (e.g. left) of wheels 120 and 122 are precluded from moving and the other side (e.g., right) wheels 120 and 122 are under power of movement, as well as forward and reverse movement of wheels 120 and 122 and turn steer capabilities where as wheels 120 and 122 (e.g., left) rotate or drive forward at full power and wheels 120 and 122 (e.g., right) rotate or drive at a reduced power or vice versa which creates a slow, smooth gradual turning like that of an automobile. Preferably, a joy stick 164 can be operably connected to the control processor 160 and be equipped with contact switches such that actuation of the joy stick in a predetermined quadrant direction or part thereof will initiate one of the aforementioned operations of the control processor. For | |

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| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| | example, the forward movement of the stick 164 moves the vehicle 100 forward, backward movement moves vehicle 100 back, left or right movement produces a turn steer and or skid steer of one or the other side wheels 120 or 122 to effect a turn based on the position of the joy stick at the moment (e.g. from the point of neutral, half way through the axis of side travel of the joystick the vehicle will be in turn steer mode. As the operator or driver passes the half way axis point the vehicle 100 transitions into the skid steer mode then onto the counter-rotation mode), a diagonal movement produces a turn steer mode of the wheels disposed on opposite sides of the vehicle 100. The vehicle 100 includes more than four wheels, such as six and preferably eight wheels but could be of even a greater number of wheels which are connected to the vehicle and powered by independent hydraulic and or other propel means wheel motors.<br><br>**[0054]** It is contemplated that a direct drive system can be employed wherein one or more wheels is driven by a drive shaft with suitable yoke connections, a hydrostatic drive transmission or via a hydraulic system as is known in the art. One or more drive systems can be employed on the vehicle 100 providing the user with multiple drive mechanism options. | |
| | | |
| 18. The vehicle of claim 17, wherein the vehicle further comprises a nozzle at the end of the conduit. | **[0050]** The chassis 104 can include functional engines fire-fighting equipment 200 including a water tank, 201, dual engine pumps 202 and hoses with nozzles 204 all of which are operatively interconnected. Additionally, foam systems, dry chemical systems, split cell foam tanks, mechanical compo-nents, electrified water and or slippery slime tanks, micro-wave impulse equipment, water cannon, hazardous materials decontamination, weapons armaments, construction aid tools and packages can be provided. | |

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| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| 19. The vehicle of claim 17, wherein the at least one of speed and direction of the vehicle when the vehicle is floating is controlled by a fluid mover. | **[0049]** A protective cage 103 can be provided on the chassis 102 for the occupant and or occupants. Communications, special operations, laser, search, rescue, medical, surveillance, cargo, transport, construction, fuel tank, vehicle engine, transmission, propulsion pumps, wiring connectors, wire harnesses, instrument panels, access panels, computer, doors, windows, hatches, sensors, imaging equipment can preferably be operatively connected to the chassis 102 and or chassis 104.<br><br>**[0058]** The vehicle 100 is designed to be drivable on uneven ground, on mud, through deep water, or on other surfaces a regular automobile or truck cannot be driven on. To achieve this effect, the vehicle can be relatively lightweight, having eight, ten or twelve-wheel drive or more, which can prefer-ably be sealed against water intrusion to critical engine and transmission parts. Weight reduction can be achieved by using various polymers which also have ballistic proof capa-bility.<br><br>**[0059]** This combination also has several important advan-tages, such as the ability to transport a pump or other device to direct the water, foam and dry chemicals at the fire, as well as decontamination solutions for decon missions. For example, the pump can force the water, foam and dry chemi-cal and decon solutions through the hose at a higher velocity, thus allowing the firefighters to attack the fire or decon objec-tive from a greater distance than if they were on foot. Further-more, while it is not practical for a firefighter or group of firefighters to carry a water cannon and then hold and operate it by hand, the present invention does permit the transporta-tion of the water cannon, thus enabling the firefighters to attack the fire or decon objective from an even greater dis-tance. The water cannon is as well capable to shoot | **Abstract:** A floating manure agitator that floats on the surface of a manure lagoon and that may be remotely controlled to agitate manure supernatant into a slurry with sludge settling on the bottom of the lagoon. The agitator is provided with a plurality of fluid outputs, the direction of which may be controlled to motivate and steer the agitator. The outputs are angled to develop vortices of supernatant into the sludge to further mix the materials into a slurry<br><br>**[0011]** In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore.<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe |

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| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| | streams of water (straight streams, fog, wide streams) of just water, foam, dry chemical or decon solutions in any combination and can be remotely controlled either wirelessly or wired in manned, unmanned and autonomous modes as well the water cannon can be operated manually in the case of a system failure.<br><br>[0064] Manual controls provide for operation of the vehicle 100. However, the operations of each unit described herein can be performed by remote control as part of processor 160 which is operably quick connectable to the vehicle 100 hav-ing suitable connections therewith for each aforesaid compo-nent as well as transceiver equipment associated therewith enabling the processor 160 to be reprogrammed on a need to need basis. This enables the vehicle 100 to be remotely con-trolled via line of sight, gps, or by air via aircraft such as the so-called "Preditor." Remote control mechanics, servos, hardware, wiring harnesses can be quick releasable to facili-tate easy replacement of any faulty components in case of damage or failure. A manual over-ride can be incorporated should the vehicle 100 need to be taken out of autonomous, unmanned mode for whatever reason and vice versa.<br><br>[0079] The hull (bottom section) of the vehicle 100 can preferably be shaped in such a configuration as that of a boat in a slight curved V shape with angles from 1 degree to 95 degrees and may be greater that accomplish two separate tasks. (Task!) The hull of vehicle 100 can facilitate amphibious operations that accomplish three different sub tasks being (1) eliminating water drag on the vehicle as it moves through the water, (2) water build up distribution in front of and to the sides of the vehicle 100 (which slows the movement and turning capabilities of the vehicle 100), (3) significantly enhances both the movement directional speed | (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>[0029] Releasably coupled to the second slurry output (62) and third slurry output (64) are a pair of nozzles (66) and (68) pivotably coupled to the vessel (12). The second slurry output (62) and third slurry output (64) are oriented and configured to direct the slurry (50) as desired and to increase the velocity with which the slurry (50) exits the nozzles (66) and (68). The second slurry output (62) is preferably directed between five and eighty degrees port, more preferably directed between ten and sixty degrees port and, most preferably, between fifteen and forty-five degrees port. The third slurry output (64) is preferably directed between five and eighty degrees star-board, more preferably between ten and sixty degrees star-board and, most preferably, between fifteen and forty-five degrees starboard. The intake pipe (40) is preferably posi-tioned between the first slurry output (44) and the second slurry output (62).<br><br>[0032] The remote control system (64) also includes an engine stop button (98), start button (100), a throttle down button (102) and throttle up button (104). To steer the agitator (10) the remote control system (84) is provided with |

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| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| | i.e. forward or reverse and significantly enhances the turning capabilities left or right as well of vehicle 100. (Task 2) Upper body 105 and lower body 107 of vehicle 100 can facilitate land and sea borne operations in relationship to ballistic resistant proper-ties and Explosive Energy Dispersion, (EED), in relationship to IED's (Improvised Explosive Devices) and other explosive devices i.e. (land mines and or water mines), that accomplish two sub tasks. (Sub-Task 1) The hull uses angles of 1 degree to 95 degrees or greater significantly enhance ballistic pro-jectile defeat by creating a ricochet effect thereby increasing the effectiveness of the used method of armor. Using varying degrees of angles in different configurations using different thicknesses within the armors configuration can create a pocket and or channel the trajectory path of the munition into this pocket to catch or trap the munition or channel and deflect the munition into a different trajectory away from a crucial portion of the vehicle 100. (Sub-Task 2) The hull can use the same 1 degree to 95 degree angles or greater incorporated into configuration geometry into both the upper and lower body of vehicle 100 which accomplishes explosive blast energy dis-persion away from the vehicle 100. The lower body of vehicle 100 would also incorporate blast ducts using 1 degree to 95 degree angles in a shape configuration of duct channels formed within or incorporated onto the lower body of vehicle 100 that would give the energy and or pressure release of the blast a directional path to follow leading away from the vehicle 100 and critical components of the underbody and side components of the vehicle 100 such as wheel mounting hubs, tires and other critical components. | a bow left button (106) and bow right button (108). The bow left button (106) causes the steering control hydraulic cylinder (52) to extend, thereby directing the nozzle (48) to starboard and driving the agitator (10) port. The remote control system (84) is also provided with a bow right button (108) to retract the hydraulic cylinder (52) and steer the agitator (10) star-board. The remote control system (84) is provided with a reverse button (110) which causes the hydraulic cylinder (70) to extend, thereby forcing the pivot pipe (58) to direct the slurry outputs (62) and (64) toward the bow (18) of the agi-tator (10), thereby driving the vessel (12) rearward. Similarly, a forward button (112) causes the hydraulic cylinder (70) to retract and drive the agitator (10) forward.<br><br>**[0035]** Once the agitator (10) is floating in the lagoon (22), the remote control system (84) is used to activate the power source (36) to cause the slurry pump (38) to draw supernatant (128) into the intake pipe (40) and out the outputs (44), (62) and (64). The remote control system (84) is used to direct the pivot pipe (58) to angle the slurry outputs (62) and (64) aft to drive the agitator (10) forward. The remote control system (84) then actuates the control panel (74) to direct the hydrau-lic cylinder (52) to angle the first slurry output (44) to turn the agitator (10) port or starboard as desired. The remote control system (84) is thereafter used to direct the volume of super-natant (128) drawn into the intake pipe (40) and the direction at which the supernatant (128) is expelled from the slurry outputs (44), (62) and (64). By manipulating the direction of the slurry outputs (44), (62) and (64) with the remote control system (84), a user may direct the agitator (10) to any desired portion of the lagoon. |

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| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| 20. The vehicle of claim 17, further comprising a plurality of fluid nozzles fluidly connected to the fluid pump. | | **[0008]** It would, therefore, be desirable to provide a vehicle which floats on the manure pond and which is maneuverable. It would also be desirable to provide the vehicle with multiple outlet nozzles to direct the fluid downward into the lagoon a sufficient distance to agitate the solids in the bottom of the lagoon into suspension and create vortices within the lagoon to assist in carrying solids within the sludge into suspension in the supernatant. It would additionally be desirable to direct the nozzles to create vortices that mix the solids of the sludge into suspension with the supernatant, while minimizing the amount of unpleasant smelling hydrogen sulfide rising to the surface and escaping into the air.<br><br>**[0011]** In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore. |

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| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| | | **[0027]** Coupled to the slurry pump (38) by a transport pipe ( 42) is a first slurry output ( 44). (FIG. 5). The first slurry output ( 44) is an angled pipe ( 46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe ( 46) is a tapered liquid manure nozzle ( 48) to increase the velocity of slurry (50) passing through the nozzle ( 48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles ( 48) may be coupled to the angled pipe ( 46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output ( 44). Coupled between the angled pipe ( 46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**[0029]** Releasably coupled to the second slurry output (62) and third slurry output (64) are a pair of nozzles (66) and (68) pivotably coupled to the vessel (12). The second slurry output (62) and third slurry output (64) are oriented and configured to direct the slurry (50) as desired and to increase the velocity with which the slurry (50) exits the nozzles (66) and (68). The second slurry output (62) is preferably directed between five and eighty degrees port, more preferably directed between ten and sixty degrees port and, most preferably, between fifteen and forty-five degrees port. The third slurry output (64) is preferably directed between five and eighty degrees star-board, more preferably between ten and sixty degrees star-board and, most preferably, between fifteen and forty-five degrees starboard. The intake pipe (40) is preferably posi-tioned between the first slurry output (44) and the second slurry output (62). |

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| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| | | **[0035]** Once the agitator (10) is floating in the lagoon (22), the remote control system (84) is used to activate the power source (36) to cause the slurry pump (38) to draw supernatant (128) into the intake pipe (40) and out the outputs (44), (62) and (64). The remote control system (84) is used to direct the pivot pipe (58) to angle the slurry outputs (62) and (64) aft to drive the agitator (10) forward. The remote control system (84) then actuates the control panel (7 4) to direct the hydrau-lic cylinder (52) to angle the first slurry output ( 44) to turn the agitator (10) port or starboard as desired. The remote control system (84) is thereafter used to direct the volume of super-natant (128) drawn into the intake pipe ( 40) and the direction at which the supernatant (128) is expelled from the slurry outputs (44), (62) and (64). By manipulating the direction of the slurry outputs (44), (62) and (64) with the remote control system (84), a user may direct the agitator (10) to any desired portion of the lagoon.<br><br>**[0037]** The remote control system (84) may be used to cause the slurry pump (38) to expel slurry (50) more slowly from the slurry outputs (44), (62) and (64) as the agitator (10) is near the shore (142) of the lagoon (22) so as not to penetrate the lining (144) of the lagoon (22) thereby allowing the slurry (50) to escape. As the agitator (10) moves towards the center of the lagoon (22) which may range from five to forty feet deep, or more, the remote control system (84) can be used to increase the speed at which the supernatant (128) is passed from the slurry outputs (44), (62) and (64) to adequately mix the sludge (130) at the deepest portions of the lagoon (22). The remote control system (84) is used to direct the agitator (10) to all desired portions of the lagoon |

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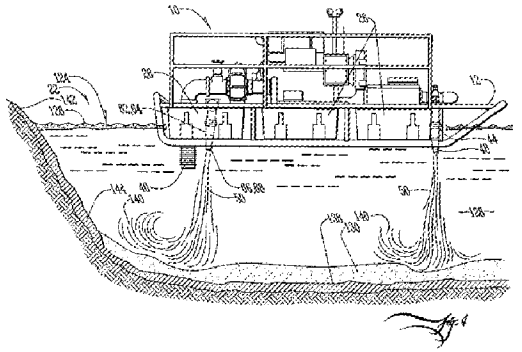
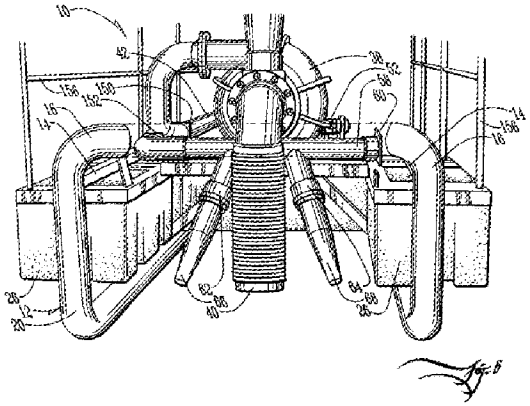
| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| | | until the crust (126) and supernatant (128) is adequately mixed with the sludge (130).<br><br>**Figure 4:**<br>  <br><br>**Figure 6:**<br>  |

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| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| 21. The vehicle of claim 20, wherein the wireless remote control is configured to control the plurality of fluid nozzles to control the at least one of speed and direction of the vehicle when the vehicle is floating. | | **Abstract:** A floating manure agitator that floats on the surface of a manure lagoon and that may be remotely controlled to agitate manure supernatant into a slurry with sludge settling on the bottom of the lagoon. The agitator is provided with a plurality of fluid outputs, the direction of which may be controlled to motivate and steer the agitator. The outputs are angled to develop vortices of supernatant into the sludge to further mix the materials into a slurry.<br><br>**[0011]** In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore.<br><br>**[0032]** The remote control system (64) also includes an engine stop button (98), start button (100), a throttle down button (102) and throttle up button (104). To steer the agitator (10) the remote control system (84) is provided with |

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| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| | | a bow left button (106) and bow right button (108). The bow left button (106) causes the steering control hydraulic cylinder (52) to extend, thereby directing the nozzle ( 48) to starboard and driving the agitator (10) port. The remote control system (84) is also provided with a bow right button (108) to retract the hydraulic cylinder (52) and steer the agitator (10) star-board. The remote control system (84) is provided with a reverse button (110) which causes the hydraulic cylinder (70) to extend, thereby forcing the pivot pipe (58) to direct the slurry outputs (62) and (64) toward the bow (18) of the agi-tator (10), thereby driving the vessel (12) rearward. Similarly, a forward button (112) causes the hydraulic cylinder (70) to retract and drive the agitator (10) forward.<br><br>**[0033]** If desired, the remote control system (84) may be provided with a first gate close button (114) that closes a valve (115) on the transport pipe (42) positioned between the fluid intake pipe (40) and forward nozzle (48). A gate open button (116) is also provided to open the valve (150). Similarly, a close gate button (118) and open gate button (120) are provided to open and close a valve (152) provided between the fluid intake pipe (40) and forward nozzle (48). A gate open button (116) is also provided to open the valve (150). Similarly, a close gate button (118) and open gate button (120) are provided to open and close a valve (152) provided between the fluid intake pipe (40) and the nozzles (66) and (68). The gate buttons (114), (116), (118), and (120) allow a user to selectively supply fluid through one, two or three of the nozzles (48), (66) and (68) as is desired to appropriately agitate the fluid (128) within which the agitator (10) is floating. The remote control system (84) is |

Exhibit 2031
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| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| | | also provided with a button (122) to actuate lights (154) provided on the agitator (10) if it is desired to use the agitator (10) in circumstances where additional lighting is desired. The remote control system (84) may be configured to receive feedback from the control panel (74), such as system status, latitude, longitude and height coordinates.<br><br>**[0035]** Once the agitator (10) is floating in the lagoon (22), the remote control system (84) is used to activate the power source (36) to cause the slurry pump (38) to draw supernatant (128) into the intake pipe (40) and out the outputs (44), (62) and (64). The remote control system (84) is used to direct the pivot pipe (58) to angle the slurry outputs (62) and (64) aft to drive the agitator (10) forward. The remote control system (84) then actuates the control panel (7 4) to direct the hydrau-lic cylinder (52) to angle the first slurry output ( 44) to turn the agitator (10) port or starboard as desired. The remote control system (84) is thereafter used to direct the volume of super-natant (128) drawn into the intake pipe ( 40) and the direction at which the supernatant (128) is expelled from the slurry outputs (44), (62) and (64). By manipulating the direction of the slurry outputs (44), (62) and (64) with the remote control system (84), a user may direct the agitator (10) to any desired portion of the lagoon.<br><br>**[0037]** The remote control system (84) may be used to cause the slurry pump (38) to expel slurry (50) more slowly from the slurry outputs (44), (62) and (64) as the agitator (10) is near the shore (142) of the lagoon (22) so as not to penetrate the lining (144) of the lagoon (22) thereby allowing the slurry (50) to escape. As the agitator (10) moves towards the center of the lagoon (22) which may range from five to forty |

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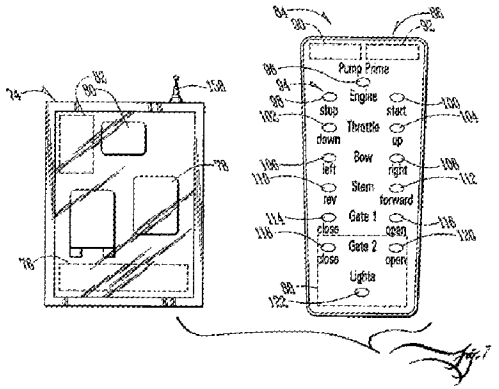
| Claim | Carrier I (US 2012/0185129) | Puck (2014/0112093) |
|---|---|---|
| | | feet deep, or more, the remote control system (84) can be used to increase the speed at which the supernatant (128) is passed from the slurry outputs (44), (62) and (64) to adequately mix the sludge (130) at the deepest portions of the lagoon (22). The remote control system (84) is used to direct the agitator (10) to all desired portions of the lagoon until the crust (126) and supernatant (128) is adequately mixed with the sludge (130).<br>**Figure 7:**<br>  |

Exhibit 2031
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# EXHIBIT E

US 20140288763A1

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(43) **Pub. Date: Sep. 25, 2014**

**Bennett et al.**

(54) **TRACKED ALL-TERRAIN VEHICLE**

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(72) Inventors: **Jeffrey D. Bennett**, Roseau, MN (US); **Amber P. Malone**, Stacy, MN (US)

(73) Assignee: **Polaris Industries Inc.**, Medina, MN (US)

(21) Appl. No.: **14/225,206**

(22) Filed: **Mar. 25, 2014**

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**Publication Classification**

(51) **Int. Cl.**

***B62D 55/06*** (2006.01)
***G06F 11/30*** (2006.01)
***B62D 11/04*** (2006.01)

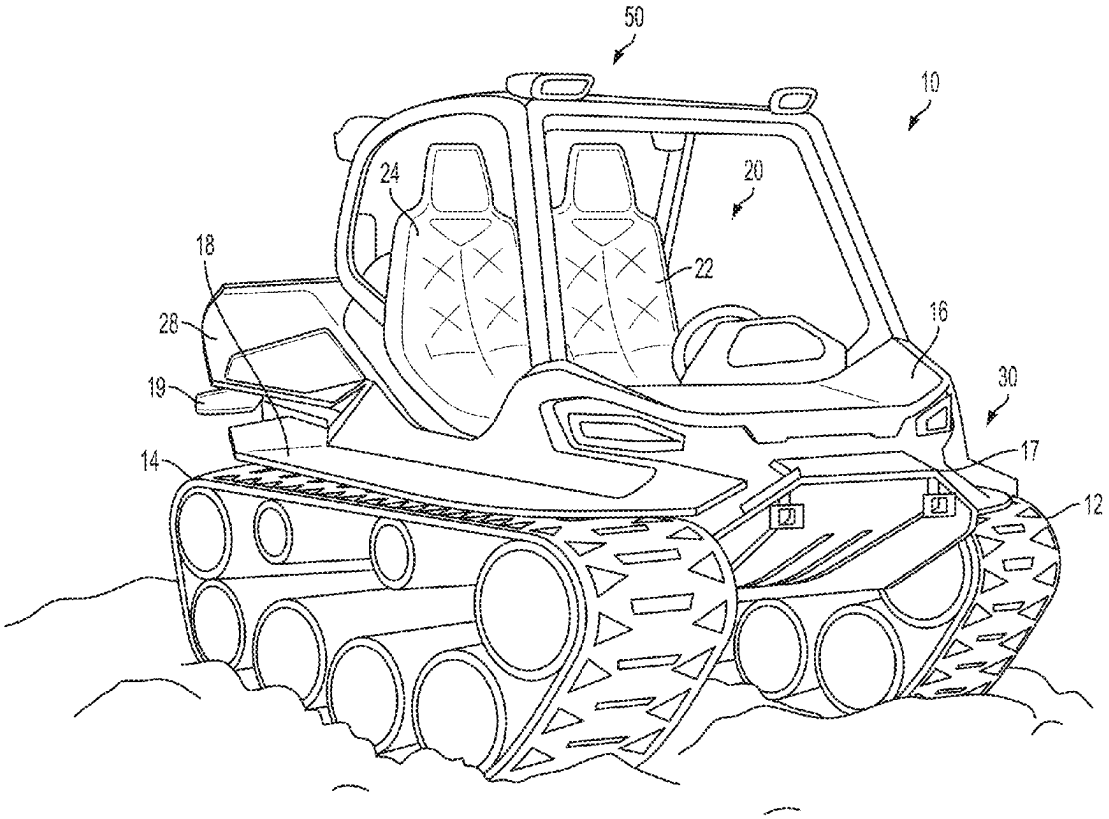
(52) **U.S. Cl.**

CPC ..... ***B62D 55/06*** (2013.01); ***B62D 11/04*** (2013.01); ***G06F 11/30*** (2013.01)

USPC ..... **701/31.6**; 180/6.44; 180/9.5

(57) **ABSTRACT**

A tracked ATV includes a frame, a track coupled to the frame, and a power source supported by the frame and drivingly coupled to the track. The tracked ATV further includes a steering and drive assembly, which has a first hydraulic pump coupled to the tracks for large radius turns. The steering and drive assembly also has a second hydraulic pump coupled to the tracks for small radius turns.



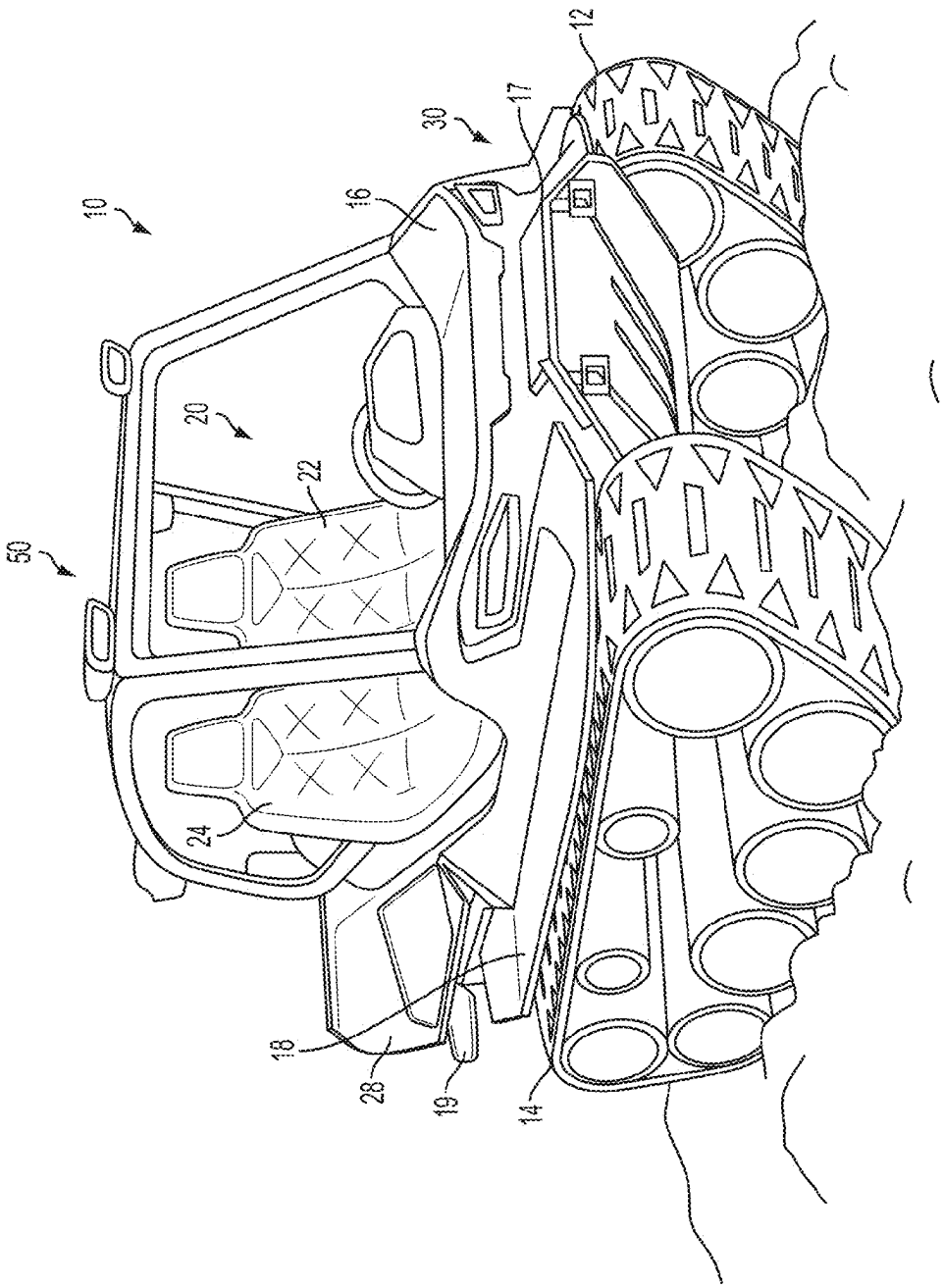



FIG. 1

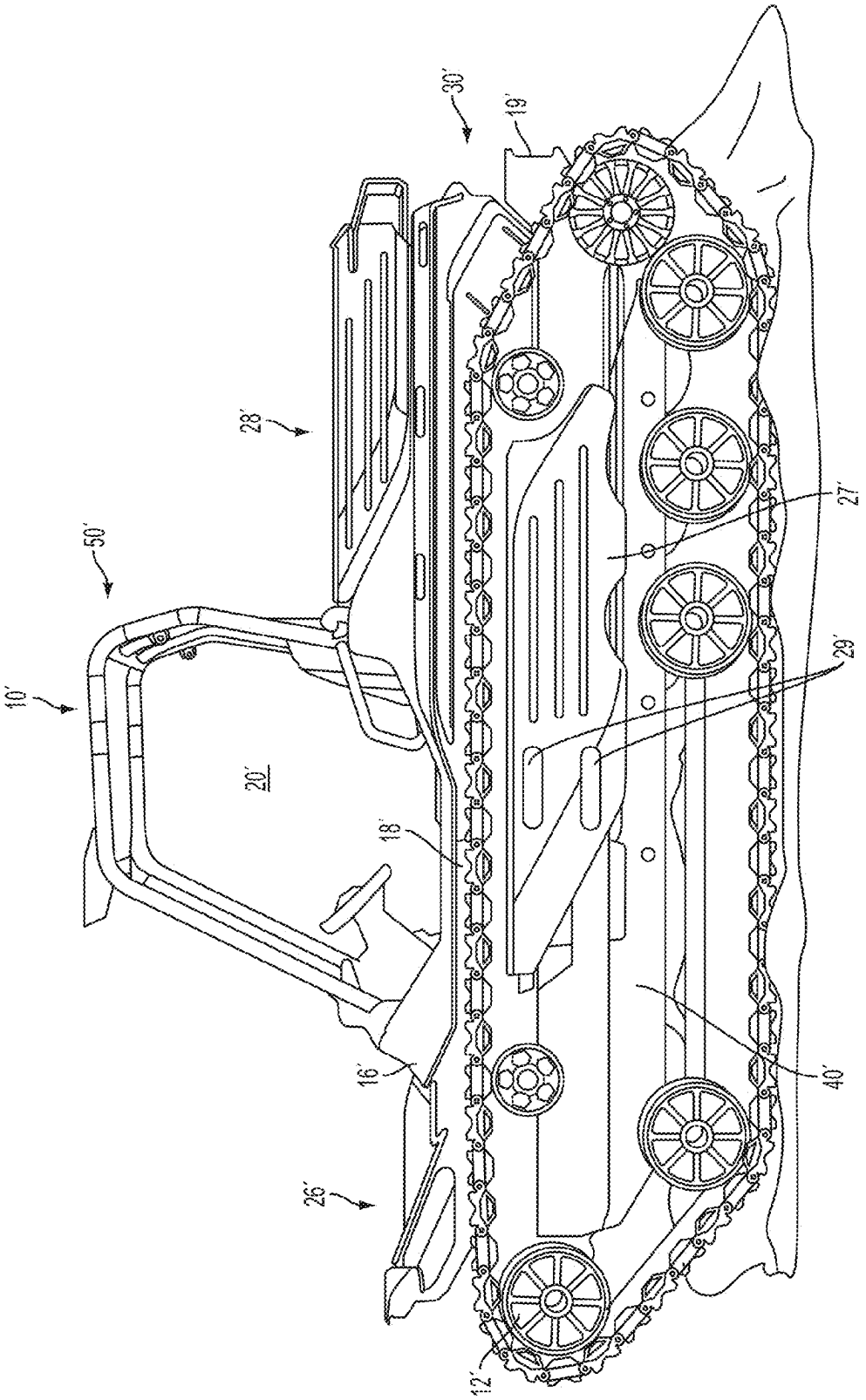



FIG. 2

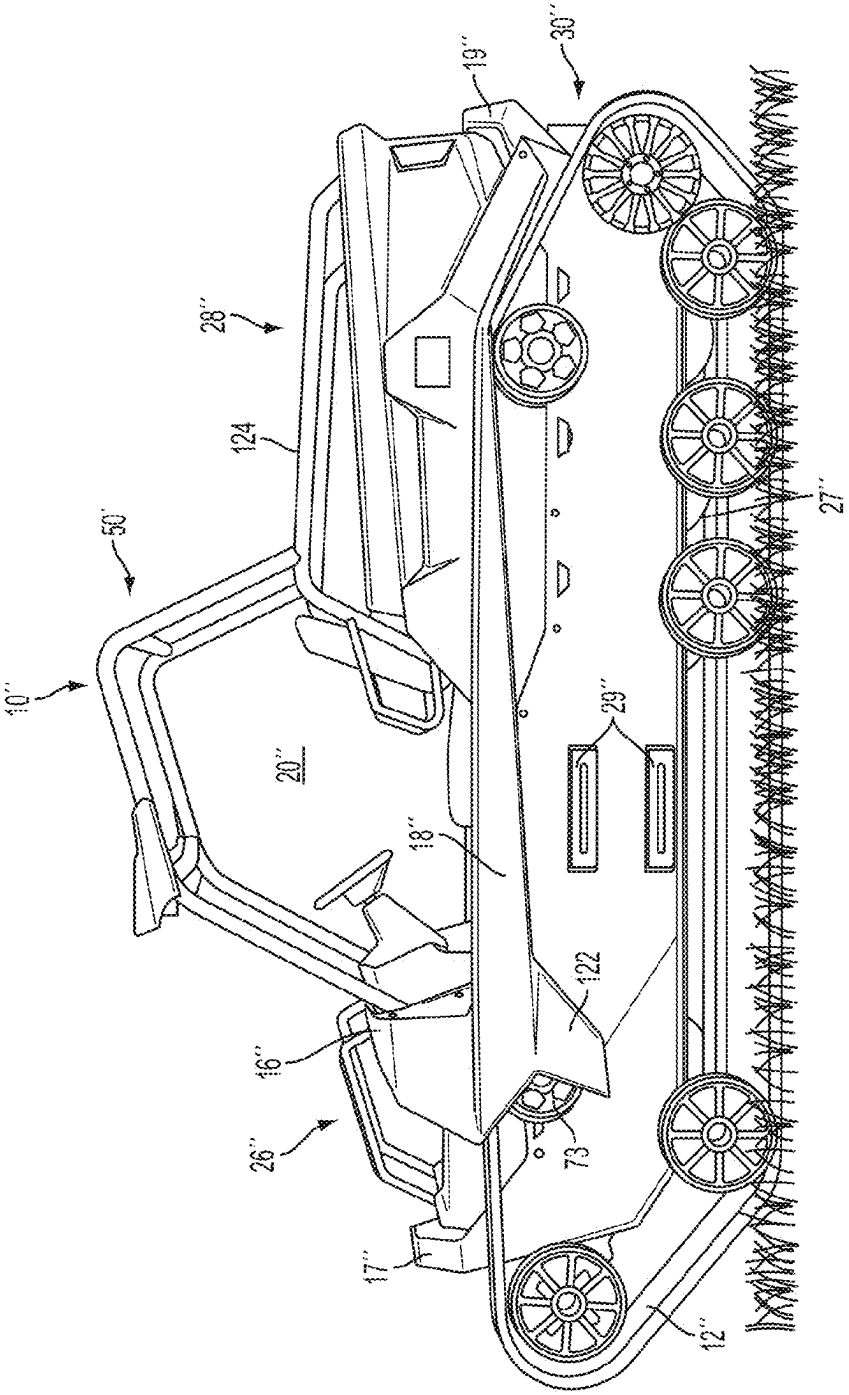



FIG. 3

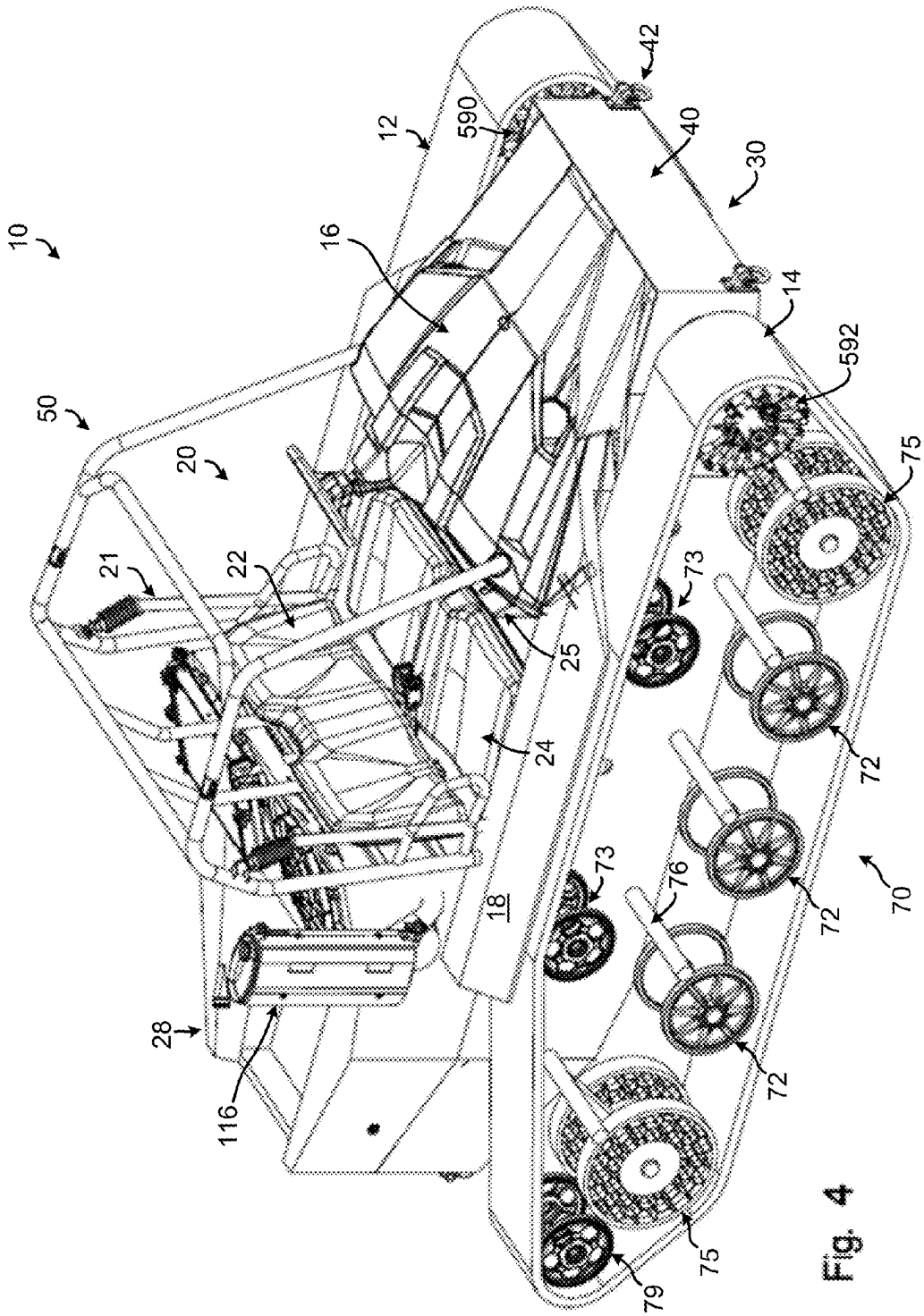

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Fig. 4

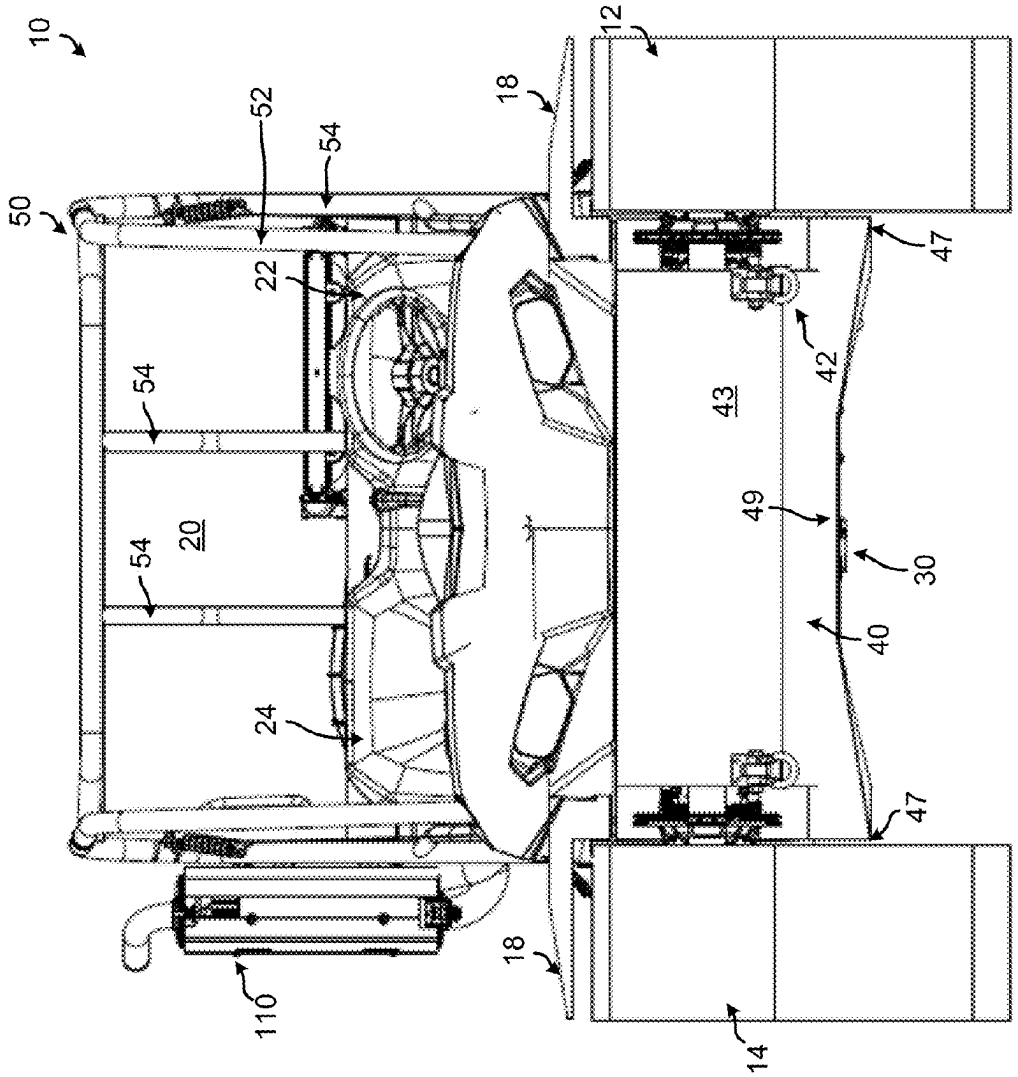



Fig. 5

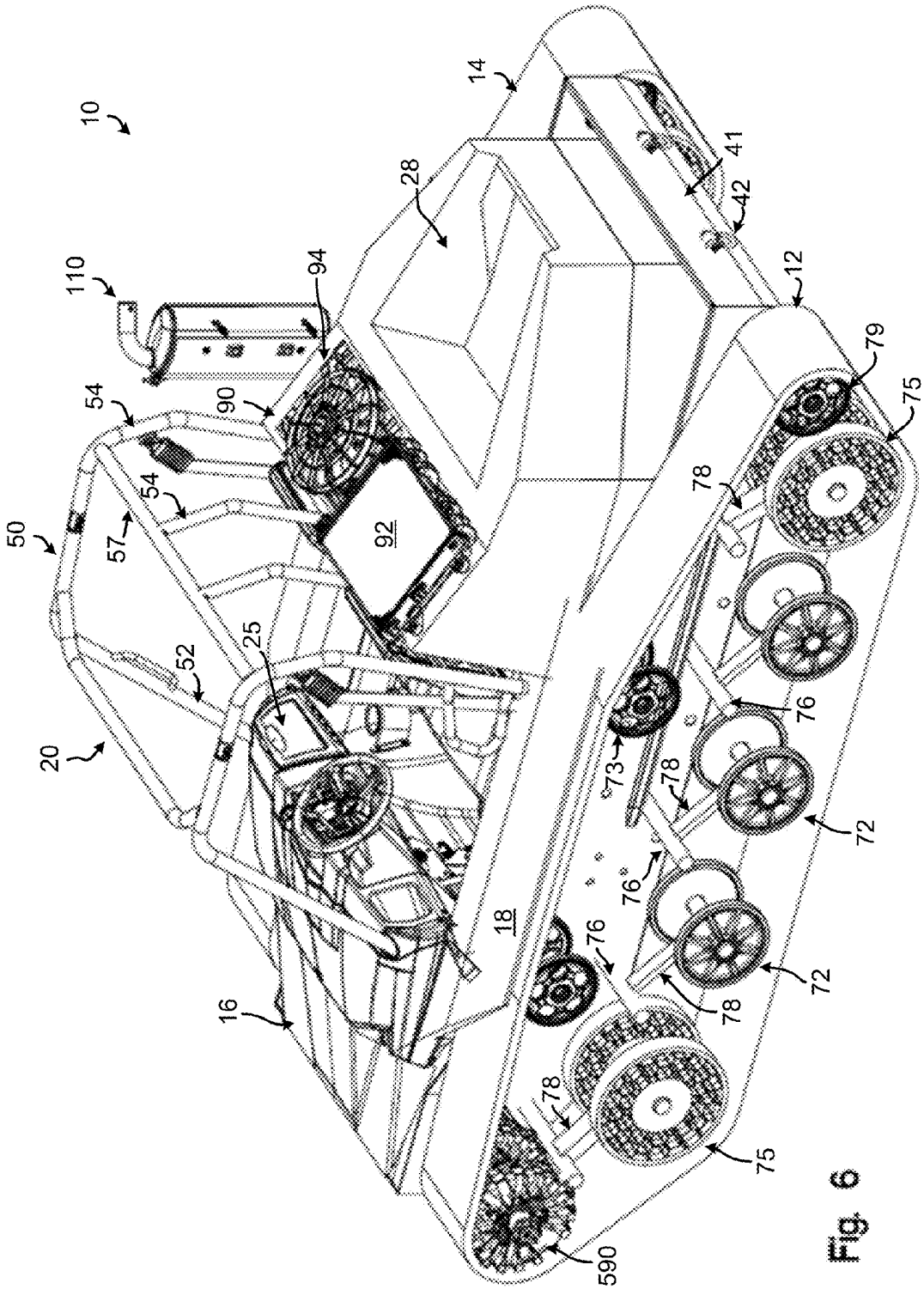

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Fig. 6

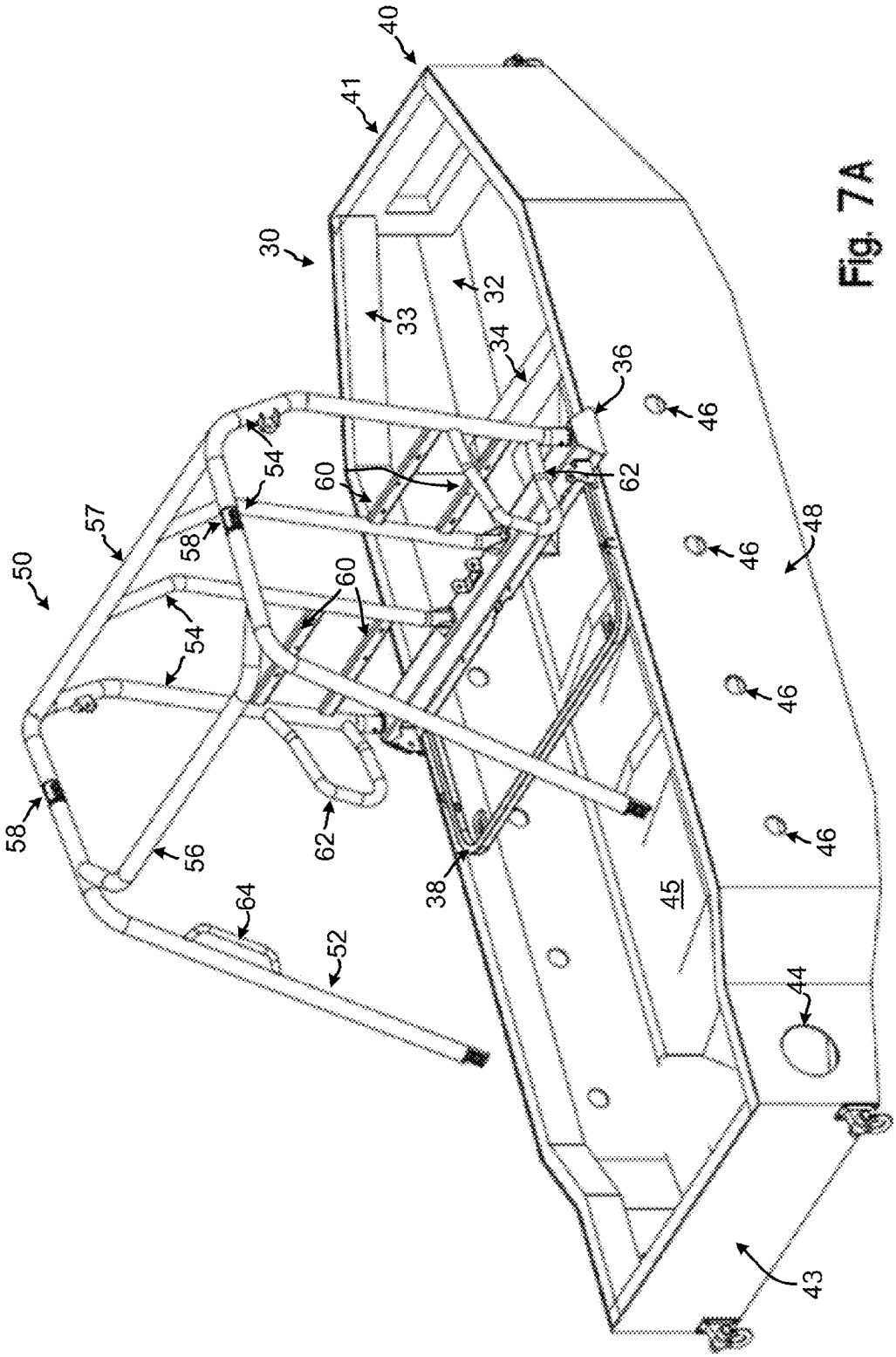

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Fig. 7A

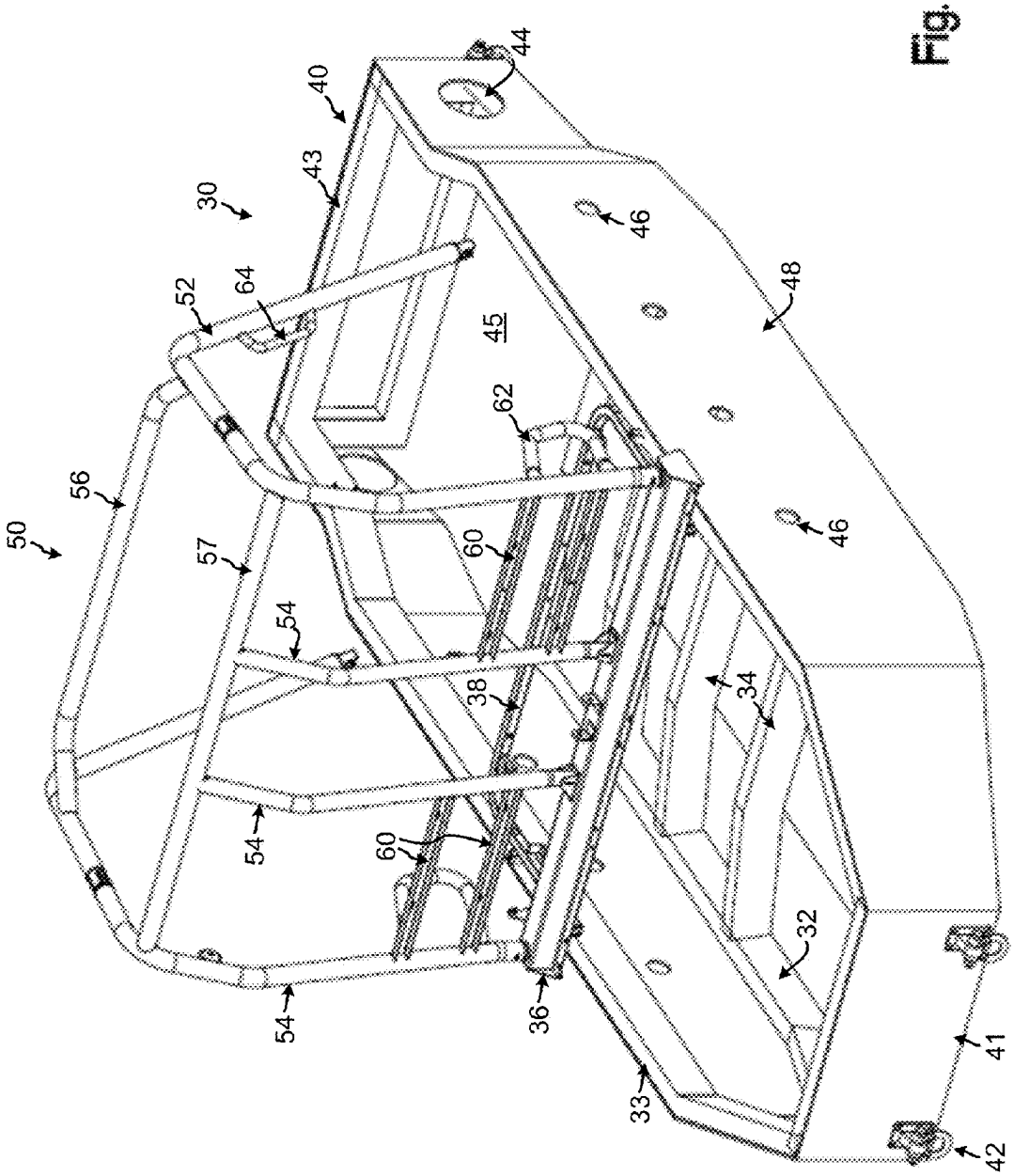

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Fig. 7B

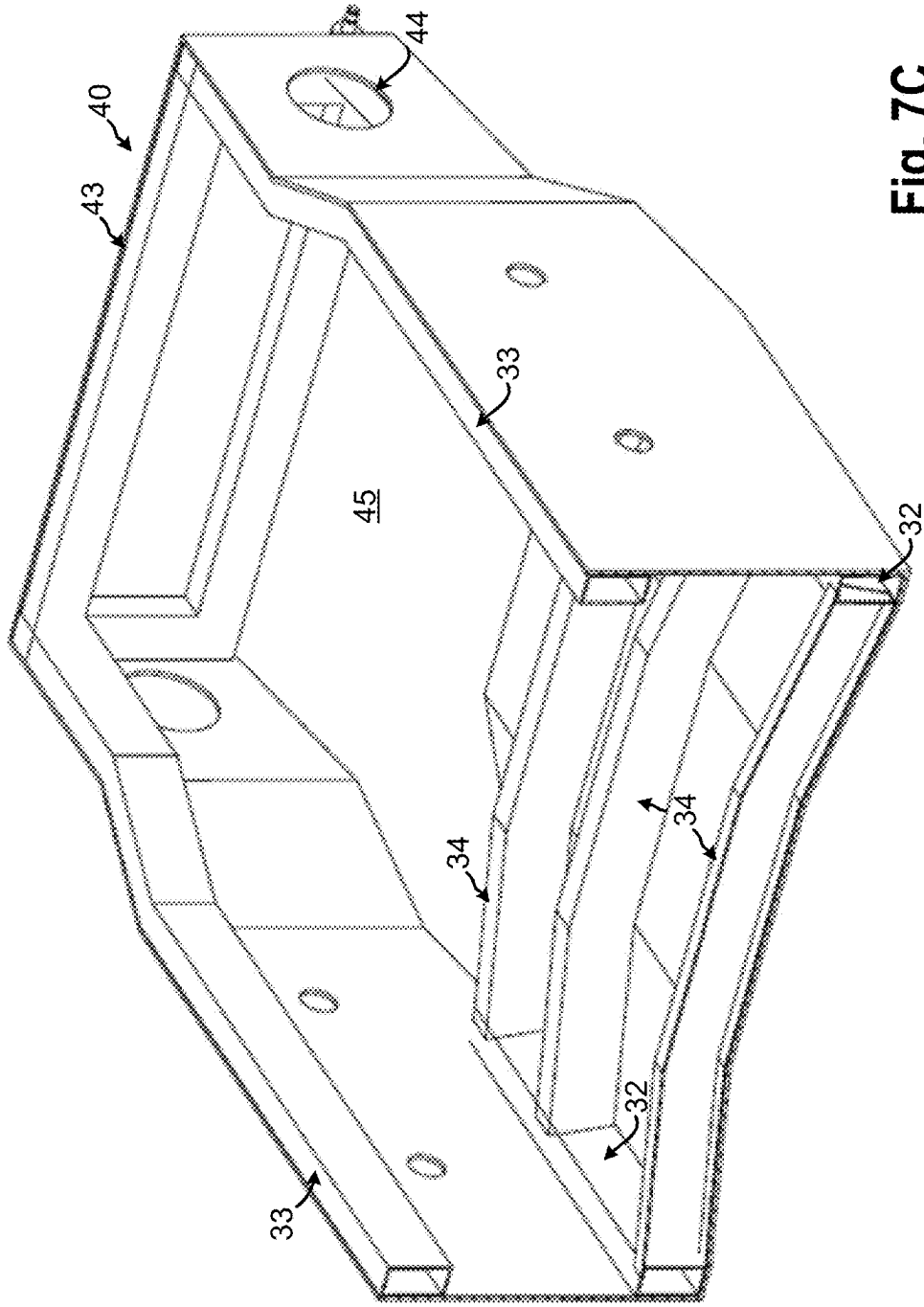



Fig. 7C

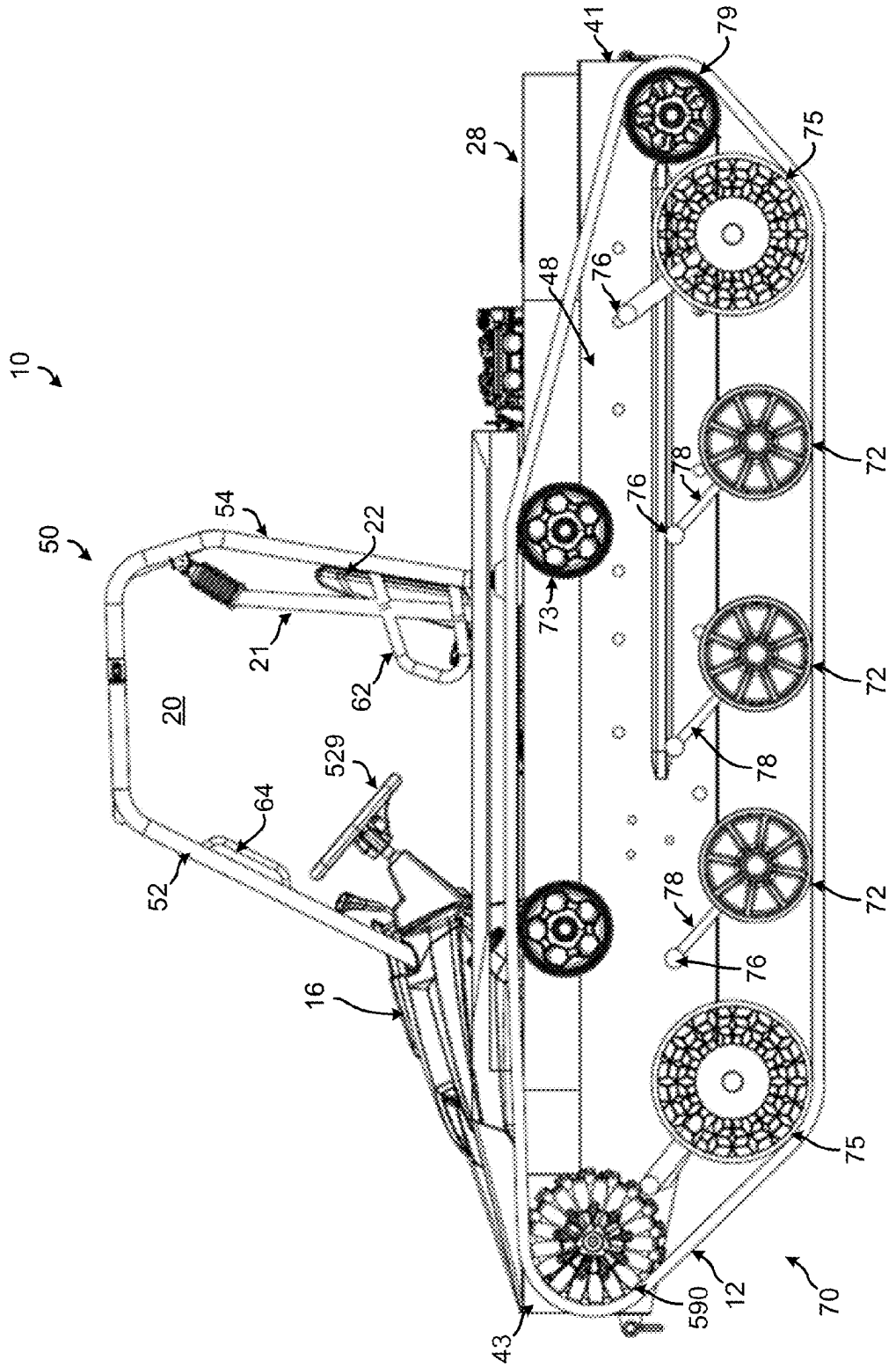

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Fig. 8

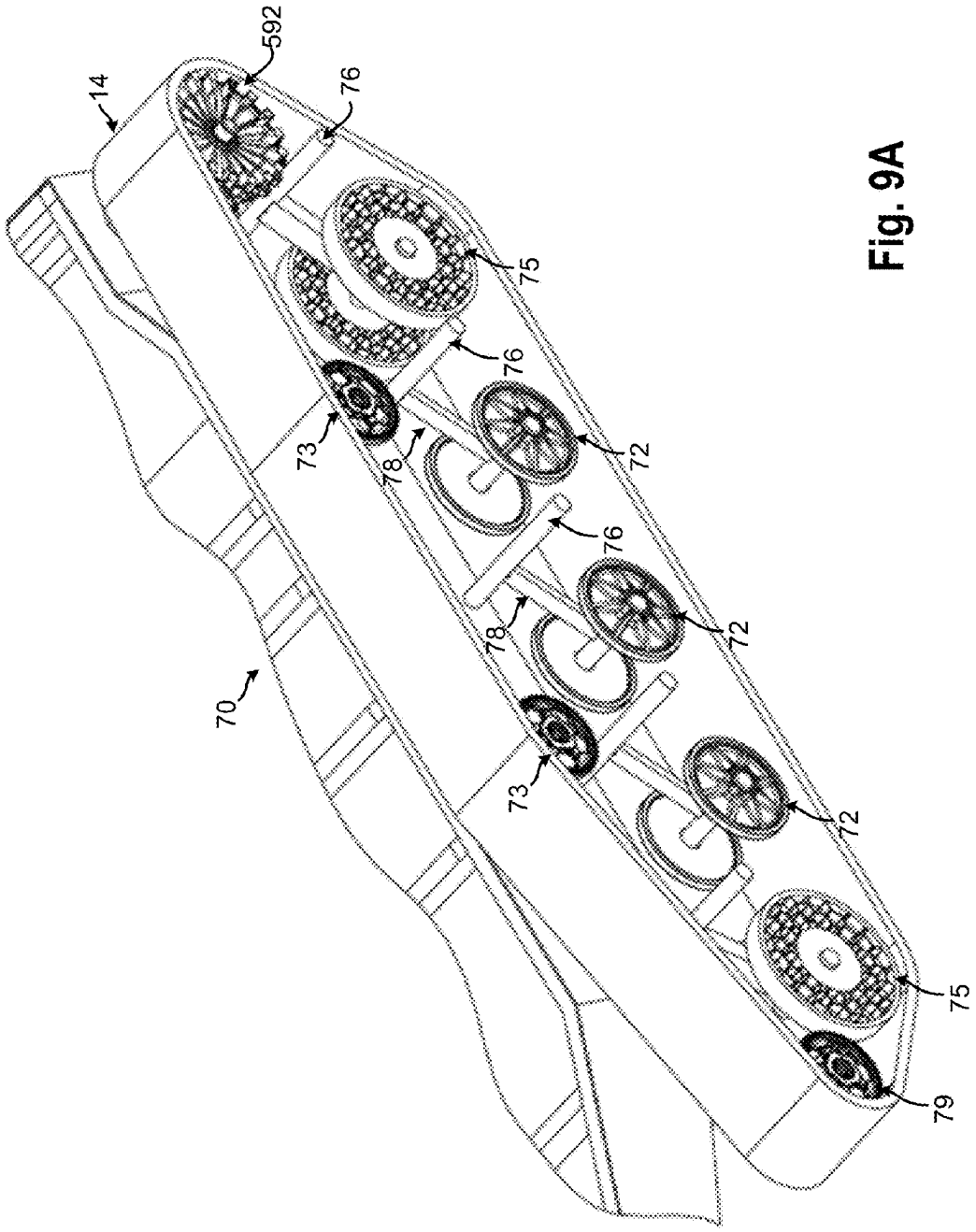



Fig. 9A

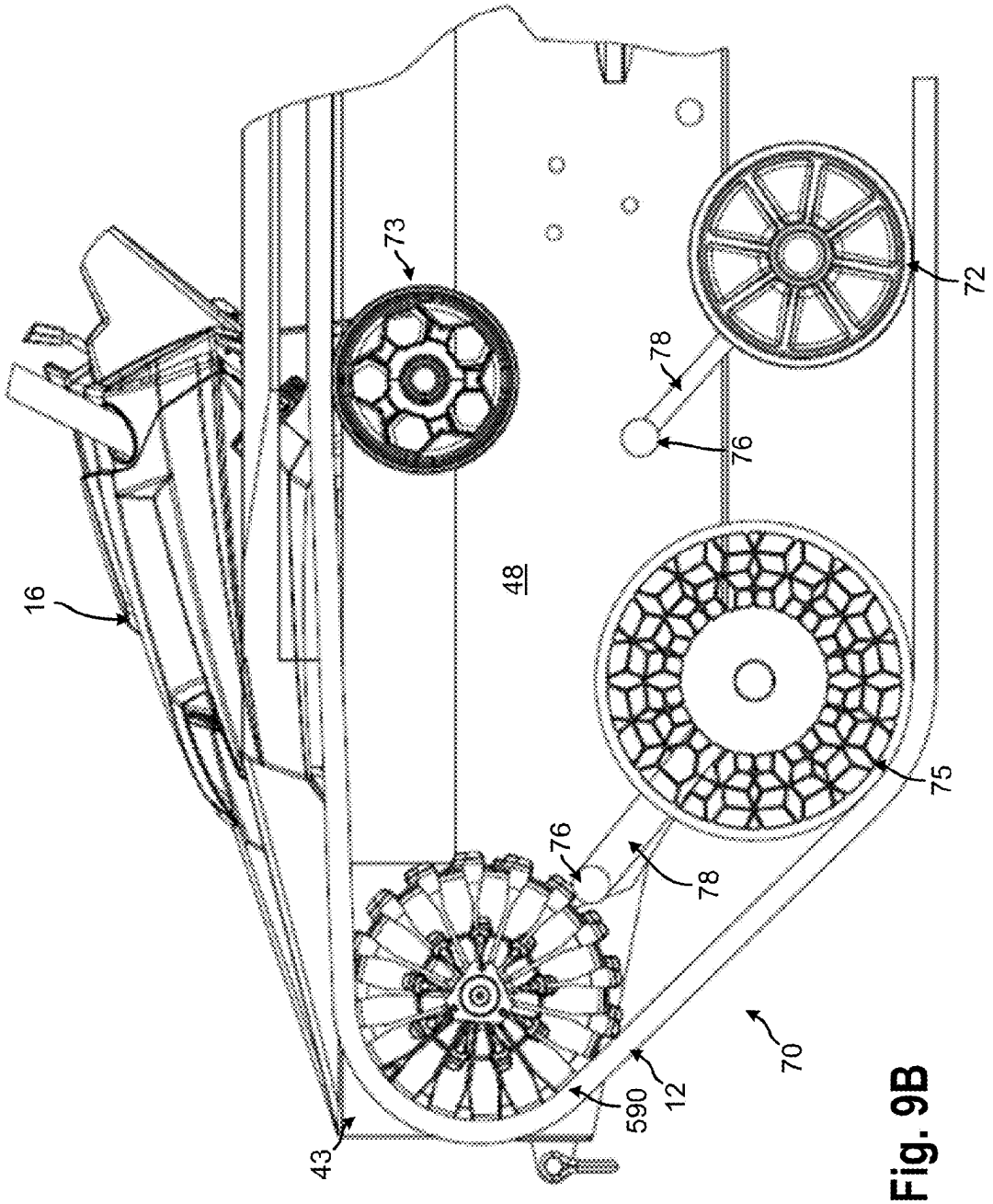



Fig. 9B

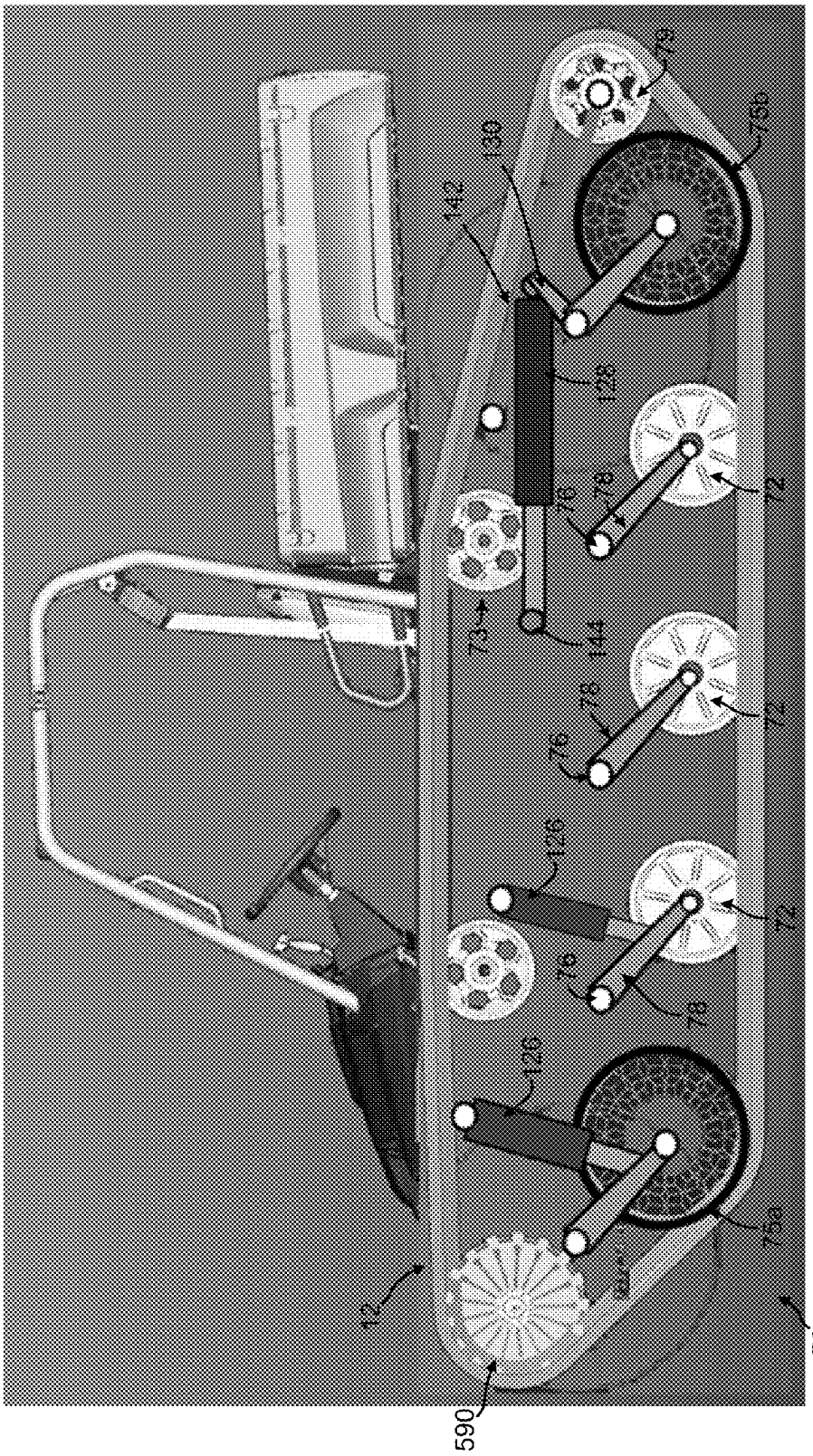



Fig. 9C

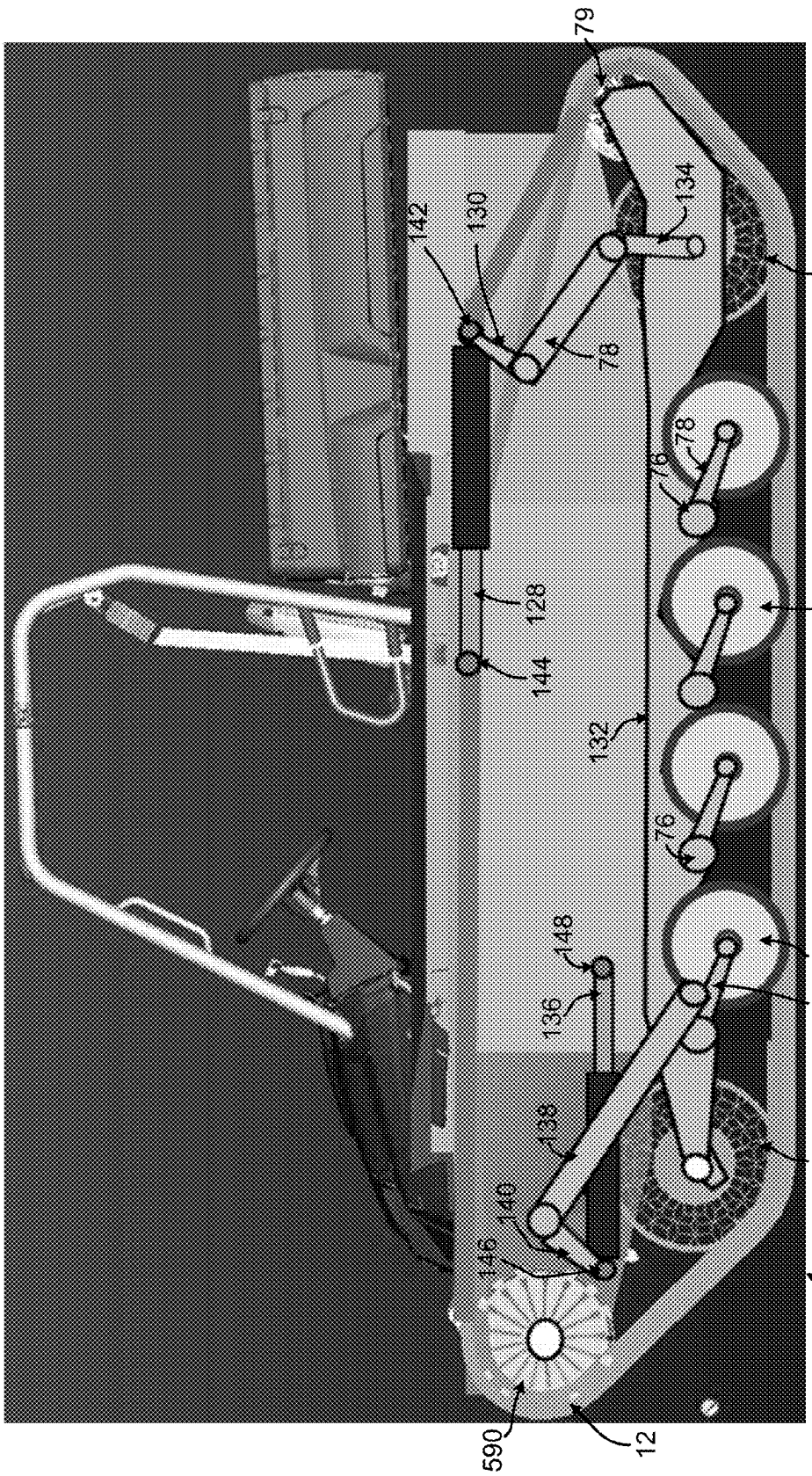

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Fig. 9D

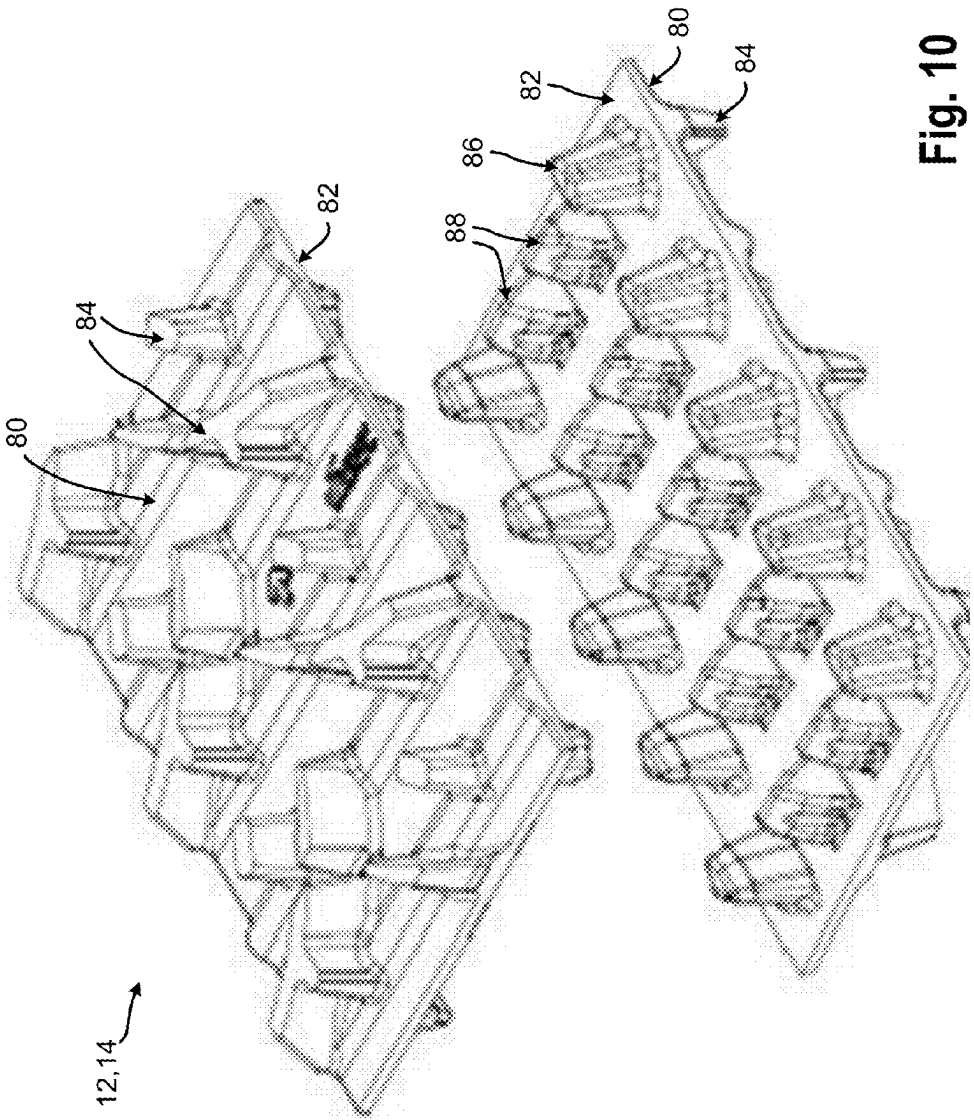



Fig. 10

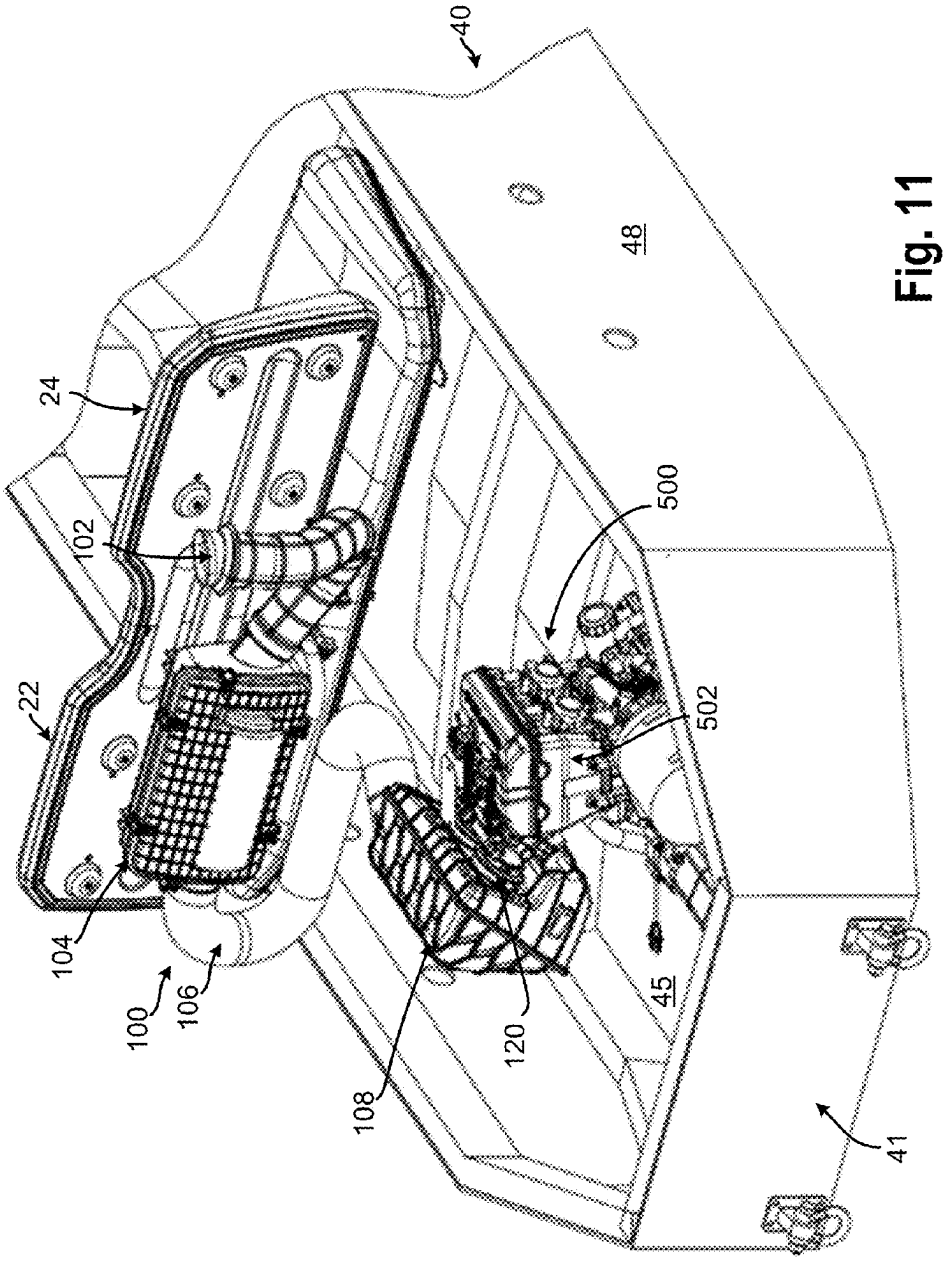



Fig. 11

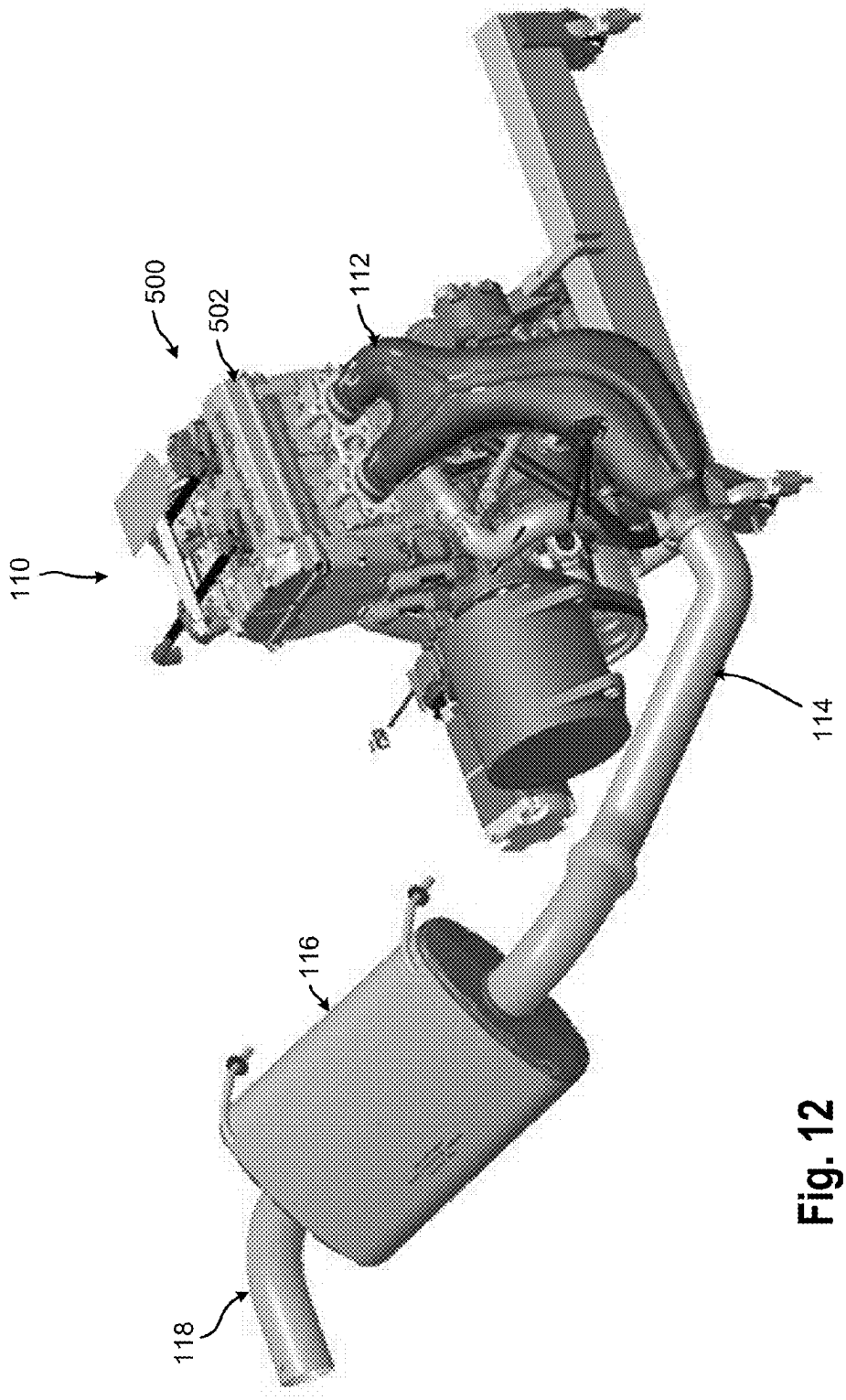



Fig. 12

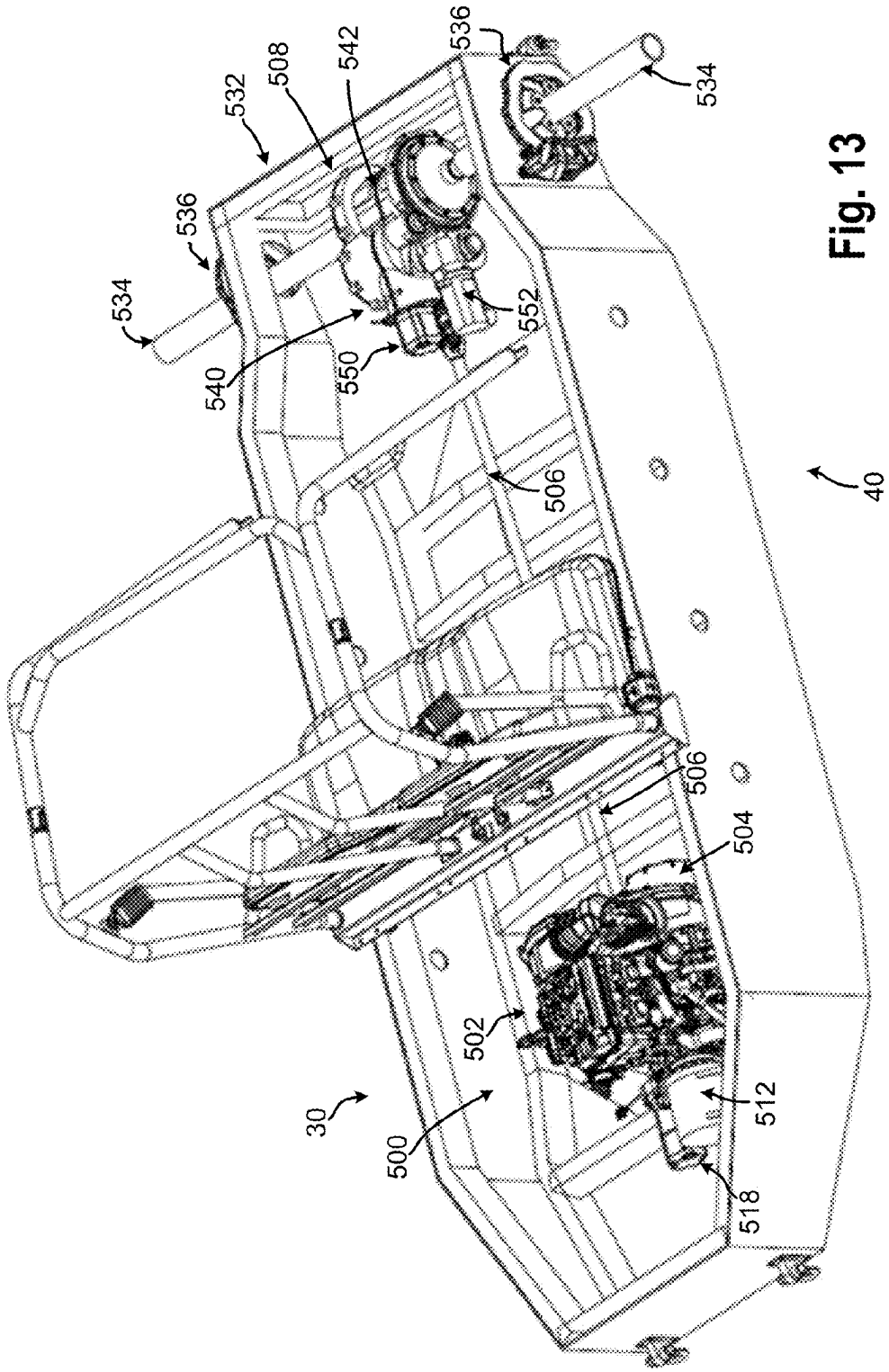

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Fig. 13

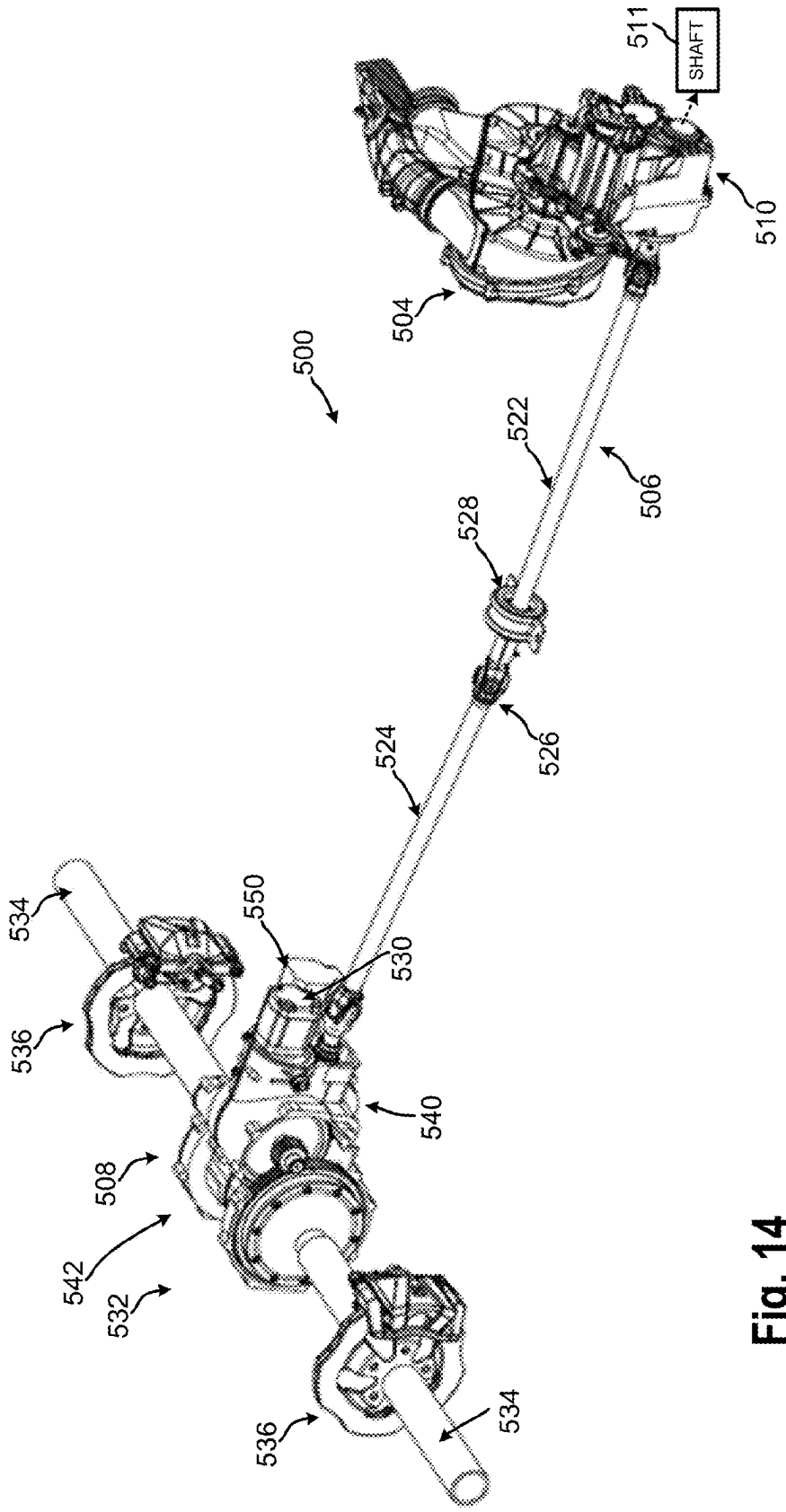

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Fig. 14

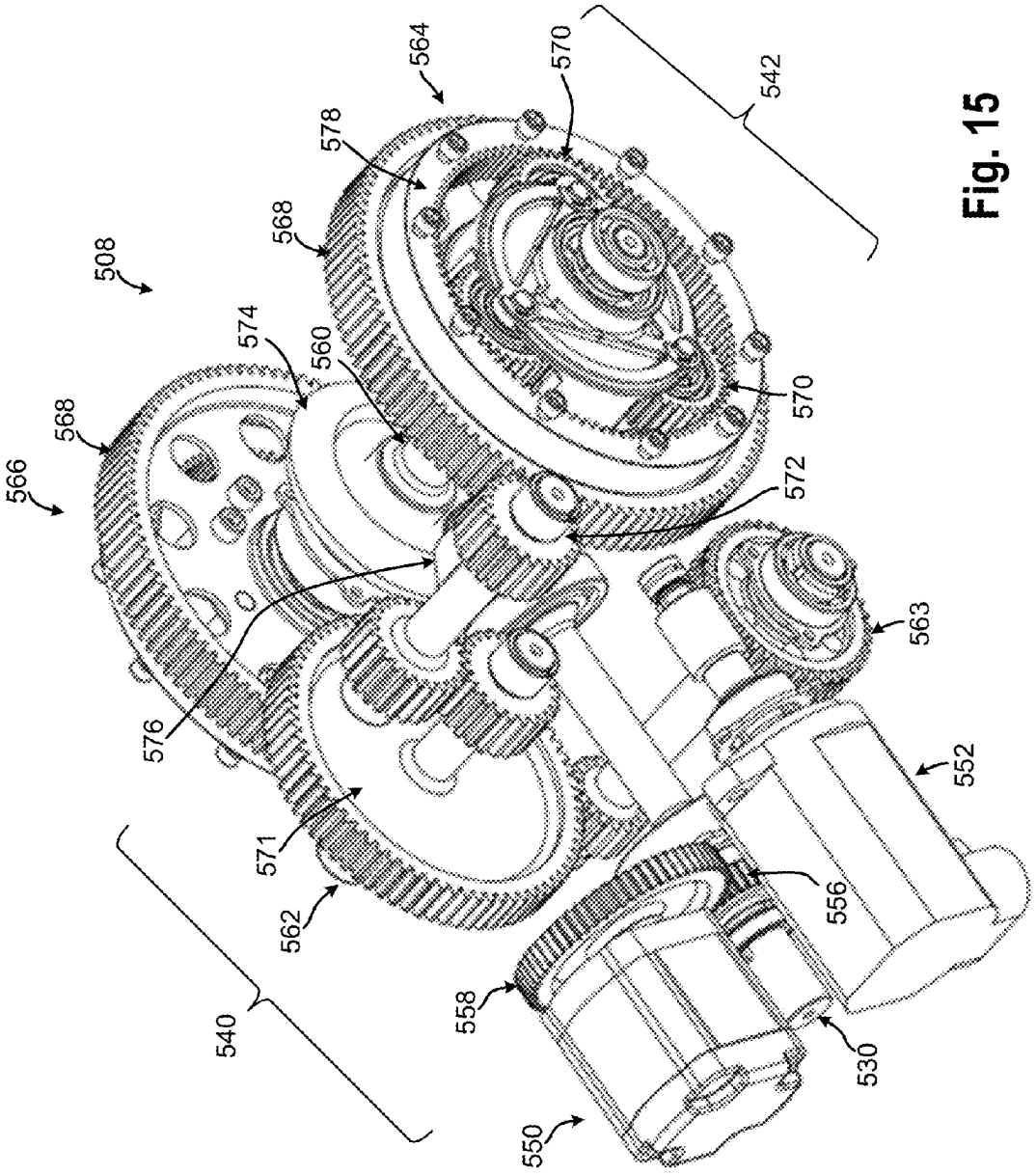

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Fig. 15

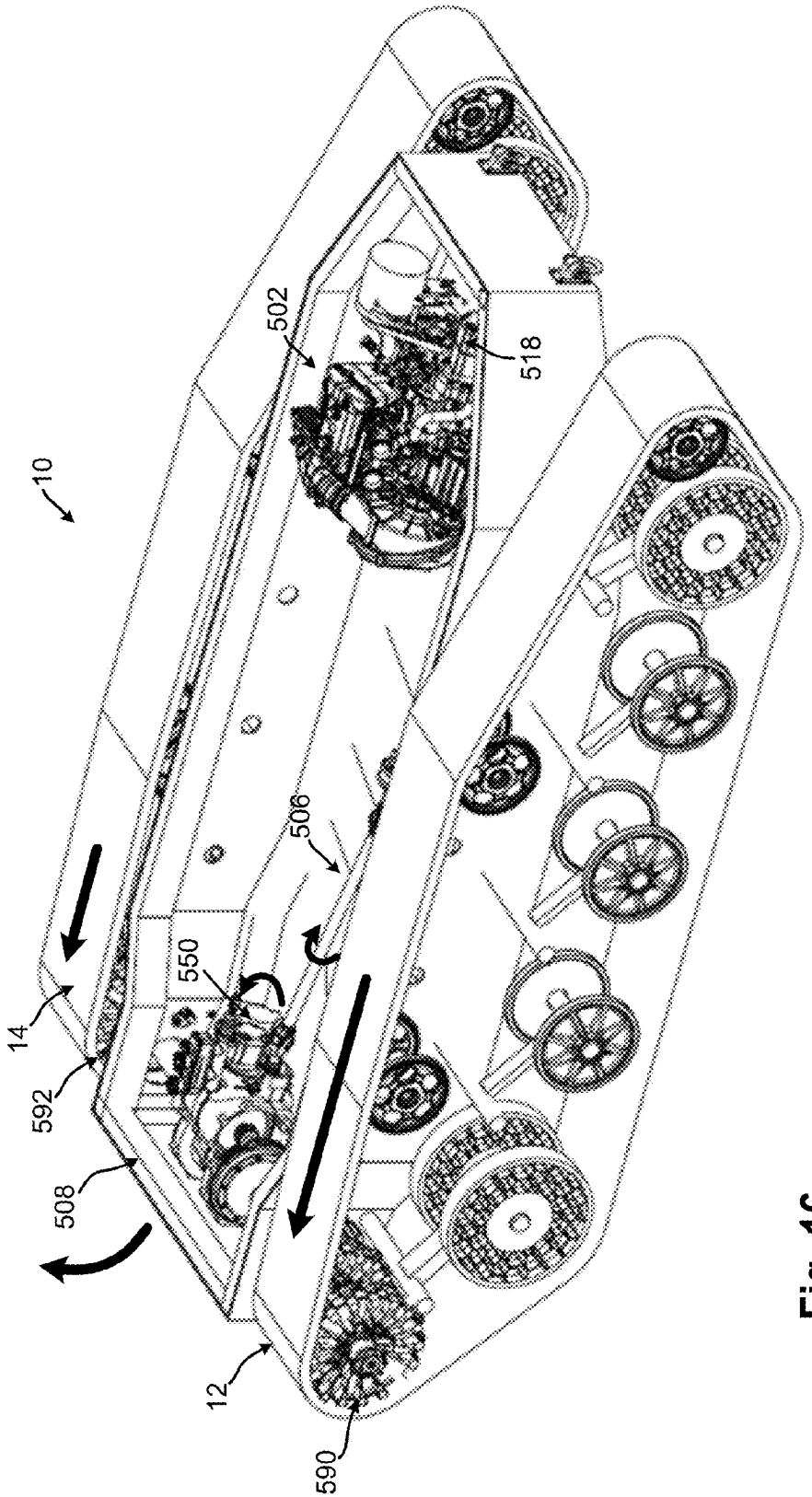



Fig. 16

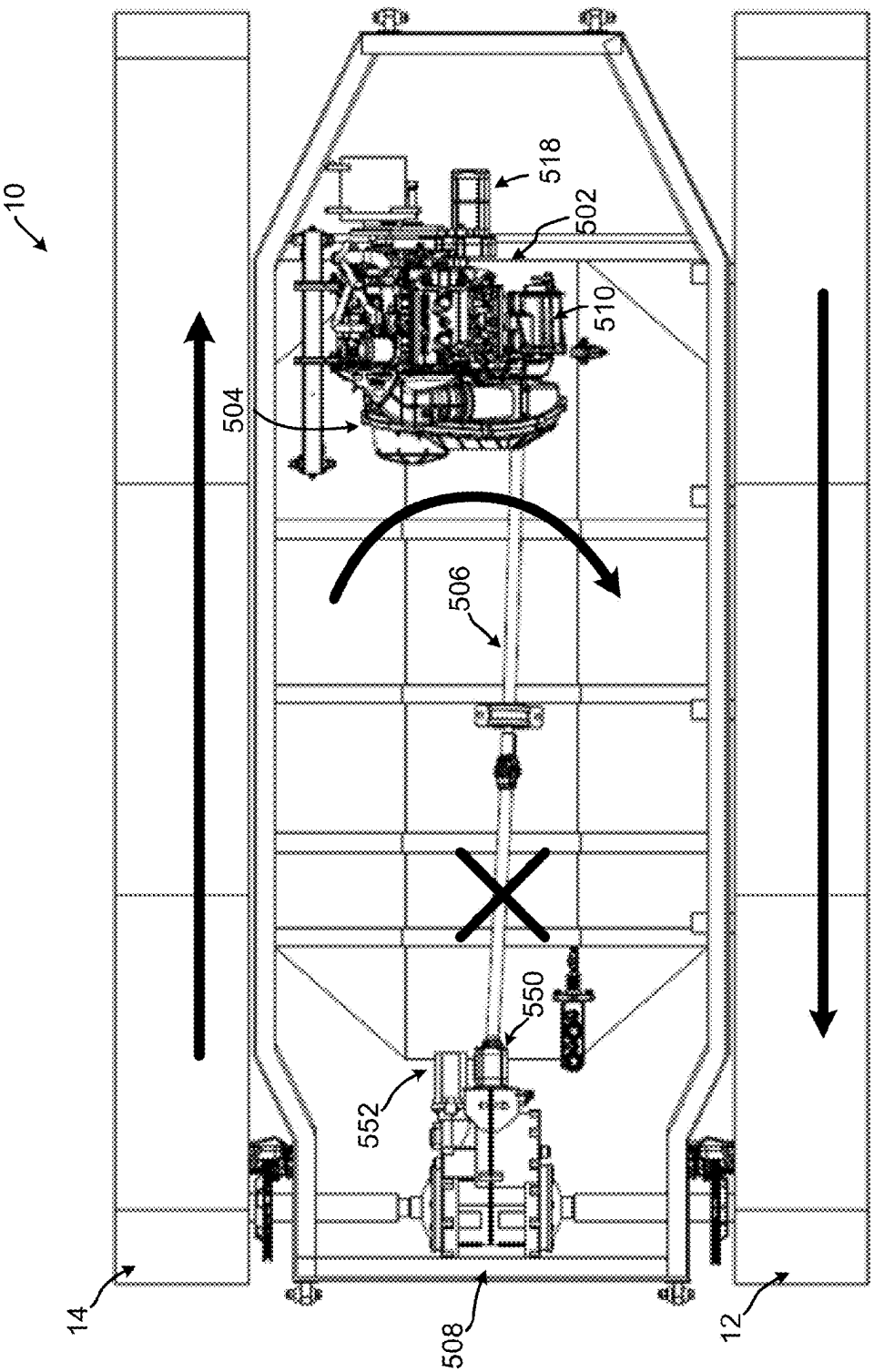



Fig. 17

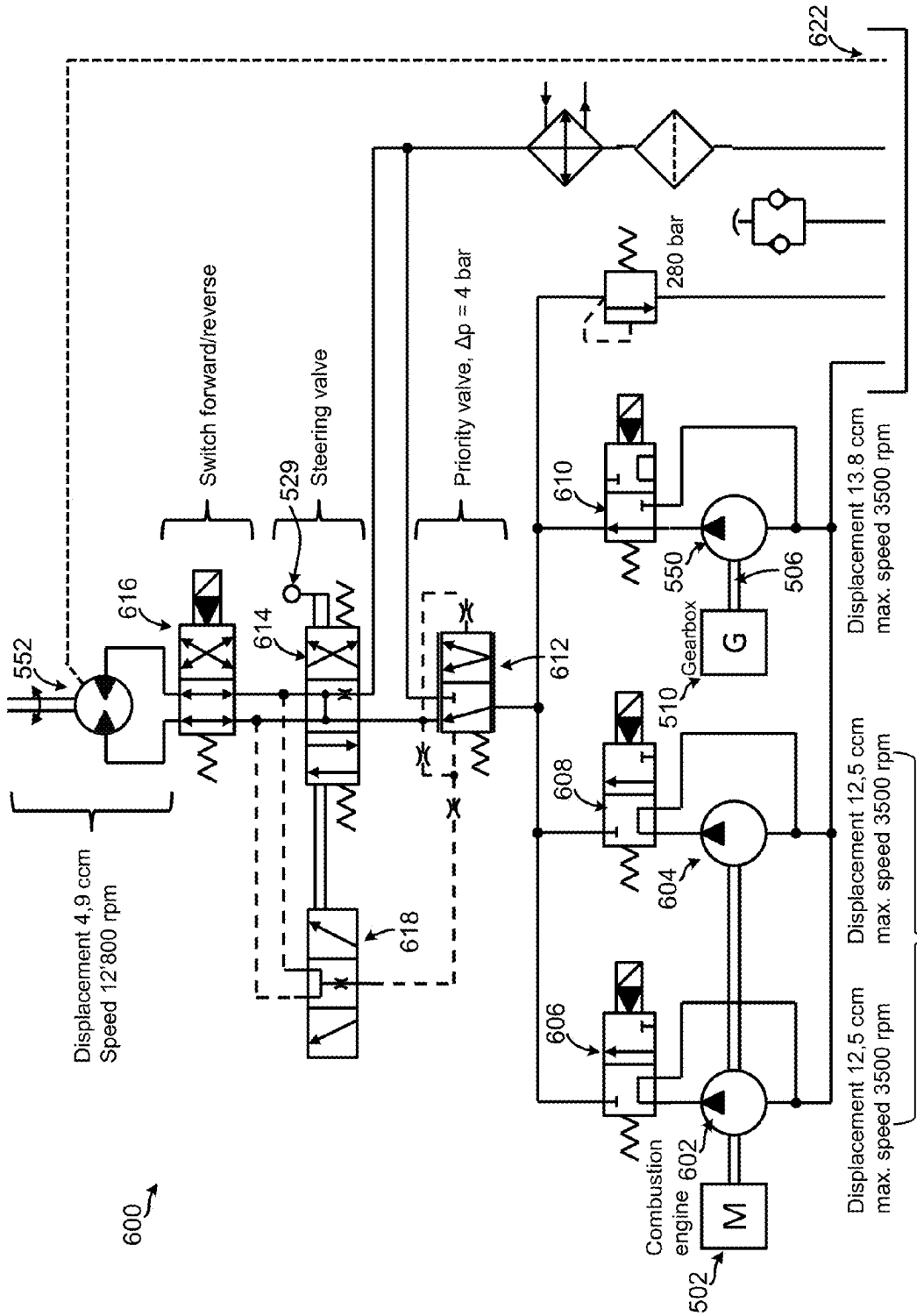

600
552
Displacement 4,9 ccm
Speed 12'800 rpm
616
Switch forward/reverse
614
529
Steering valve
618
612
Priority valve, Δp = 4 bar
622
280 bar
610
608
606
604
602
Combustion engine
502
M
550
506
Gearbox
510
G
Displacement 13.8 ccm
max. speed 3500 rpm
Displacement 12,5 ccm
max. speed 3500 rpm
Displacement 12,5 ccm
max. speed 3500 rpm
518

Fig. 18

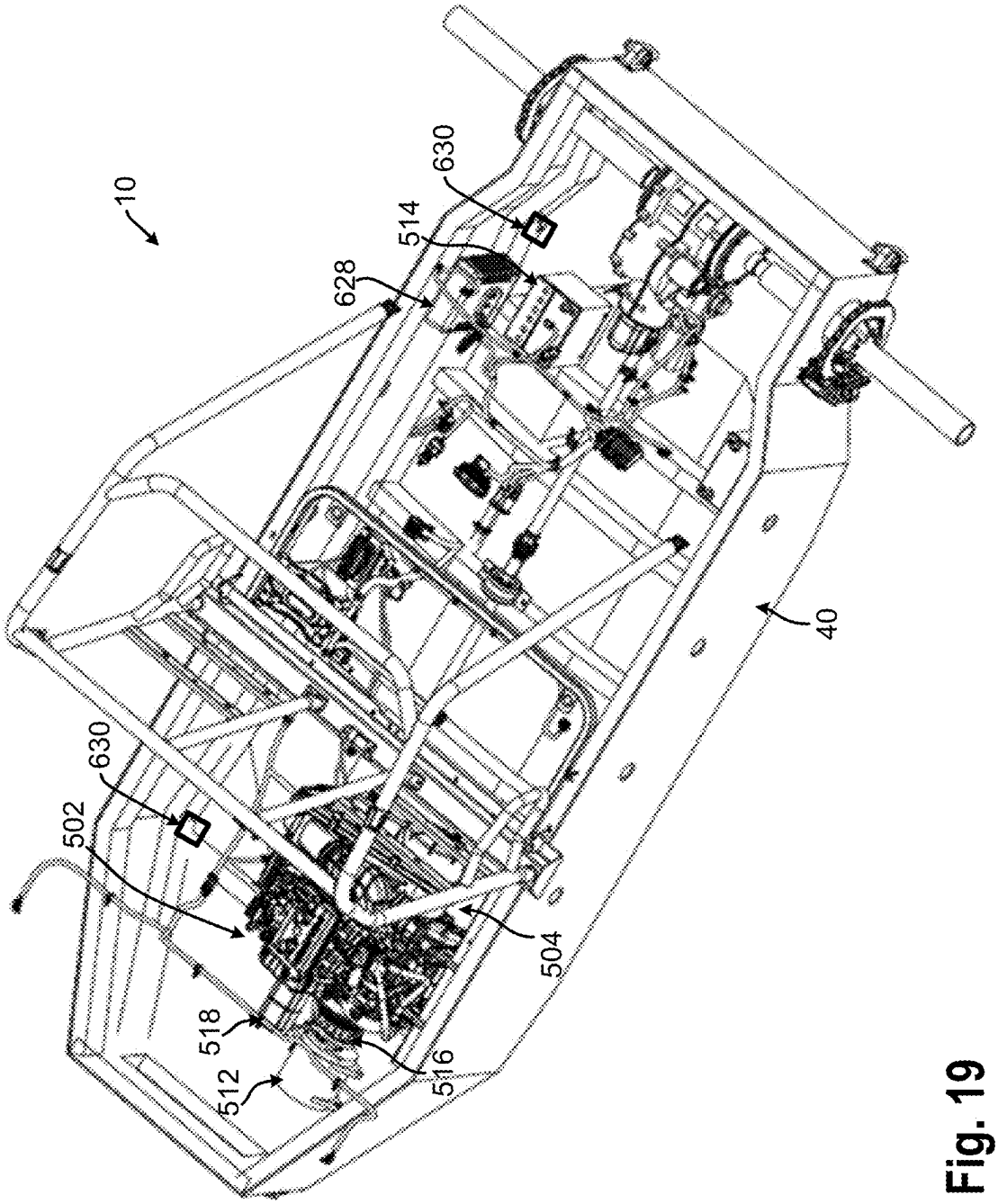



Fig. 19

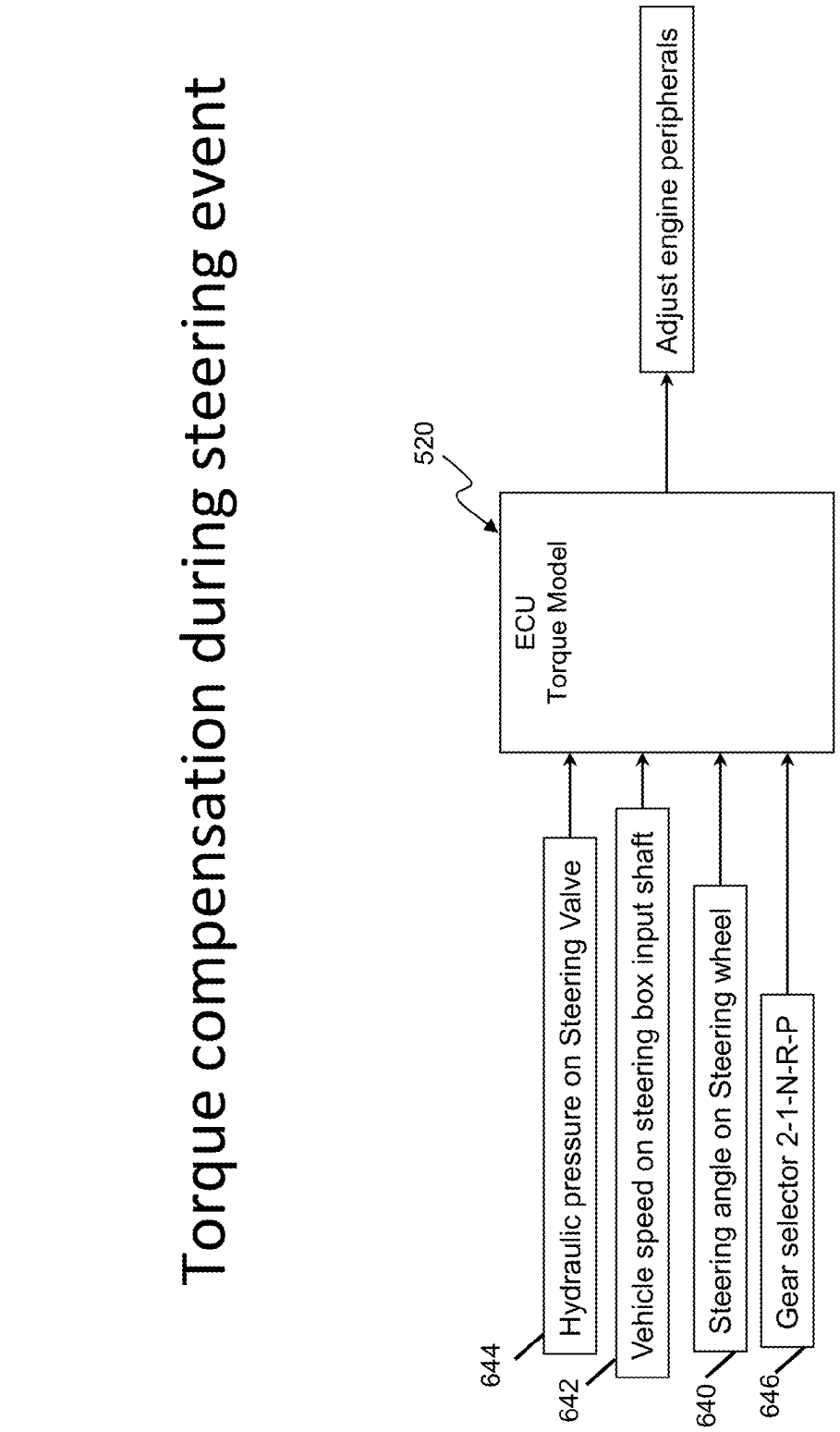

Torque compensation during steering event
520
ECU
Torque Model
Adjust engine peripherals
644
Hydraulic pressure on Steering Valve
642
Vehicle speed on steering box input shaft
640
Steering angle on Steering wheel
646
Gear selector 2-1-N-R-P

FIG. 20

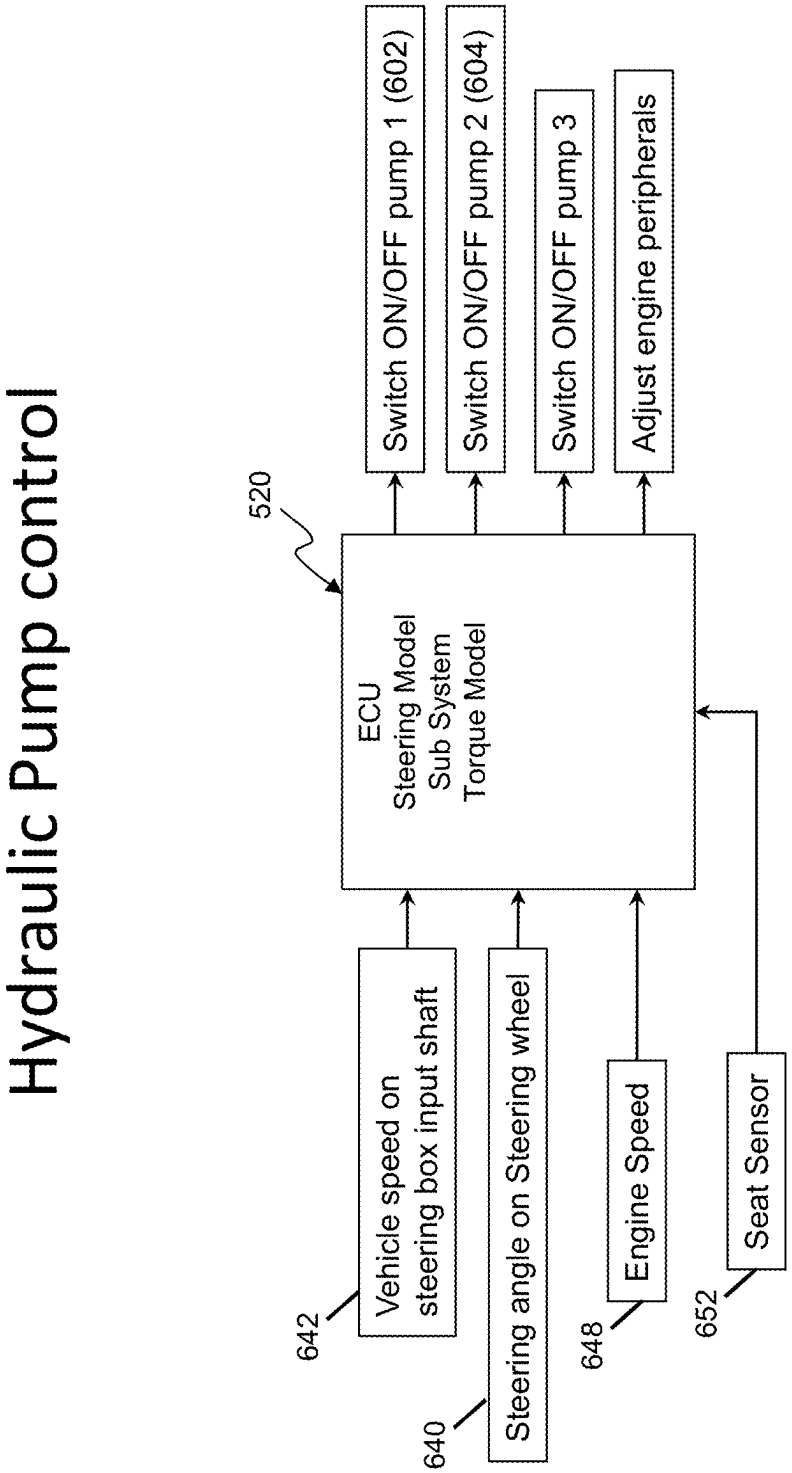

Hydraulic Pump control
520
ECU
Steering Model
Sub System
Torque Model
Switch ON/OFF pump 1 (602)
Switch ON/OFF pump 2 (604)
Switch ON/OFF pump 3
Adjust engine peripherals
642
Vehicle speed on steering box input shaft
640
Steering angle on Steering wheel
648
Engine Speed
652
Seat Sensor

FIG. 21

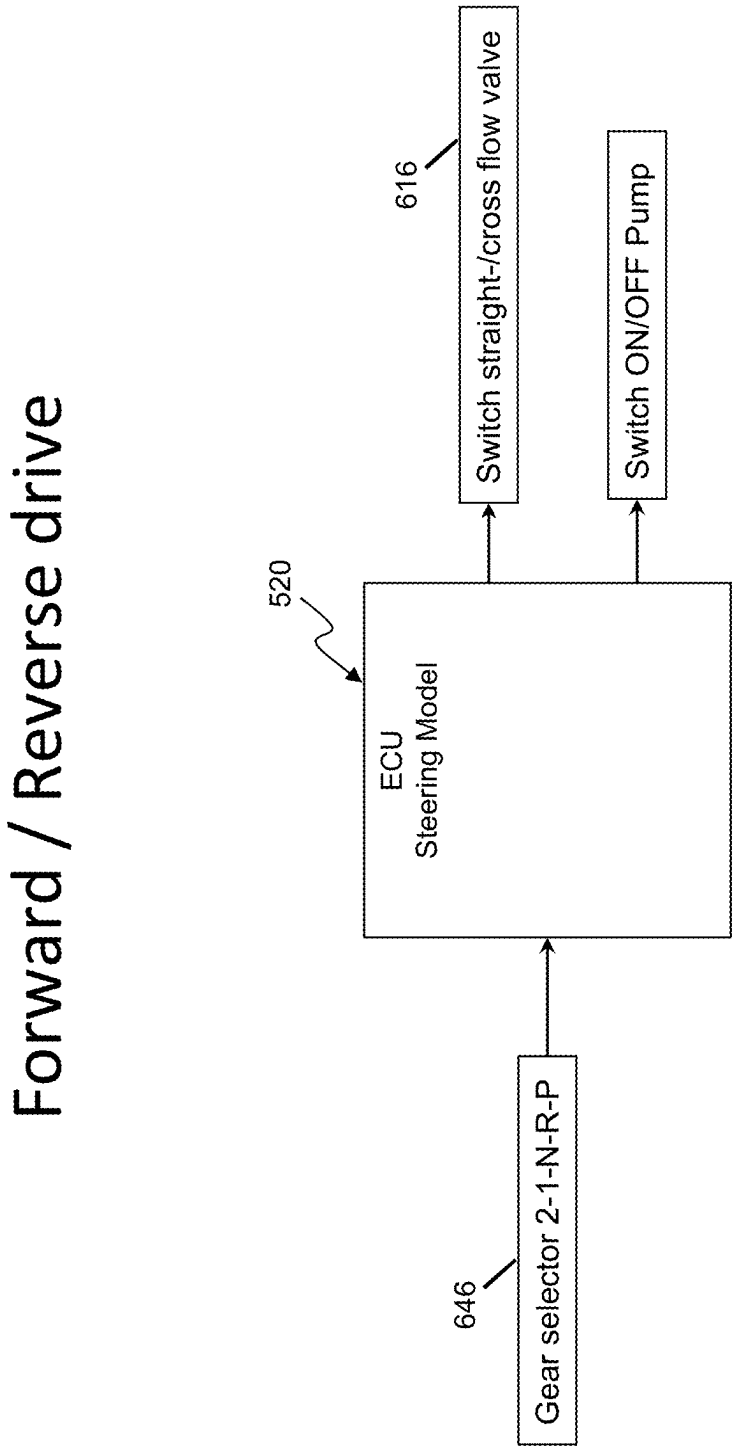

Forward / Reverse drive
646
Gear selector 2-1-N-R-P
520
ECU
Steering Model
616
Switch straight-/cross flow valve
Switch ON/OFF Pump

FIG. 22

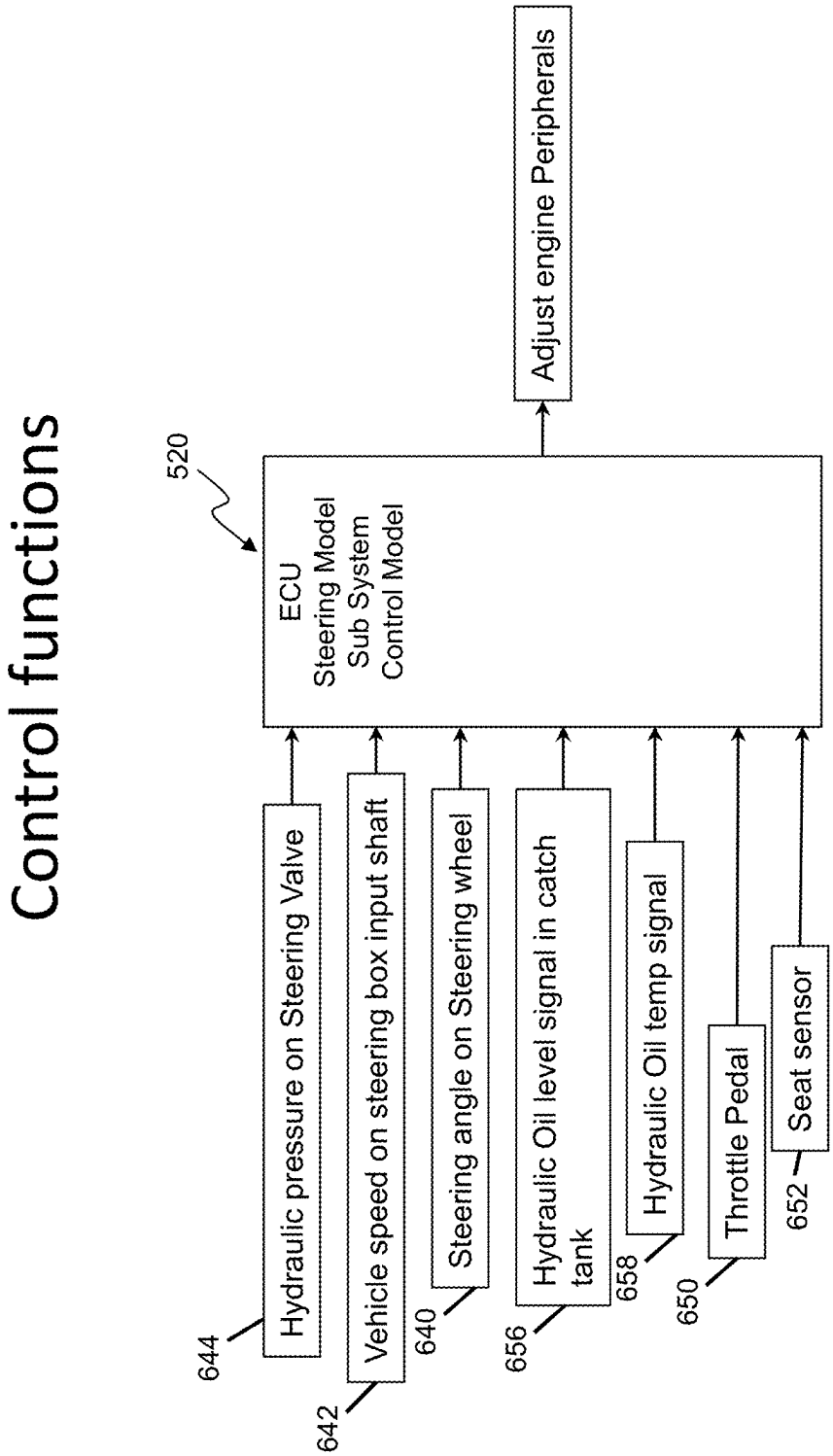

Control functions
520
ECU
Steering Model
Sub System
Control Model
Adjust engine Peripherals
Hydraulic pressure on Steering Valve
644
Vehicle speed on steering box input shaft
642
Steering angle on Steering wheel
640
Hydraulic Oil level signal in catch tank
656
Hydraulic Oil temp signal
658
Throttle Pedal
650
Seat sensor
652

FIG. 23

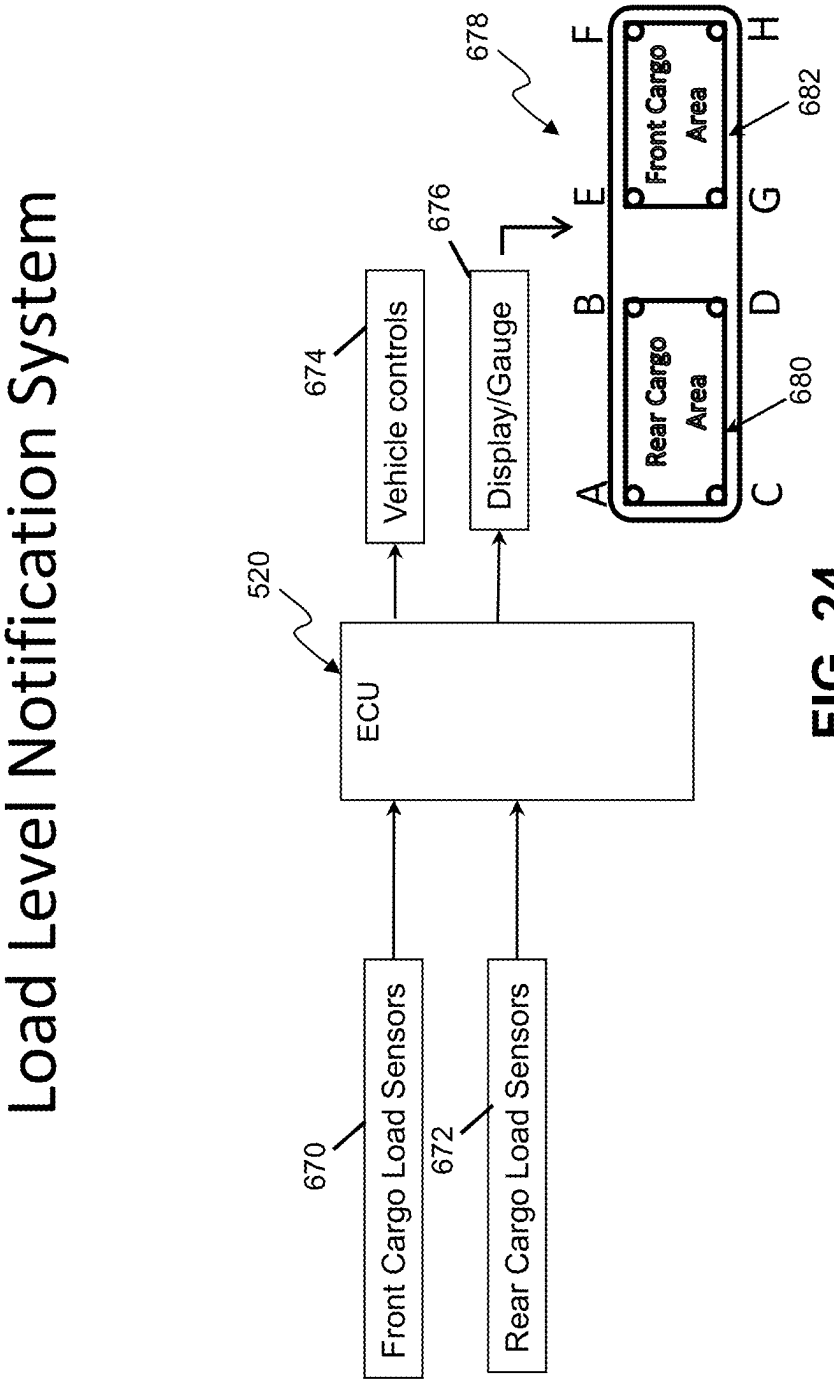

Load Level Notification System
Front Cargo Load Sensors
Rear Cargo Load Sensors
ECU
Vehicle controls
Display/Gauge
Front Cargo Area
Rear Cargo Area
A
B
C
D
E
F
G
H
670
672
520
674
676
678
680
682

FIG. 24

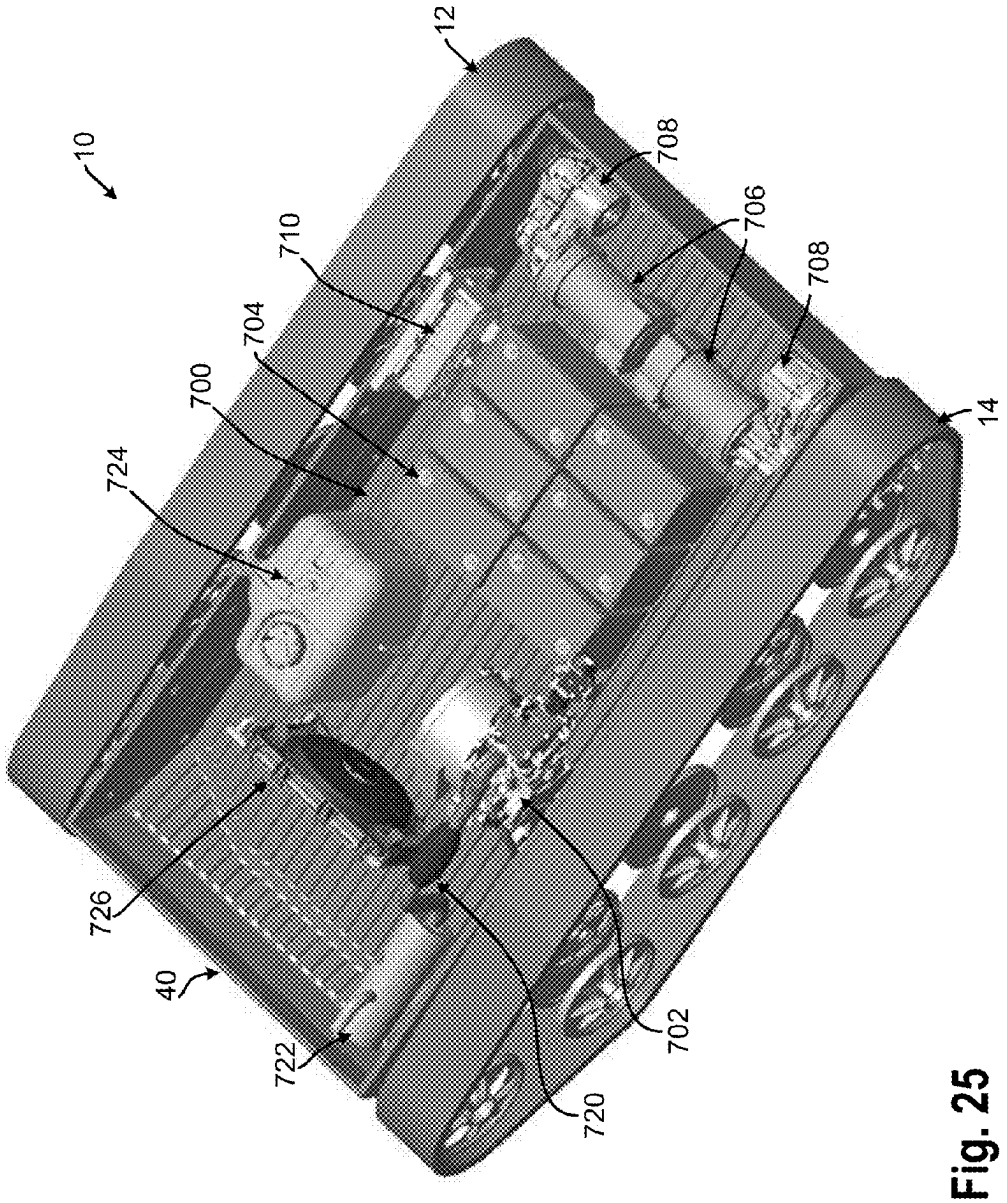



Fig. 25

# TRACKED ALL-TERRAIN VEHICLE

## CROSS-REFERENCE TO RELATED APPLICATION

**[0001]** This application claims priority to U.S. Provisional Application No. 61/805,113, filed on Mar. 25, 2013, the entire disclosure of which is expressly incorporated by reference herein.

## BACKGROUND OF THE DISCLOSURE

**[0002]** The present disclosure relates to vehicles, and more particularly to utility and all-terrain vehicles.

**[0003]** Generally, all-terrain vehicles ("ATVs") and utility vehicles ("UVs") are used to carry one or more passengers over a variety of terrain. More particularly, some ATVs and UVs may include side-by-side seating, in which a passenger may be seated next to the driver at the front of the vehicle. Side-by-side vehicles also may include a rear seating area to accommodate additional passengers in the vehicle. A roll cage may be provided over the seating of the vehicle. Additionally, ATVs and UVs may provide a cargo area in the front and/or the rear of the vehicle in order to carry cargo. ATVs and UVs include ground-engaging members, which may be tires, tracks, skis, or any other device for moving the vehicle across the ground.

## SUMMARY OF THE DISCLOSURE

**[0004]** Some embodiments of the present disclosure includes a tracked ATV comprising a frame, a track coupled to the frame, and a power source supported by the frame and drivingly coupled to the track. The tracked ATV further comprises a steering and drive assembly, which has a first hydraulic pump coupled to the tracks for large radius turns. The steering and drive assembly also has a second hydraulic pump coupled to the tracks for small radius turns.

**[0005]** A further embodiment of the present disclosure includes a tracked ATV comprising a frame and a track coupled to the frame. The tracked ATV further comprises a power source supported by the frame and drivingly coupled to the track. The tracked ATV also comprises a steering and drive assembly, which includes a drive gear assembly coupled to the track for driving the track and a steering gear assembly. The steering gear assembly includes a first hydraulic pump and a motor. The first hydraulic pump is driven by the drive gear assembly when the vehicle is moving.

**[0006]** Another embodiment of the present disclosure includes a tracked ATV comprising a frame, a track coupled to the frame, and a power source supported by the frame and drivingly coupled to the track. The tracked ATV further comprises a suspension system coupled to the frame and supporting the track. The suspension system comprises a plurality of control arms coupled at an upper end to the frame and at a lower end to a carrier roller. At least some of the carrier rollers move independently of the other carrier rollers.

**[0007]** According to another illustrative embodiment of the present disclosure, a tracked ATV is provided including a frame, a track coupled to the frame, and a power source supported by the frame and drivingly coupled to the track. The tracked ATV further includes a plurality of load sensors supported by the frame, and each load sensor is operative to detect a load on the frame. The tracked ATV further includes a display device operative to display an indication of payload distribution of the vehicle. The tracked ATV further includes a control unit in communication with the plurality of load sensors and the display device. The control unit is operative to calculate a payload distribution of the vehicle based on output from the plurality of load sensors and to determine a recommended payload adjustment based on the calculated payload distribution. The control unit is operative to transmit a signal to the display device representative of the recommend payload adjustment.

**[0008]** According to yet another illustrative embodiment of the present disclosure, a method of managing payload distribution of a tracked all-terrain vehicle (ATV) is provided. The method includes providing a tracked ATV including a frame, a track coupled to the frame, and a power source supported by the frame and drivingly coupled to the track. The method includes detecting, by a plurality of load sensors, at least one load on the frame. The method includes calculating, by a control unit, a payload distribution of the vehicle based on output from the plurality of load sensors. The method includes determining, by the control unit, a recommended payload adjustment based on the calculated payload distribution. The method further includes transmitting, by the control unit, a signal to a display device representative of the recommend payload adjustment.

**[0009]** Additional features and advantages of the present invention will become apparent to those skilled in the art upon consideration of the following detailed description of the illustrative embodiment exemplifying the best mode of carrying out the invention as presently perceived.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0010]** The foregoing aspects and many of the intended advantages of this invention will become more readily appreciated as the same becomes better understood by reference to the following detailed description when taken in conjunction with the accompanying drawings.

**[0011]** FIG. **1** is a right front perspective view of an illustrative vehicle of the present disclosure;

**[0012]** FIG. **2** is a left side view of an alternative embodiment of the vehicle of FIG. **1**;

**[0013]** FIG. **3** is a left side view of an alternative embodiment of the vehicles of FIGS. **1** and **2**;

**[0014]** FIG. **4** is a right front perspective view of the vehicle of the present disclosure;

**[0015]** FIG. **5** is a front view of the vehicle of FIG. **4**;

**[0016]** FIG. **6** is a left rear perspective view of the vehicle of FIG. **4**;

**[0017]** FIG. **7**A is a left front perspective view of a frame assembly and a tub of the vehicle of FIG. **4**;

**[0018]** FIG. **7**B is a right rear perspective view of the frame assembly and the tub of FIG. **7**A;

**[0019]** FIG. **7**C is a rear cross-sectional view of a front portion of the frame assembly and the tub of FIG. **7**A;

**[0020]** FIG. **8** is a side view of the vehicle of FIG. **4**, showing a suspension assembly;

**[0021]** FIG. **9**A is a top rear perspective view of the suspension assembly of FIG. **8**;

**[0022]** FIG. **9**B is a detailed side view of the suspension assembly of FIG. **8**;

**[0023]** FIG. **9**C is a side view of an alternative embodiment of the suspension assembly of FIG. **9**A;

**[0024]** FIG. **9**D is a side view of a further alternative embodiment of the suspension assembly of FIG. **9**A;

**[0025]** FIG. **10** is a perspective view of a track of the vehicle of FIG. **4**;

**[0026]** FIG. **11** is right rear perspective view of an air intake assembly of the vehicle of FIG. **4**;

**[0027]** FIG. **12** is a right rear perspective view of an exhaust assembly of the vehicle of FIG. **4**;

**[0028]** FIG. **13** is a rear right perspective view of a powertrain system of the vehicle supported by the frame assembly;

**[0029]** FIG. **14** is a rear left perspective view of the powertrain system of FIG. **13**;

**[0030]** FIG. **15** is a perspective view of a steering and drive assembly of the powertrain system of FIG. **13** with an outer housing removed;

**[0031]** FIG. **16** is a rear left perspective view of the vehicle of FIG. **4** illustrating a turning operation;

**[0032]** FIG. **17** is a top perspective view of the vehicle of FIG. **4** illustrating a zero-speed turning operation;

**[0033]** FIG. **18** is a diagrammatic view of a hydraulic steering system of the vehicle of FIG. **4**;

**[0034]** FIG. **19** is a front right perspective view of the frame assembly, the powertrain, and the electrical system of the vehicle of FIG. **4**;

**[0035]** FIG. **20** is a block diagram illustrating a torque compensation function of an engine control unit of the vehicle of FIG. **4**;

**[0036]** FIG. **21** is a block diagram illustrating a hydraulic pump control function of the engine control unit;

**[0037]** FIG. **22** is a block diagram illustrating a forward/reverse drive function of the engine control unit;

**[0038]** FIG. **23** is a block diagram illustrating safety functions of the engine control unit;

**[0039]** FIG. **24** is a block diagram illustrating a load level notification system provided with the engine control unit; and

**[0040]** FIG. **25** is a front right perspective view of the vehicle of FIG. **4** according to an embodiment having a series hybrid drive configuration.

**[0041]** Corresponding reference characters indicate corresponding parts throughout the several views. Although the drawings represent embodiments of various features and components according to the present disclosure, the drawings are not necessarily to scale and certain features may be exaggerated in order to better illustrate and explain the present disclosure. The exemplifications set out herein illustrate embodiments of the invention, and such exemplifications are not to be construed as limiting the scope of the invention in any manner.

## DETAILED DESCRIPTION OF THE DRAWINGS

**[0042]** The embodiments disclosed below are not intended to be exhaustive or to limit the invention to the precise forms disclosed in the following detailed description. Rather, the embodiments are chosen and described so that others skilled in the art may utilize their teachings. While the present disclosure is primarily directed to a utility vehicle, it should be understood that the features disclosed herein may have application to other types of vehicles such as all-terrain vehicles ("ATV"), utility vehicles ("UV"), motorcycles, watercraft, snowmobiles, side-by-side vehicle ("S×S"), and golf carts.

**[0043]** Referring to FIG. **1**, an illustrative embodiment of a vehicle **10** is shown. As detailed further herein, vehicle **10** may be a tracked ATV that includes ground engaging members, illustratively a left side track member **12** and a right side track member **14**, a powertrain assembly **500** (FIG. **13**), a frame assembly **30**, a body or tub **40** (FIG. **4**), a roll cage assembly **50**, and a suspension assembly **70** (FIG. **4**). Vehicle **10** may be configured for military applications and is configured to travel through various terrains or surfaces. More particularly, vehicle **10** is configured for both land and amphibious operation. Additionally, vehicle **10** may be operated by remote control. In one embodiment, vehicle **10** may be configured to travel at speeds of approximately 50 mph during land operation.

**[0044]** As shown in FIG. **1**, frame assembly **30** is supported on track members **12**, **14**. In one embodiment, track members **12**, **14** may be comprised of a polymeric material (e.g., rubber) and may be approximately 12 inches in width (approximately 0.3 m). Frame assembly **30** also may support a plurality of body panels, for example a hood **16**, a front fender **17**, side fenders **18**, and a rear fender **19**. Front fender **17** and rear fender **19** are provided to protect components of vehicle **10** from dirt, mud, debris, and/or damage. Additionally, frame assembly **30** supports an operator area **20**, which includes an operator seat **22**, a passenger seat **24**, a dash board assembly **25** (FIG. **6**), and operator controls, as detailed further herein. Operator seat **22** and passenger seat **24** may be in a side-by-side arrangement and may include a seat back and a seat bottom. In the illustrative embodiment of vehicle **10** of FIG. **1**, operator seat **22** is adjacent to and is separate from passenger seat **24**. Alternatively, as shown in FIG. **4**, operator seat **22** may be coupled to passenger seat **24** such that the seat bottoms are configured as a bench seat and the seat backs are configured as a single back rest.

**[0045]** Side fenders **18** are laterally outward of operator area **20** and may be provided as support structure for ingress and egress with vehicle **10**. Hood **16** may support a front cargo area forward of operator area **20**, as detailed further herein. Frame assembly **30** also may support a rear cargo area **28** rearward of operator area **20**. Illustrative rear cargo area **28** may be a fixed cargo box. Alternatively, rear cargo area **28** may be a movable dump box configured to pivot upwardly and rearwardly for unloading cargo therefrom. In one embodiment, the base weight of vehicle **10** may be approximately 1750 lb (approximately 794 kg) and vehicle **10** may be configured to accommodate approximately 500 lbs (approximately 227 kg) of cargo. Vehicle **10** may be configured with features for distributing the weight of any cargo supported on vehicle **10** during land operation and amphibious operation. For example, the cargo weight may be distributed such that the combined center of gravity of vehicle **10** and the cargo is positioned approximately at a center point of vehicle **10**. As such, vehicle **10** may not bias forwardly or rearwardly in the water during amphibious operation. As described herein, vehicle **10** may include a load level notification system to alert the operator of payload distribution.

**[0046]** Referring to FIG. **2**, an alternative embodiment of vehicle **10** is shown as vehicle **10'**. Vehicle **10'** includes features similar to those of vehicle **10**, wherein like reference numbers indicate like components. Vehicle **10'** includes a frame assembly **30'** supported on at least one track member **12'**. Frame assembly **30'** also supports a hood **16'**, side fenders **18'**, and a rear fender **19'**. Hood **16'** may support a front cargo area **26'** forward of an operator area **20'** and a rear cargo area **28'** may be positioned rearward of operator area **20'**. Operator area **20'** supports an operator seat and a passenger seat. Side fenders **18'** are laterally outward of operator area **20'** and may be provided for ingress and egress with vehicle **10'**. Additionally, a side body panel **27'** may be supported on frame assembly **30'** and may include at least one step **29'** for facilitating ingress and egress from operator area **20'**. For example, when an operator or passenger is entering operator area **20'**, the

operator or passenger may use step **29'** in order to step onto side fender **18'**, which allows the operator or passenger to enter and leave operator area **20'**.

**[0047]** Referring to FIG. **3**, an alternative embodiment of vehicle **10** and vehicle **10'** is shown as vehicle **10"**. Vehicle **10"** includes features similar to those of vehicle **10** and vehicle **10'**, wherein like reference numbers indicate like components. Vehicle **10"** includes a frame assembly **30"** supported on at least one track member **12"**. Frame assembly **30"** also supports a hood **16"**, a front fender **17"**, side fenders **18"**, and a rear fender **19"**. Additionally, frame assembly **30"** supports an operator area **20"**, which includes an operator seat and a passenger seat. Side fenders **18"** are laterally outward of operator area **20"** and may be provided for ingress and egress with vehicle **10"**. Additionally, a side body panel **27"** may be supported on frame assembly **30"** and may include at least one step **29"** for facilitating ingress and egress from operator area **20"**. Hood **16"** may support a front cargo area **26"** forward of operator area **20"** and a rear cargo area **28"** may be positioned rearward of operator area **20"**. Illustratively, rear cargo area **28"** includes side bars or roll bars **124**.

**[0048]** Referring to FIGS. **4-6**, an embodiment of vehicle **10** is shown. In one embodiment, track members **12**, **14** may include PROSPECTOR II tracks available from Polaris Industries, Inc. located at 2100 Highway 55 in Medina, Minn. 55340. Illustrative track members **12**, **14** are configured to rotate about suspension assembly **70** and are independently turnable relative to each other, as detailed further herein. More particularly, track members **12**, **14** are supported by a plurality of guide or carrier rollers **72**, **73**, a plurality of load wheels **75**, and a plurality of drive units **590**, **592** of suspension assembly **70**. When vehicle **10** is operating on track members **12** and **14**, the operator and/or passenger may wear a safety harness, illustratively a seat belt **21**, when in operator area **20**.

**[0049]** In one embodiment, track members **12**, **14** extend forwardly and rearwardly of frame assembly **30** and tub **40** such that track members **12**, **14** define the full length of vehicle **10**. As shown in FIGS. **2** and **3**, by defining the forward-most and rearward-most ends of vehicle **10**, track members **12**, **14** are configured to contact an object before the object contacts tub **40** of vehicle **10**. As such, track members **12**, **14** may drive vehicle **10** over the object without damaging tub **40**, frame assembly **30**, front fender **17**, and/or rear fender **19**.

**[0050]** Referring now to FIGS. **7A-7C**, frame assembly **30** includes a plurality of lower longitudinal frame members **32**, a plurality of upper longitudinal frame members **33**, and a plurality of cross members **34**. Illustrative frame assembly **30** includes at least two lower longitudinal frame members **32**, at least two upper longitudinal frame members **33**, and five cross members **34**; however, frame assembly **30** may include varying quantities and arrangements of longitudinal frame members **32**, **33** and cross members **34**. Illustratively, upper longitudinal frame members **33** are supported at the top surface of tub **40** and may be coupled together and coupled to tub **40** with conventional fasteners, such as structural bonds, welds, rivets, bolts, and adhesive. Lower longitudinal frame members **32** and cross members **34** are supported on a bottom wall **45** of tub **40**. Lower longitudinal frame members **32** and cross members **34** may be coupled together and coupled to tub **40** with conventional fasteners, such as structural bonds, welds, rivets, bolts, and adhesive. In one embodiment, the longitudinal length of frame assembly **30** and tub **40** may be approximately 11.5 ft (approximately 3.5 m) and the width of frame assembly **30** and tub **40** may be approximately 6.5 ft (approximately 2.5 m).

**[0051]** Longitudinal frame members **32**, **33** and cross frame members **34** may be comprised of a metallic or polymeric material. Frame assembly **30** of FIGS. **7A-7C** may be comprised of an aluminum material, for example 6061-T6 Aluminum. Similarly, tub **40** may be comprised of an aluminum material, for example 5052-H32 Aluminum. Alternatively, at least a portion of frame assembly **30** and/or tub **40** may include ultra-high molecular weight polyethylene. Additionally, frame assembly **30** and/or tub **40** may include a marine-grade pourable urethane coating and/or foam material inserts in order to fill volume voids and resist water ingestion during amphibious operation. As such, frame assembly **30** and tub **40** are configured to minimize water accumulation within vehicle **10**. Flotation devices, such as inflatable units, may also be included and secured to vehicle **10** to further increase the buoyancy of vehicle **10** during amphibious operation. In one embodiment, vehicle **10** is configured to float at approximately 1,600 kg without any urethane materials, however, urethane materials may increase the buoyancy of vehicle **10** during amphibious operation.

**[0052]** As shown in FIGS. **7A** and **7B**, frame assembly **30** also includes a brace member **36** which is positioned above lower longitudinal frame members **32** and cross members **34**. Brace member **36** may be coupled to a seat frame member **38** extending in a forward direction from brace member **36**. Seat frame member **38** supports operator seat **22** and passenger seat **24** (FIG. **4**). Illustratively, brace member **36** and seat frame member **38** are supported on upper longitudinal frame members **33** at the top surface of tub **40** and may be coupled thereto and coupled to each other with conventional fasteners, such as welds, bolts, rivets, adhesive, and/or structural bonds. As with longitudinal frame members **32**, **33** and cross members **34**, brace member **36** also may be comprised of an aluminum material and may include a urethane material to prevent water ingestion and to increase the buoyancy of vehicle **10**.

**[0053]** Brace member **36** and tub **40** are configured to support roll cage assembly **50**. Roll cage assembly **50** is coupled to brace member **36** and upper longitudinal frame members **33** with conventional fasteners, such as welds, bolts, rivets, adhesive, and structural bonds. In one embodiment, roll cage assembly **50** is configured to be removed from brace member **36** and upper longitudinal frame members **33**. In a further embodiment, roll cage assembly **50** is permanently affixed to brace member **36** and upper longitudinal frame members **33**.

**[0054]** Referring still to FIGS. **7A** and **7B**, roll cage assembly **50** includes a plurality of upstanding front members **52**, a plurality of upstanding rear members **54**, a front cross member **56**, and a rear cross member **57**. Roll cage assembly **50** may be comprised of a steel material. Front members **52** may be coupled to upper longitudinal frame members **33** and support grab bars **64** on both the operator side and the passenger side of roll cage assembly **50**. Additionally, front members **52** are coupled to rear members **54** with couplers **58**. Couplers **58** may be integral with front members **52** and/or rear members **54** or may be coupled thereto with welds, adhesive, bolts, rivets, or other fasteners. Additional details of couplers **58** may be included in U.S. Provisional Patent Application Ser. No. 61/788,874, filed on Mar. 15, 2013, the complete disclosure of which is expressly incorporated by reference herein.

**[0055]** Front cross member **56** is coupled to front members **52** and may be integrally formed thereto. Similarly, rear cross member **57** is coupled to rear members **54** and may be integrally formed thereto. Alternatively, front cross member **56** and rear cross member **57** may be coupled to front members **52** and rear members **54**, respectively, with conventional fasteners, such as welds, rivets, bolt, adhesive, and/or structural bonds.

**[0056]** As shown in FIGS. **7**A and **7**B, illustrative roll cage assembly **50** includes four rear members **54** coupled to brace member **36** of frame assembly **30** and rear cross member **57**. A plurality of rear braces **60** extend between two rear members **54**. More particularly, two rear braces **60** are positioned behind operator seat **22** (FIG. **4**) and are generally parallel to each other and coupled to two rear members **54**. Similarly, two rear braces **60** are positioned behind passenger seat **24** (FIG. **4**) and are generally parallel to each other and coupled to two rear members **54**. The outermost rear members **54** also may support bolster bars **62** on both the operator side and the passenger side of roll cage assembly **50**.

**[0057]** Front members **52**, rear members **54**, and cross members **56**, **57** may have a profiled cross-section in a figure-eight or hourglass configuration. As such, front members **52**, rear members **54**, and cross members **56**, **57** include recessed portions for receiving accessories, such as windows, doors, a front windshield, a rear windshield, and/or a roof, which may enclose operator area **20**. The recessed portions of roll cage assembly **50** may include sealing members in order to sealingly enclose operator area **20**. Additional details of the profiled configuration of front members **52**, rear members **54**, and cross members **56**, **57**, as well as the enclosing accessories (e.g., doors, windshields, windows, and/or a roof) are disclosed in U.S. Patent Application Publication No. 2013/0033070, filed on Jun. 8, 2012, the complete disclosure of which is expressly incorporated by reference herein. If operator area **20** is enclosed, operator area **20** may be configured to supply heat, defrost, and/or air conditioning, as well as other accessories, for the comfort and convenience of the operator and the passenger.

**[0058]** Referring still to FIGS. **7**A-**7**C, tub **40** includes a rear wall **41**, a front wall **43**, bottom wall **45**, and side walls **48**. Front wall **43**, rear wall **41**, bottom wall **45**, and side walls **48** may be integrally coupled together or may be welded, riveted, bolted, adhered, or otherwise fastened together. As shown in FIG. **5**, bottom wall **45** may have an inverted "U" shape such that the center portion **49** of bottom wall **45** is elevated relative to the lower outer edges or a perimeter **47** of bottom wall **45**. In one embodiment, bottom wall **45** of tub **40** has a ground clearance of approximately 6-15 inches (approximately 15-38 cm).

**[0059]** The inverted "U" shape of bottom wall **45** is designed to direct any water in tub **40** toward perimeter **47** of bottom wall **45**. As shown in FIG. **19**, vehicle **10** may include a plurality of pumps, for example bilge pumps **630**, positioned around perimeter **47** of tub **40** in order to evacuate any water from tub **40**. In one embodiment, vehicle **10** may include four pumps **630** coupled to bottom wall **45** at perimeter **47** (i.e., adjacent side walls **48**) of tub **40**. Pumps **630** may be configured for automatic operation upon the detection of water in tub **40** and/or may be manually operated. Vehicle **10** also may be configured to support a jet pump and/or propeller member to assist with amphibious operation, as detailed further herein.

**[0060]** Rear and front walls **41**, **43** may include latches **42** which provides vehicle **10** with towing capabilities. Additional tie-downs, latches, hooks, or other members may be provided for attaching additional cargo or assisting with towing capacity. Illustrative vehicle **10** may have a towing capacity of approximately 500-1000 lbs (approximately 227-450 kg).

**[0061]** Side walls **48** of tub **40** include a plurality of openings. For example, side walls **48** include a plurality of axle openings **44** adjacent front wall **43**. Axle openings **44** are configured to receive a front axle assembly **532** (FIG. **13**), as detailed further herein. Additionally, side walls **48** include a plurality of openings **46**, which may be configured to support additional components of vehicle **10** and/or may be used to drain water from tub **40** if water enters tub **40** during amphibious operation.

**[0062]** Referring now to FIGS. **8**, **9**A, and **9**B, suspension assembly **70** includes a plurality of lower guide or carrier rollers **72**, a plurality of upper carrier rollers **73**, drive units **590**, **592**, at least one idler wheel **79**, and a plurality of load wheels **75**. Carrier rollers **72** and **73**, drive units **590**, **592**, idler wheel **79**, and/or load wheels **75** may be comprised of metallic and/or polymeric materials. For example, as shown in FIGS. **9**A and **9**B, at least one load wheel **75** is configured as a non-pneumatic tire while carrier rollers **72**, **73** and idler wheel **79** are configured as spoked wheels. In one embodiment, these spoked wheels are made of a polymer. Non-pneumatic tires may be comprised of a polymeric material and may be used to increase the compliance of suspension assembly **70** and track members **12**, **14** during operation of vehicle **10**.

**[0063]** Carrier rollers **72**, **73**, drive units **590**, **592**, and load wheels **75** are in contact with track members **12**, **14** and are supported on side walls **48** of tub **40**. In one embodiment, idler wheels **79** are connected to suspension members. Drive units **590**, **592** may be supported by front axle assembly **532**. Drive units **590**, **592** are profiled to engage track members **12**, **14**, as detailed further herein. Upper carrier rollers **73** may be fixed to side walls **48** of tub **40**. Upper carrier rollers **73** and idler wheel **79** are configured to maintain the tension in track members **12**, **14**. In one embodiment, for example on vehicle **10"** of FIG. **3**, at least one of upper carrier rollers **73** may be partially covered with a shroud **122**. Shroud **122** may be integrally formed with side fender **18"** or may be coupled thereto and/or to side body panel **27"** with conventional fasteners.

**[0064]** Lower carrier rollers **72** and load wheels **75** may be operably coupled to side walls **48** of tub **40** with a plurality of shafts **76** and a plurality of control arms **78**. As shown in FIGS. **4**, **6**, **8**, **9**A, and **9**B, shafts **76** are coupled to side walls **48** with conventional fasteners (e.g., welds, rivets, bolts, adhesive) and an upper end of control arms **78** may be pivotally coupled to shafts **76**. Lower ends of control arms **78** are operably coupled to lower carrier rollers **72** and load wheels **75**. Load wheels **75** include a front load wheel **75***a* and a rear load wheel **75***b* and are configured to support the majority of the load of vehicle **10**. Lower carrier rollers **72** are configured to support a portion of the load of vehicle **10** and also are configured to guide track members **12**, **14** to prevent derailment. For example, load wheels **75** may support approximately 75% of the load of vehicle **10** while lower carrier rollers **72** may support approximately 25% of the load of vehicle **10**.

**[0065]** In one embodiment, as shown in FIG. **9**C, shock absorbers **126** also may be supported on shafts **76**. Illustratively, shock absorbers **126** have a generally vertical travel component and are coupled to control arms **78** of lower carrier rollers **72** and front load wheel **75***a*. Shock absorbers **126** may be positioned intermediate side walls **48** and control arms **78** such that shock absorbers **126** may be outboard of tub **40**. Alternatively, shock absorbers **126** may be positioned inboard of tub **40**. Shock absorbers **126** may be any linear force element. For example, shock absorbers **126** may be hydraulically operated and include springs. In one embodiment, shock absorbers **126** are adjustable coil-over damper type shock absorbers having a vertical travel of approximately 2-6 inches (approximately 5-16 cm).

**[0066]** As shown in FIG. **9**C, an alternative embodiment of suspension **70** includes a rear shock absorber **128** operably coupled to rear load wheel **75***b* through a scissor link **130**. Scissor link **130** is pivotably coupled to control arm **78** of rear load wheel **75** and is coupled to a movable end **142** of rear shock absorber **128**. A fixed end **144** of rear shock absorber **128** may be coupled to tub **40** such that illustrative rear shock absorber **128** has a generally horizontal travel component. In one embodiment, rear shock absorber **128** is inboard of tub **40**.

**[0067]** Alternatively, as shown in FIG. **9**D, suspension assembly **70** may include a carriage **132** operably coupled to front load wheel **75***a*, lower carrier rollers **72**, rear load wheel **75***b*, and idler wheel **79**. Carriage **132** extends in a generally horizontal direction and may be generally parallel with a portion of track members **12**, **14**. Lower carrier rollers **72** are pivotably coupled to carriage **132** through shafts **76** and control arms **78**. As such, lower carrier rollers **72** are configured to pivot or otherwise move independently relative to carriage **132** and each other in order to envelope an object on the ground or other surface during operation of vehicle **10**. Additionally, all lower carrier rollers **72** are configured to move together with carriage **132**, as detailed further herein, in order to maintain the tension in track members **12**, **14**. In one embodiment, each roller **72** may be biased downwardly from carriage **132** with a biasing member, such as with shock absorbers, for example.

**[0068]** As shown in FIG. **9**D, carriage **132** also is operably coupled to rear shock absorber **128** through control arm **78** coupled to rear load wheel **75***b* and scissor link **130**. Additionally, control arm **78** coupled to rear load wheel **75***b* is coupled to a pivot link **134**. Pivot link **134** is pivotably coupled to carriage **132** and control arm **78**. As such, as carriage **132** moves during operation of vehicle **10**, pivot link **134**, control arm **78** and scissor link **130** are configured to adjust movable end **142** of rear shock absorber **128**. As detailed herein, rear shock absorber **128** is positioned inboard of tub **40**.

**[0069]** Referring still to FIG. **9**D, the alternative embodiment of suspension assembly **70** also includes a front shock absorber **136** operably coupled to carriage **132** through a torque arm **138** and a scissor link **140**. Illustratively, front shock absorber **136** may have a generally horizontal travel component and may be positioned inboard of tub **40**. More particularly, a fixed end **148** of front shock absorber **136** may be coupled to an inner surface of side wall **48** of tub **40**. Scissor link **140** is operably coupled to a moveable end **146** of front shock absorber **136** and is pivotably coupled to torque arm **138**.

**[0070]** In operation, suspension assembly **70** of FIG. **9**D is configured to move upwardly and rearwardly when track members **12**, **14** encounter objects on the ground. The combined upward and rearward movement of carriage **132** also moves lower carrier rollers **72** in an upward and rearward direction which maintains the tension in track members **12**, **14**. Additionally, because each lower carrier roller **72** is separately coupled to carriage **132**, each lower carrier roller **72** is configured for independent movement which allows lower carrier rollers **72** to envelope objects on the ground or other surface for increase ride and handling characteristics of vehicle **10**.

**[0071]** Referring to FIG. **10**, track members **12**, **14** are defined by an outer surface **80** which includes a plurality of lugs **84** and an inner surface **82** which includes a plurality of guide members **88** and a plurality of drive members **86**. Lugs **84** on outer surface **80** contact the ground and other objects when vehicle **10** is operating. Drive members **86** and guide members **88** on inner surface **82** contact carrier rollers **72**, **73**, drive units **590**, **592**, and load wheels **75** in order to secure and maintain the alignment of track members **12**, **14** on carrier rollers **72**, **73**, drive units **590**, **592**, and load wheels **75**. Additionally, the raised profile of drive members **86** and guide members **88** is configured to compliment the profile of at least drive units **590**, **592** in order to drive track members **12**, **14** from front axle assembly **532**.

**[0072]** In operation, each control arm **78** and the corresponding lower carrier roller **72** coupled thereto moves independently of the other control arms **78** and lower carrier rollers **72**. As such, each lower carrier roller **72** is able to move in its own path when traversing objects or terrain. More particularly, because each lower carrier roller **72** is configured for independent movement, each lower carrier roller **72** and track members **12**, **14** may envelope or generally surround an object on the ground.

**[0073]** Additionally, as lower carrier rollers **72** and load wheels **75** contact the ground and other objects during operation of vehicle **10**, lower carrier rollers **72** and load wheels **75** move upwardly and rearwardly. Because track members **12**, **14** are secured on carrier rollers **72**, **73**, load wheels **75**, and drive units **590**, **592**, the upward and rearward movement of lower carrier rollers **72** and load wheels **75** maintains the tension in track members **12**, **14** when suspension assembly **70** moves relative to tub **40**.

**[0074]** Referring now to FIG. **6**, a cooling assembly **90** is shown. Cooling assembly **90** includes a radiator **92** and a fan **94**. Illustratively, cooling assembly **90** is positioned rearward of operator area **20** and forward of rear cargo area **28**. Cooling assembly **90** may be elevated relative to track members **12**, **14** such that amphibious operation of vehicle **10** does not submerge or otherwise affect cooling assembly **90**. Cooling assembly **90** is illustratively elevated above cargo area **28**. Additionally, cooling assembly **90** may be positioned in an angular configuration. Alternative arrangements of cooling assembly **90** may be positioned at other locations of vehicle **10**.

**[0075]** As shown in FIG. **11**, vehicle **10** also includes an air intake assembly **100** illustratively partially positioned below rear cargo area **28**. Air intake assembly **100** includes an air intake port **102**, a filter box **104**, a hose **106**, and an air box **108**. Air intake assembly **100** is positioned rearward of operator seat **22** and passenger seat **24** and is operably coupled to powertrain assembly **500**. Illustratively, air intake port **102** is elevated relative to bottom wall **45** of tub **40** and relative to

tops of track members **12**, **14** such that air intake port **102** is not submerged or otherwise affected during amphibious operation of vehicle **10**. In one embodiment, air intake port **102** may have a built-in snorkel for drawing in air from above the water line during amphibious operation of vehicle **10**. Air intake port **102** is coupled to filter box **104**, which includes a filter (not shown) sealed by a housing **103**. Filter box **104** is fluidly coupled to air box **108**. Air box **108** is sealingly coupled to throttle bodies **120** of an engine **502** of powertrain assembly **500** in order to supply air to engine **502**.

**[0076]** Referring to FIG. **12**, vehicle **10** also includes an exhaust assembly **110**. Exhaust assembly **110** includes a manifold **112**, an exhaust pipe **114**, a muffler **116**, and a tail pipe **118**. Illustratively, manifold **112** is coupled to engine **502** and to exhaust pipe **114**. Exhaust pipe **114** extends between manifold **112** and muffler **116**. Tail pipe **118** is coupled to muffler **116** in order to exhaust gases from vehicle **10**. In one embodiment, exhaust assembly **110** is elevated relative to bottom wall **45** of tub **40** such that amphibious operation of vehicle **10** does not submerge or otherwise affect exhaust assembly **110**. Tail pipe **118** is elevated above track members **12**, **14**, as illustrated in FIG. **16**.

**[0077]** Referring to FIGS. **13** and **14**, a powertrain system **500** is supported by frame assembly **30** for driving tracks **12**, **14** of vehicle **10**. Powertrain system **500** includes an engine **502**, a transmission **504** coupled to an output of engine **502**, and a drive shaft **506** coupled to an output of transmission **504**. Powertrain system **500** further includes a steering and drive assembly **508** coupled to an opposite end of drive shaft **506**. Engine **502** and transmission **504** are positioned in a rear portion of vehicle **10** behind operator seat **22**, and steering and drive assembly **508** is positioned in a front portion of vehicle **10** in front of operator seat **22**. In an exemplary embodiment, engine **502** is an internal combustion engine having an electronically controlled throttle valve controlled by an engine control unit (ECU) **520** (FIG. **20**). An exemplary engine control system is detailed further herein and in U.S. patent application Ser. No. 13/153,037, filed on Jun. 3, 2011, titled "ELECTRONIC THROTTLE CONTROL," the entire disclosure of which is incorporated by reference herein. Engine **502** is detailed further in U.S. patent application Ser. No. 13/242,239, filed on Sep. 23, 2011, titled "ENGINE," the entire disclosure of which is incorporated by reference herein.

**[0078]** In the illustrated embodiment, transmission **504** includes an electrically controlled continuously variable transmission (CVT), as detailed further in U.S. patent application Ser. No. 13/652,253, filed on Oct. 15, 2012, the complete disclosure of which is incorporated by reference herein. Transmission **504** is controlled by ECU **520** (FIG. **20**) or by another suitable controller, such as a transmission control unit. The output of transmission **504** is operably coupled to a gearbox **510** (FIG. **14**), and the output of gearbox **510** is drivingly coupled to drive shaft **506**. In one embodiment, gearbox **510** includes a sub-transmission geared to provide selectable operating gears. For example, gearbox **510** may shifted to a high gear, a low gear, a reverse gear, a neutral gear, and a park configuration. High gear provides a higher top speed of vehicle **10** than the top speed of low gear, and low gear provides greater low end torque. In one embodiment, a shift lever positioned in the operator area of vehicle **10** is operably coupled to gearbox **510** for shifting gearbox **510** between operating gears. Fewer or additional sub-transmission gears may be provided.

**[0079]** As illustrated in FIG. **14**, gearbox **510** drives an attachment shaft **511** for transferring engine torque to an attachment or implement (e.g., a work tool) attached to vehicle **10**. Attachment shaft **511** illustratively extends outwardly from a backside of gearbox **510** opposite drive shaft **506** and towards the back of vehicle **10** (e.g., through an aperture of the tub) for attaching the external implement. In one embodiment, attachment shaft **511** provides a power take-off for driving the implement with engine **502**. In one embodiment, gearbox **510** selectively engages attachment shaft **511** based on an operator input. For example, the shift lever may be actuated to engage attachment shaft **511** to power the implement coupled to vehicle **10**. In one embodiment, a clutch assembly is selectively engaged by the operator to engage attachment shaft **511** via gearbox **510**. The clutch assembly may be hydraulically or electronically operated. In one embodiment, attachment shaft **511** is used to drive a jet pump and/or propeller member to assist in propelling vehicle in water during amphibious operation.

**[0080]** Drive shaft **506** illustratively extends through the center of frame assembly **30** in the tub **40** below the operator seat **22**. In one embodiment, drive shaft **506** extends through a tunnel provided below seat **22**. As illustrated in FIG. **14**, drive shaft **506** includes a first portion **522** coupled to gear box **510**, a second portion **524** drivingly coupled to an input shaft **530** of steering and drive assembly **508**, and a u-joint **526** coupling first portion **522** to second portion **524**. A support bracket **528** is configured to couple to frame **30** to rotatably support drive shaft **506**. Support bracket **528** includes an internal bearing surface that receives drive shaft **506**.

**[0081]** Referring to FIGS. **13** and **19**, an alternator **512** is coupled to engine **502** for charging one or more vehicle batteries **514** (FIG. **19**) and for providing electrical power to electronic components of vehicle **10**. In an exemplary embodiment, alternator **512** is a 24 volt, 110-amp alternator, and vehicle battery **514** includes two 12-volt wet-cell batteries. Alternator **512** illustratively is driven by a chain **516** (FIG. **19**) coupled to the crankshaft of engine **502**. Vehicle **10** further includes a battery equalizer **628**, such as a 24V/12V equalizer, coupled to batteries **514**. Equalizer **628** is operative to draw substantially equal power from each battery **514** when powering vehicle components. In one embodiment, ECU **520** communicates over a controller area network (CAN) bus with other electronic components of vehicle **10**. As illustrated in FIG. **19**, a bilge pump **630** is provided at each corner of tub **40** for pumping water out of tub **40**.

**[0082]** As illustrated in FIG. **13**, a front axle assembly **532** includes a pair of drive axles **534** coupled to steering and drive assembly **508** for transferring torque from engine **502** to tracks **12**, **14**. Axles **534** are coupled to front drive units **590**, **592** (FIG. **16**) for driving left and right tracks **12**, **14**, respectively, in a front-wheel drive configuration. In an alternative embodiment, steering and drive assembly **508** is coupled to rear drive units of vehicle **10** to provide a rear-wheel drive configuration. A brake **536** is coupled to each axle **534** for providing a braking force to each axle **534** and drive unit **590**, **592**. Brakes **536** are actuated via a brake pedal provided in the operator area of vehicle **10**. In the illustrated embodiment, brakes **536** are hydraulically controlled disc brakes. Brakes **536** are illustratively positioned outboard of tub **40**. In one embodiment, the positioning of brakes **536** outside of tub **40** facilitates air-cooling of brakes **536**.

**[0083]** A hydraulic pump assembly **518** is also coupled to engine **502** and is driven by the crankshaft of engine **502**. As

described herein, hydraulic pump assembly **518** is operative to drive hydraulic motor **552** of steering and drive assembly **508** to facilitate zero-speed turning and low-speed turning of vehicle **10**. In one embodiment, hydraulic pump assembly **518** includes a dual hydraulic pump in a dual stage configuration, i.e., a pair of hydraulic pumps coupled in a series relationship (see FIG. **18**, for example). Hydraulic lines are routed from hydraulic pump assembly **518** to hydraulic motor **552** of steering and drive assembly **508**. In one embodiment, hydraulic pump assembly **518** drives other hydraulic components of vehicle **10**.

**[0084]** In operation, to drive vehicle **10** straight forward, steering and drive assembly **508** applies power from engine **502** to both drive units **590**, **592** (FIG. **16**) such that both left and right tracks **12**, **14** rotate at the same speed. To steer the vehicle **10** based on the steering angle of steering wheel **529** (FIG. **8**), steering and drive assembly **508** applies a differential to the driving speeds of each drive unit **590**, **592** (FIG. **16**). The speed difference between the left and right drive units **590**, **592** is different depending on the desired corner radius that vehicle **10** is driven.

**[0085]** In one embodiment, the differential speed of the two driving units **590**, **592** is achieved by a controlled variation of the drive ratio between the two driving units **590**, **592**, and not by applying brakes **536**. As such, the distribution of the torque applied to drive units **590**, **592** is adjusted without changing the total torque applied. The torque reduced on the one side of vehicle **10** is applied to the other side of vehicle **10**. Based on this behavior, the vehicle **10** keeps a constant driving speed during steering. In an alternative embodiment, brakes **536** are actuated to assist with steering vehicle **10**.

**[0086]** As illustrated in FIGS. **13-15**, steering and drive assembly **508** includes a steering assembly **540** coupled to a drive assembly **542**. Steering assembly **540** includes a hydraulic pump **550** driven by drive shaft **506**, a hydraulic motor **552**, and a steering gear assembly **562**. In the illustrated embodiment, hydraulic pump **550** and hydraulic pump assembly **518** are provided on the same hydraulic circuit of vehicle **10** (see FIG. **18**) and are operative to drive hydraulic motor **552**. As described herein, the steering angle of steering wheel **529** controls a steering valve (FIG. **18**) to control the rotation of hydraulic motor **552** and thus the steering input to steering gear assembly **562** and drive assembly **542**.

**[0087]** As illustrated in FIG. **15**, steering assembly **540** includes an input shaft **530** that couples to second portion **522** (FIG. **14**) of drive shaft **506**. Input shaft **530** is drivingly coupled to a shaft **560** of drive assembly **542** via interacting angled gears **574**, **576**. Drive assembly **542** includes a differential gearbox having right and left planetary gear assemblies **564**, **566**, respectively, driven by shaft **560**. Each planetary gear assembly **564**, **566** includes a sun gear **578** coupled at each end of shaft **560** to provide driving input to drive axles **534**. Each planetary gear assembly **564**, **566** further includes planetary gears **570** and a ring gear **568**.

**[0088]** The steering angle of the steering input device, i.e., steering wheel **529** of FIG. **8**, defines the differential speed of the two drive axles **534** and therefore the turning radius of vehicle **10** depending on the vehicle speed. A greater vehicle speed results in a greater turning radius for a same steering input. The steering input is directed from hydraulic steering motor **552** through the steering gear assembly **562** to the ring gear **568** of the planetary gear assemblies **564**, **566**. Steering gear assembly **562** includes a steering gear train comprising a gear shaft **563** coupled to the output of motor **552** and a gear shaft **571** coupled to gear shaft **563** for driving ring gear **568** of planetary gear assembly **566**. Steering gear assembly **562** includes an intermediate gear shaft **572** coupled to gear shaft **571** for driving ring gear **568** of gear assembly **564**.

**[0089]** When vehicle **10** is driving straight in the forward or reverse direction without steering input, the output of motor **552**, steering gear assembly **562**, and ring gear **568** are stationary, and drive axles **534** coupled to planetary gear assemblies **564**, **566** rotate at the same speed. Depending on the steering angle of steering wheel **529**, hydraulic motor **552** is driven faster or slower in one or the other direction based on the turning direction requested. The hydraulic motor **552** thus drives the ring gear **568** through the steering gear assembly **562**. Rotation of the ring gear **568** changes the gear ratio of the planetary gear assembly **564**, **566** and results in the differential speed of the two drive axles **534**.

**[0090]** In one embodiment, to keep a constant velocity of vehicle **10** during a turning operation, the outer side drive axle **534** (relative to the turning direction) is driven faster than a neutral vehicle speed (i.e., the requested speed of the vehicle **10**), and the inner side drive axle **534** is driven the same amount slower than the neutral vehicle speed. In the illustrated embodiment, intermediate shaft **572** of steering gear assembly **562** is operative to invert the rotational direction of the ring gear **568** of planetary gear assembly **564** relative to the rotational direction of ring gear **568** of planetary gear assembly **566**. As such, the steering input provided with hydraulic motor **552** causes one drive axle **534** to drive faster and one drive axle **534** to drive slower relative to the neutral vehicle speed to provide the turning effect.

**[0091]** An operation of a drive assembly **542**, hydraulic motor **552**, and steering gear assembly **562** based on the steering input is detailed further in U.S. patent application Ser. No. 11/965,165, filed Dec. 27, 2007, titled "SKID STEERED ALL TERRAIN VEHICLE," the entire disclosure of which is incorporated by reference herein.

**[0092]** Referring to FIG. **18**, an exemplary hydraulic steering system **600** is illustrated. Engine **502** drives a first hydraulic pump **602** and a second hydraulic pump **604** of hydraulic pump assembly **518**. A control valve **606**, **608** is coupled at the output of each pump **602**, **604**, respectively. Gearbox **510** drives drive shaft **506** to drive hydraulic pump **550** of steering and drive assembly **508**, and a control valve **610** is coupled at the output of pump **550**. The hydraulic components of FIG. **18** are coupled together view hydraulic hoses or lines as illustrated. Exemplary pump displacements, pressure values, pump speeds, and other values are shown in FIG. **18** to illustrate an exemplary embodiment of hydraulic steering system **600**, and other suitable values and specifications may be provided depending on system configuration.

**[0093]** A priority flow control valve **612** controls the flow volume from pumps **518**, **550** to a steering valve **614** such that the pressure drop over the steering valve **614** is substantially constant. Steering wheel **529** is coupled to steering valve **614** and switching valve **618** to control the fluid flow to motor **552**. Steering valve **614** serves as an adjustable orifice to control the amount of fluid flow to motor **552** and thus the amount of rotation of motor **552** and the amount of steering of vehicle **10**. The flow direction to motor **552** is switched with switching valve **618** based on the direction that steering wheel **529** is turned. As such, steering valve **614** and switching valve **618** cooperate to control the direction and volume of fluid flow to hydraulic motor **552** to control the rotational direction of motor **552** based on steering wheel **529** being turned to the left

or right (for a corresponding left or right vehicle turn). As such, the steering angle of steering wheel **529** is operative to control the volume and direction of flow to motor **552**.

**[0094]** A hydraulic switch, illustratively switching valve **616** is provided between motor **552** and the output of steering valve **614** to further control the direction of flow to the hydraulic motor **552** based on the operating gear of vehicle **10**. In particular, in a forward gear of gearbox **510**, switching valve **616** controls the fluid flow to rotate motor **552** in one direction. In a reverse gear of gearbox **510**, switching valve **616** is operative to reverse the flow direction to motor **552**, thereby allowing the steering direction of vehicle **10** to be independent of the forward or reverse movement of vehicle **10** based on a same steering angle of steering wheel **529**. Switching valve **616** may be controlled electrically or mechanically based on the selection of a forward or reverse gear of gearbox **510**.

**[0095]** Hydraulic fluid which is not used for steering may be either used to drive any other working hydraulic units of vehicle **10** or returned over a return line to the oil reservoir **622**. The operation of priority control valve **612**, steering valve **614**, switching valve **616**, and switching valve **618** of FIG. **18** is detailed further in U.S. patent application Ser. No. 11/965,165, filed Dec. 27, 2007, titled "SKID STEERED ALL TERRAIN VEHICLE," the entire disclosure of which was previously incorporated by reference herein.

**[0096]** In one embodiment, steering wheel **529** includes a position sensor **640** (FIGS. **20-21**) in communication with ECU **520** (or another vehicle controller) for detecting a steering angle of steering wheel **529**. In this embodiment, based on the detected steering angle, ECU **520** routes a control signal to steering valve **614** and switching valve **616**. Steering wheel **529** may alternatively be mechanically or hydraulically coupled to steering valve **614** and switching valve **616**.

**[0097]** Hydraulic pump **550** and hydraulic pump assembly **518** are operative to drive hydraulic motor **552** based on the operating condition of vehicle **10**. In the illustrated embodiment, hydraulic pump **550** drives motor **552** for steering operations when vehicle is moving. In particular, hydraulic pump **550** is driven by drive shaft **506** via gears **556**, **558** (FIG. **15**). As such, movement of vehicle **10** across the ground causes drive shaft **506** to rotate to thereby drive pump **550**. Thus, hydraulic pump **550** provides power to hydraulic motor **552** when pump **550** is driven by drive shaft **506**.

**[0098]** In the illustrated embodiment, when engine **502** is disabled, but tracks **12**, **14** are moving to rotate drive shaft **506**, hydraulic pump **550** is operative to drive motor **552** to provide vehicle steering. Such a configuration may serve as a control feature for steering vehicle **10** when vehicle **10** is not powered but is coasting or moving down a hill, for example. In the illustrated embodiment, pump **550** is mechanically coupled to drive shaft **506** such that pump **550** rotates when drive shaft **506** rotates. In the illustrated embodiment, both forward and reverse movement of vehicle **10** is operative to drive pump **550** to power motor **552**.

**[0099]** Hydraulic pump assembly **518** is operative to drive motor **552** to turn vehicle **10** when vehicle **10** is stopped or below a minimal threshold speed (e.g., 5 mph, 3 mph, etc.) or when ECU **520** determines that additional hydraulic power is required to drive hydraulic motor **552**. Hydraulic pump **518**, driven by engine **502**, provides hydraulic power to motor **552** such that vehicle **10** is operative to turn when at a zero vehicle speed based on an operator turning steering wheel **529** and without operator input to the vehicle accelerator. As such, in one embodiment, hydraulic pump assembly **518** is operative to drive motor **552** for small radius turns, including a zero radius turn, and hydraulic pump **550** is operative to drive motor **552** for larger radius turns (i.e., when tracks **12**, **14** are moving).

**[0100]** In one embodiment, vehicle **10** must be traveling at a speed less than a threshold vehicle speed before hydraulic pump assembly **518** is actuated by ECU **520** to drive motor **552**. For example, vehicle **10** includes a speed sensor **642** (FIGS. **20-21**) operative to detect a speed of tracks **12**, **14** and/or drive shaft **506**. Upon the detected speed decreasing to below the speed threshold, ECU **520** activates hydraulic pump assembly **518** to drive hydraulic motor **552**. In one embodiment, ECU **520** or another suitable controller controls the activation of hydraulic pump assembly **518** based on the vehicle speed and/or other inputs. In one embodiment, zero-radius turning is activated by ECU **520** when gearbox **510** is in a neutral operating gear, although it may be activated in other operating gears (e.g., reverse or forward). In one embodiment, ECU **520** further controls hydraulic pump assembly **518** to assist with steering when hydraulic pump **550** provides inadequate power to motor **552** (e.g., low vehicle speeds).

**[0101]** For example, referring to FIG. **16**, an exemplary right turn steering operation is illustrated as controlled by hydraulic pump **550** for when tracks **12**, **14** are moving. Due to the movement of vehicle **10** and thus the rotation of drive shaft **506**, hydraulic pump **550** provides hydraulic power to rotate motor **552**. Based on the steering angle of steering wheel **529**, hydraulic motor **552** provides steering input to steering gear assembly **562** to cause a differential speed between drive units **590**, **592**, as described herein. In FIG. **16**, drive unit **592** is driven slower than the neutral vehicle speed, and drive unit **590** is driven faster than the neutral vehicle speed to cause the vehicle to turn right.

**[0102]** Referring to FIG. **17**, an exemplary zero radius steering operation is illustrated as controlled by hydraulic pump assembly **518** for when vehicle **10** is stationary. With drive shaft **506** not rotating, hydraulic pump **550** does not provide hydraulic input to motor **552**. Rather, engine **502** drives hydraulic pump assembly **518** to power motor **552** when vehicle **10** is stationary. Based on the steering angle of steering wheel **529**, hydraulic motor **552** provides steering input to steering gear assembly **562** to cause a differential speed between drive units **590**, **592** such that vehicle **10** turns at a zero radius or a minimal radius. In FIG. **17**, tracks **12**, **14** are driven at the same speed but in opposite directions to cause vehicle **10** to turn at the zero radius.

**[0103]** In one embodiment, the steering system described herein is operative to control vehicle **10** at low to high vehicle speeds, including speeds up to and over 60 mph, for example. Vehicle **10** includes an accelerator pedal including a position sensor **650** (FIG. **23**) in communication with ECU **520** for providing a throttle request to engine **502**.

**[0104]** In one embodiment, ECU **520** (FIGS. **20-23**) is operative to enable and disable the zero-speed steering functionality provided with hydraulic pump assembly **518** based on the detection of an operator in seat **22**. Seat **22** includes a seat switch or sensor **652** (FIG. **21**) for detecting the presence of an operator, as detailed further in U.S. patent application Ser. No. 13/650,697, filed on Sep. 4, 2012, the entire disclosure of which is incorporated by reference herein. ECU **520** enables operation of hydraulic pump assembly **518** to enable zero-speed turning upon detection of an operator in seat **22**

and disables operation of hydraulic pump assembly **518** when an operator is not detected in seat **22**. In one embodiment, ECU **520** is further operative to enable and disable power to the attachment via attachment shaft **511** based on detection of an operator in operator seat **22**. In this embodiment, when an operator is not detected at seat **22**, ECU **520** disengages attachment shaft **511** to stop and/or to prevent the delivery of power from engine **502** to the attachment. As such, engine **502** may be controlled to provide power to the attachment when an operator is seated and not when an operator is off the seat. In one embodiment, ECU **520** delays deactivating hydraulic pump assembly **518** after detecting seat **22** is in an unoccupied state for a predetermined time lapse, such as for one second or any other suitable time lapse.

**[0105]** ECU **520** includes at least one processor that executes software and/or firmware stored in memory of ECU **520**. The software/firmware contains instructions that, when executed by the processor, causes ECU **520** to perform the functions described herein. ECU **520** may alternatively include one or more application-specific integrated circuits (ASICs), field-programmable gate arrays (FPGAs), digital signal processors (DSPs), hardwired logic, or combinations thereof. In one embodiment, the processor of ECU **520** includes both engine control logic operative to control engine **502** and CVT control logic operative to control CVT **504**. ECU **520** may alternatively include multiple control units or processors functioning together to perform the functions of ECU **520** described herein.

**[0106]** Referring to FIG. **20**, ECU **520** is operative to provide torque compensation during a steering event. Due to the hydraulic system using some engine power to steer vehicle **10** and/or to power other components of vehicle **10**, ECU **520** controls engine **502** to deliver additional torque when engine **502** power is being consumed by the hydraulic system. As such, the likelihood of stable vehicle speed is increased without any corrections made by the operator (e.g., further actuation of accelerator). ECU **520** receives as sensor inputs the hydraulic pressure on steering valve **614** (FIG. **18**) from a hydraulic pressure sensor **644**, the vehicle speed (e.g., the rotational speed of input shaft **530** (FIG. **15**) or drive shaft **506**) from speed sensor **642**, the steering angle of steering wheel **529** (FIG. **8**) from steering angle sensor **640**, and the selected operating gear of sub-transmission gearbox **510** (e.g., high, low, reverse, neutral, park) from a gear selector **646**. Based on these inputs, ECU **520** automatically adjusts the speed of engine **502** by controlling the throttle valve to compensate for the torque consumed by the hydraulic system to power the steering assembly or other hydraulic components. Additional detail for engine torque compensation is provided in U.S. patent application Ser. No. 11/965,165, filed Dec. 27, 2007, titled "SKID STEERED ALL TERRAIN VEHICLE," the entire disclosure of which was previously incorporated by reference herein.

**[0107]** Referring to FIG. **21**, ECU **520** is operative to control the activation of hydraulic pumps (e.g., pumps **602**, **604** of FIG. **18**) of hydraulic pump assembly **518**. Based on the detected vehicle speed from speed sensor **642**, the detected steering angle of steering wheel **529** from sensor **640**, and the detected engine speed from an engine speed sensor **648**, ECU **520** is operative to selectively active pumps **602**, **604** of hydraulic pump assembly **518**. As described herein, ECU **520** activates one or more pumps of hydraulic pump assembly **518** based on the vehicle speed decreasing to below the threshold speed. As such, hydraulic pump assembly **518** is used to drive hydraulic motor **552** of steering and drive assembly **508** (FIG. **15**) at low or zero vehicle speeds, as described herein. ECU **520** monitors the vehicle speed and steering angle to determine if pump assembly **518** requires activation at speeds greater than the threshold, such as if additional steering power is required. In one embodiment, ECU **520** monitors the engine speed and increases the engine speed upon determining, based on the steering demand, vehicle speed, and engine speed, that additional power is required for driving the pumps of hydraulic pump assembly **518**. In one embodiment, hydraulic pump assembly **518** includes at least two hydraulic pumps coupled in series. FIG. **21** illustrates hydraulic pump assembly **518** having three pumps in series. In one embodiment, when an operator is not detected in seat **22** based on output from seat sensor **652**, ECU **520** disables operation of hydraulic pump assembly **518**, as described herein.

**[0108]** Referring to FIG. **22**, ECU **520** is operative to control the forward and reverse drive of vehicle **10** based on a signal from a gear selector **646** (e.g., shift lever, buttons, or other suitable operator input device) and/or a signal from gearbox **510**. Upon detecting a forward gear, ECU **520** controls switching valve **616** (FIG. **18**) to rotate motor **552** in a first direction such that vehicle **10** turns in a direction corresponding to the direction demanded with steering wheel **529**. Upon detecting a reverse gear, ECU **520** controls switching valve **616** to switch the flow direction to motor **552** to thereby reverse the direction of motor **552**. As such, vehicle **10** turns in a direction corresponding to the direction demanded with steering wheel **529** when vehicle **10** is moving in reverse.

**[0109]** FIG. **23** illustrates several inputs that ECU **520** uses to control engine **502** and components coupled to engine **502** (e.g., hydraulic pump assembly **518**, attachment shaft **511**, etc.) to provide control functionality to vehicle **10**. ECU **520** receives sensor inputs corresponding to the hydraulic pressure on steering valve **614** (FIG. **18**) from hydraulic pressure sensor **644**, the vehicle speed from sensor **642**, the steering angle of steering wheel **529** from sensor **640**, the hydraulic oil level in reservoir **622** (FIG. **18**) from a hydraulic level sensor **656**, the hydraulic oil temperature from a temperature sensor **658**, the throttle pedal position (throttle demand) from accelerator position sensor **650**, and the occupied or unoccupied state of seat **22** from seat sensor **652**. As described herein, ECU **520** implements various control features based on the signals. For example, ECU **520** disables the zero-speed turning feature upon an operator not being detected in seat **22**. In one embodiment, the disabling of the zero-speed turning feature is in response to a detected unoccupied state of the seat **22**, no or minimal throttle demand being detected, and no or minimal vehicle speed being detected by ECU **520**. ECU **520** further disables components of the hydraulic circuit and/or reduces vehicle speed based on a low oil level, a high oil temperature, or a low/high oil pressure detection.

**[0110]** Referring to FIG. **24**, ECU **520** is further operative to detect and to notify the operator of a payload distribution of vehicle **10**. For example, the distribution of payload (e.g., cargo, operator, other loads) may affect the stability of vehicle **10** more when vehicle **10** is in buoyancy mode in water than when vehicle **10** is on dry land. If vehicle **10** has been loaded unevenly, vehicle operation may become unstable upon vehicle **10** transitioning into water. ECU **520** is operative to provide an indication to the operator via a signal to a gauge **676** of an optimal or recommended distribution of the payload.

**[0111]** Vehicle **10** includes a network of load sensors in communication with ECU **520**, illustratively load sensors **670** mounted in the front cargo area **26** and load sensors **672** mounted in the rear cargo area **28**. Additional load sensors may be provided in other areas of vehicle **10**. Load sensors **670**, **672** may include weight or pressure sensors or other suitable sensors for detecting a load and providing a signal representative of the detected load to ECU **520**. In one embodiment, load sensors **670**, **672** are integrated into mounting bolts that are coupled to a respective structure (e.g., floor panel) of front and rear cargo areas **26**, **28**. Other suitable weight or pressure sensor apparatuses fit for the environment and necessary output levels may be provided.

**[0112]** The output of sensors **670**, **672** are read by ECU **520** to determine the weight or pressure at each location of sensors **670**, **672**. Based on the readings, ECU **520** determines the load differential between the different sensor mounting locations to determine the payload distribution of vehicle **10**. ECU **520** communicates the status of the payload distribution to a display or gauge **676** to notify the operator of the payload distribution and to alert the operator when weight differentials exceed threshold limits. If the threshold limits are exceeded, ECU **520** alerts the operator that the payload should be shifted to obtain improved vehicle stability. ECU **520** may also notify the operator when a maximum total vehicle payload has been exceeded, or a maximum rear or front total payload has been exceeded. In one embodiment, the threshold limits may be calibrated. In one embodiment, ECU **520** may implement or modify vehicle controls when the payload threshold limits are exceeded. For example, ECU **520** may limit the maximum speed or maximum torque of the engine via electronic throttle control, or other suitable control measures may be taken by ECU **520**. ECU **520** may also sound an audible alarm when the limits are exceeded.

**[0113]** An exemplary gauge **676** is illustrated with gauge **678** of FIG. **24**. Gauge **678** provides a graphical representation of vehicle **10**, including a top-down representation **680** of rear cargo area **28** and a top-down representation **682** of front cargo area **26** of vehicle **10** within an outline of the outer perimeter of vehicle **10**. Representations **680**, **682** may include a picture or other rendering coupled to dashboard **25** (FIG. **6**) or may include graphical data displayed by ECU **520** on a display screen. Multiple indicators A through H are provided in representations **680**, **682** to represent the physical locations of the sensors **670**, **672** on vehicle **10**. For example, indicators A, B, C, and D are at the corners of representation **680** to represent sensors **672** mounted at the corners of rear cargo area **28**, and indicators E, F, G, and H are at the corners of representation **682** to represent sensors **670** mounted at the corners of front cargo area **26**. Sensors **670**, **672** may be mounted at other suitable locations of cargo areas **26**, **28**. In one embodiment, indicators A through H are illuminated with different colors to indicate the sensor status and therefore the payload status. Indicators A-H may include light emitting diodes (LEDs), graphical data provided on a display screen, or other suitable devices controlled by ECU **520** for indicating the sensor status.

**[0114]** For example, an individual indicator is illuminated green indicates the load point is "acceptable", solid amber indicates the load point is "cautionary" and too light compared to another load point, flashing amber indicates the load point is "highly cautionary" and too light compared to another load point, solid red indicates the load point is "cautionary" and too heavy compared to another load point, and flashing red indicates the load point is "highly cautionary" and too heavy compared to another load point. Further, all indicators are illuminated red as "cautionary" when a first recommended total payload limit of vehicle **10** is exceeded and flashing red as "highly cautionary" when a second (higher) recommended payload limit of vehicle **10** is exceeded. Other colors and behavior of indicators may be implemented to indicate load status.

**[0115]** The following table provides examples of key sensor mounting location relationships with reference to gauge **678**:

TABLE 1

Key Sensor Mounting Location Relationships

| VEHICLE REAR | VEHICLE FRONT | TOTAL VEHICLE |
|---|---|---|
| A-B | E-F | A-F |
| A-C | E-G | A-H |
| A-D | E-H | C-F |
| B-C | F-G | C-H |
| B-D | F-H | |
| C-D | G-H | |

As illustrated in Table 1, gauge **678** may be used to monitor the loads between different combinations of sensor mounting locations to thereby determine payload differentials between mounting locations or regions at the rear portion of vehicle **10**, the front portion of vehicle **10**, and the overall vehicle **10**. ECU **520** may provide calibratable limits for each location differential to set load differential at which the payload distribution transitions from acceptable to cautionary to highly cautionary. For example, ECU **520** may broadcast the status of each sensor **670**, **672** via indicators A-H as follows:

TABLE 2

Load Sensor Status (A-H)
WEIGHT/PRESSURE SENSOR STATUS (A-H)

| STATES | DESCRIPTION | POSSIBLE INDICATOR STATUS |
|---|---|---|
| 000 | Acceptable Differentials | Indicator Solid Green |
| 001 | Cautionary (Differential indicates this needs MORE weight) | Indicator Solid Amber |
| 010 | Highly Cautionary (Differential indicates this needs MORE weight) | Indicator Flashing Amber |
| 011 | Cautionary (Differential indicates this needs LESS weight) | Indicator Solid Red |
| 100 | Highly Cautionary (Differential indicates this needs LESS weight) | Indicator Flashing Red |
| 110 | Error | Indicator Flashes Alternating Red and Amber |
| 111 | Not Available | Indicator Flashes Alternating Red and Amber |

wherein each state is illustratively represented by a three-bit code. As shown in Table 2, each indicator A-H may be illuminated with a different color to indicate the load status. In the illustrated embodiment, solid green indicates an acceptable status, solid amber and solid red each indicate cautionary status (more or less weight needed at location, respectively), flashing amber and flashing red indicates highly cautionary status (more or less weight needed at location, respectively),

and alternating flashing red and amber indicates an error with the load detection system or that load information is not available.

**[0116]** ECU **520** may also implement calibratable limits for indicating when the total vehicle payload transitions from acceptable to cautionary to highly cautionary. This may be indicated with a separate gauge or with gauge **678**. For example, to provide this indication with gauge **678**, the following status indicators may be provided:

TABLE 3

TOTAL PAYLOAD STATUS

| STATES | DESCRIPTION | POSSIBLE INDICATOR STATUS |
|---|---|---|
| 000 | Acceptable Differentials | Defaults to Current Weight/ Pressure Sensor Status |
| 001 | Cautionary (First Payload Calibration Limit Exceeded, but Below Next Limit) | Indicators All Solid Red |
| 010 | Highly Cautionary (Next Payload Calibration Limit Exceeded) | Indicators All Flashing Red |
| 110 | Error | Indicator Flashes Alternating Red and Amber |
| 111 | Not Available | Indicator Flashes Alternating Red and Amber |

For example, when the total vehicle payload is acceptable, the indicators A-H default to the current individual load sensor statuses described above with Table 2. Indicators A-H are all solid red to indicate a cautionary status when a first total payload limit has been exceeded. Indicators A-H are all flashing red to indicate a highly cautionary status when a second, higher total payload limit has been exceeded. Indicators A-H alternately flash red and amber to indicate an error with load detection system or load information not available.

**[0117]** In one embodiment, the calibratable threshold limits for the payload at each individual sensor and the overall payload may be pre-determined based on real-world data collection and/or stability simulation.

**[0118]** As one example, if indicators F and H of gauge **678** of FIG. **24** are solid red, indicators E and G are solid amber, and indicators A, B, C, and D are all solid green, gauge **678** indicates to an operator that cargo in the front cargo area **26** of vehicle **10** should be shifted towards the center of vehicle **10**. Once the appropriate amount of weight has been shifted towards the center of vehicle **10**, indicators E, F, G, and H all turn green when the payload balance is acceptable.

**[0119]** In an alternative embodiment, vehicle **10** includes a series hybrid drive configuration as illustrated in FIG. **25**. Referring to FIG. **25**, a hybrid electric drive system **700** of exemplary vehicle **10** includes a gas engine generator **702**, a bank of batteries **704** charged by generator **702**, an inverter **710**, and a pair of electric motors **706** configured to drive tracks **12**, **14**. Each electric motor **706** drives tracks **12**, **14** via a gear reduction box **708** coupled to the corresponding drive unit **590**, **592**. In one embodiment, disk brakes are coupled off gear boxes **708** either inboard or outboard of tub **40**. Vehicle **10** of FIG. **27** further includes a catalytic converter **720** and an exhaust silencer **722** coupled to the exhaust of engine **702**. A fuel tank **724** and a radiator and fan **726** are positioned inboard of tub **40**.

**[0120]** In operation, the gas engine **702** serves as a generator to supply electric power to inverter **710**, which charges batteries **704**. Independent operation of electric motors **706** may be commanded electronically via drive-by-wire from the ECU to provide the speed/torque differential between tracks **12**, **14** for turning vehicle **10**. Electric motors **706** may also be counter rotated at low ground speeds to provide a zero-radius turn. When batteries **704** require additional power to drive tracks **12**, **14**, engine **702** is commanded to run to charge batteries **704** until batteries **704** have sufficient power and engine **702** is shut down. The series hybrid drive configuration is further detailed in U.S. patent application Ser. No. 13/441,537, filed Apr. 6, 2012, titled "ELECTRIC VEHICLE WITH RANGE EXTENDER," the entire disclosure of which is incorporated by reference herein

**[0121]** In one embodiment, vehicle **10** is adapted to be remotely controlled. For example, a remote control electronic device may be used to control vehicle **10** wirelessly without an operator being positioned in the vehicle **10**. In one embodiment, vehicle **10** is operative to drive autonomously without human input.

**[0122]** The entire disclosure of U.S. patent application Ser. No. 11/035,925, filed Jan. 14, 2005, titled "TRACKED ATV," is incorporated by reference herein.

**[0123]** The term "logic" or "control logic" as used herein may include software and/or firmware executing on one or more programmable processors, application-specific integrated circuits (ASICs), field-programmable gate arrays (FPGAs), digital signal processors (DSPs), hardwired logic, or combinations thereof. Therefore, in accordance with the embodiments, various logic may be implemented in any appropriate fashion and would remain in accordance with the embodiments herein disclosed.

**[0124]** While this invention has been described as having an exemplary design, the present invention may be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains.

What is claimed is:

**1**. A tracked all-terrain vehicle (ATV), comprising:

a frame;

a track coupled to the frame;

a power source supported by the frame and drivingly coupled to the track; and

a steering and drive assembly, the assembly comprising a first hydraulic pump coupled to the tracks for large radius turns, and a second hydraulic pump coupled to the tracks for small radius turns.

**2**. The tracked ATV of claim **1**, wherein the second hydraulic pump is drivingly coupled to the power source.

**3**. The tracked ATV of claim **2**, wherein the second hydraulic pump comprises a dual hydraulic pump in a dual stage configuration.

**4**. The tracked ATV of claim **1**, wherein the power source is an internal combustion engine.

**5**. The tracked ATV of claim **1**, wherein the steering and drive assembly comprises a steering gear assembly and a drive gear assembly.

**6**. The tracked ATV of claim **5**, wherein the drive gear assembly is comprised of a differential drive assembly.

**7**. The tracked ATV of claim **6**, wherein the differential drive assembly comprises two planetary gear assemblies; a left planetary gear assembly coupled to a left track and a right

planetary gear assembly coupled to a right planetary gear assembly coupled to a right track.

**8**. The tracked ATV of claim **7**, further comprising an input shaft having a first end coupled to the differential drive assembly and a second end coupled to the power source.

**9**. The tracked ATV of claim **8**, wherein the first hydraulic pump is drivingly coupled to the input shaft.

**10**. The tracked ATV of claim **9**, wherein the steering gear assembly comprises a steering gear train coupled to the left and right planetary gear assemblies to operate the left and right tracks at differential speeds for steering.

**11**. The tracked ATV of claim **10**, further comprising a hydraulic motor coupled to the first hydraulic pump for providing driving input to the steering gear train.

**12**. The tracked ATV of claim **8**, wherein when the right and left tracks are moving, without input from the power source, the input shaft is driven and the coupling of the first hydraulic pump to the input shaft provides steering capabilities.

**13**. The tracked ATV of claim **5**, wherein the steering and drive assembly is positioned adjacent a front end of the vehicle and the power source is positioned adjacent a rear end of the vehicle.

**14**. The tracked ATV of claim **13**, further comprising a driveshaft extending from the power source to a front end of the vehicle.

**15**. The tracked ATV of claim **14**, wherein the frame includes an enclosed pan.

**16**. The tracked ATV of claim **15**, wherein the enclosed pan is sealed to provide an amphibious vehicle.

**17**. The tracked ATV of claim **1**, wherein the low radius turn includes a zero radius turn.

**18**. The tracked ATV of claim **1**, further comprising a speed sensor providing input to the second hydraulic pump, allowing the operation of the second hydraulic pump only under a selected speed range.

**19**. The tracked ATV of claim **1**, further comprising a gear box intermediate the power source and the steering and drive assembly, the gear box providing a forward and reverse direction for the tracked ATV.

**20**. The tracked ATV of claim **19**, further comprising a hydraulic motor coupled to the first hydraulic pump for providing driving input to the steering gear assembly.

**21**. The tracked ATV of claim **20**, wherein the hydraulic motor is bi-directional.

**22**. The tracked ATV of claim **21**, further comprising a hydraulic switch intermediate the first hydraulic pump and hydraulic motor, reversing the direction of flow to the hydraulic motor.

**23**. A tracked all-terrain vehicle (ATV), comprising:

a frame;

a track coupled to the frame;

a power source supported by the frame and drivingly coupled to the track; and

a steering and drive assembly, comprising:

a drive gear assembly coupled to the track for driving the track; and

a steering gear assembly including a first hydraulic pump and a motor, the first hydraulic pump being driven by the drive gear assembly when the vehicle is moving.

**24**. The tracked ATV of claim **23**, wherein the drive gear assembly is comprised of a differential drive assembly.

**25**. The tracked ATV of claim **24**, wherein the differential drive assembly comprises two planetary gear assemblies; a left planetary gear assembly coupled to a left track and a right planetary gear assembly coupled to a right track.

**26**. The tracked ATV of claim **25**, further comprising an input shaft having a first end coupled to the differential drive assembly and a second end coupled to the power source.

**27**. The tracked ATV of claim **26**, wherein the first hydraulic pump is drivingly coupled to the input shaft.

**28**. The tracked ATV of claim **27**, wherein when the power source is operating, the first hydraulic pump is driven by the input shaft coupled to the power source.

**29**. The tracked ATV of claim **27**, wherein when the power source is not operating, and the tracked ATV is moving, the first hydraulic pump is driven by the input shaft coupled to the differential drive assembly.

**30**. The tracked ATV of claim **27**, further comprising a steering gear train coupled to the left and right planetary gear assemblies to operate the left and right tracks at differential speeds for steering.

**31**. The tracked ATV of claim **28**, further comprising a hydraulic motor coupled to the first hydraulic pump for providing driving input to the steering gear train.

**32**. The tracked ATV of claim **28**, wherein when the right and left tracks are moving, without input from the power source, the input shaft is driven, and the coupling of the first hydraulic pump to the input shaft provides steering capabilities.

**33**. The tracked ATV of claim **23**, further comprising a hydraulic motor coupled to the first hydraulic pump for providing driving input to the steering gear assembly.

**34**. The tracked ATV of claim **33**, further comprising a second hydraulic pump drivingly coupled to the power source and coupled to the hydraulic motor.

**35**. The tracked ATV of claim **34**, wherein the second hydraulic pump comprises a dual hydraulic pump in a dual stage configuration, and drivingly coupled to the tracks for small radius turns.

**36**. The tracked ATV of claim **35**, wherein the small radius turn includes a zero radius turn.

**37**. The tracked ATV of claim **36**, further comprising a speed sensor providing input to the second hydraulic pump, allowing the operation of the second hydraulic pump only under a selected low speed range.

**38**. The tracked ATV of claim **34**, further comprising

an operator seat supported by the frame;

a seat sensor coupled to the operator seat for detecting a load on the operator seat;

a control unit operative to detect at least one of an occupied state and an unoccupied state of the operator seat based on output from the seat sensor, the control unit being operative to disable operation of the second hydraulic pump in response to detecting the unoccupied state of the operator seat.

**39**. The tracked ATV of claim **34**, further comprising

a speed sensor; and

a control unit operative to detect a speed of the vehicle based on output from the speed sensor, the control unit being operative to disable operation of the second hydraulic pump in response to the speed of the vehicle exceeding a threshold speed.

**40**. The tracked ATV of claim **23**, wherein the steering gear assembly is positioned adjacent a front end of the vehicle and the power source is positioned adjacent a rear end of the vehicle.

**41**. The tracked ATV of claim **23**, wherein the power source is an internal combustion engine.

**42**. The tracked ATV of claim **41**, further comprising a driveshaft extending from the power source to a front end of the vehicle.

**43**. The tracked ATV of claim **42**, wherein the frame includes an enclosed pan.

**44**. The tracked ATV of claim **43**, wherein the enclosed pan is sealed to provide an amphibious vehicle.

**45**. The tracked ATV of claim **23**, further comprising a gear box intermediate the power source and the steering and drive assembly, the gear box providing a forward and reverse direction for the tracked ATV.

**46**. The tracked ATV of claim **45**, further comprising a hydraulic motor coupled to the first hydraulic pump for providing driving input to the steering gear assembly.

**47**. The tracked ATV of claim **46**, wherein the hydraulic motor is bi-directional.

**48**. The tracked ATV of claim **47**, further comprising a hydraulic switch intermediate the first hydraulic pump and hydraulic motor, reversing the direction of flow to the hydraulic motor.

**49**. A tracked ATV, comprising:

a frame;

a track coupled to the frame;

a power source supported by the frame and drivingly coupled to the track; and

a suspension system coupled to the frame and supporting the track, the suspension system comprising a plurality of control arms coupled at an upper end to the frame, and at a lower end to a carrier roller, at least some of the carrier rollers moving independently of the other carrier rollers.

**50**. The tracked ATV of claim **49**, wherein the track is the furthest point forward of the tracked ATV.

**51**. The tracked ATV of claim **49**, wherein at least one of the carrier rollers is comprised of an inner web of resilient material, allowing the at least one carrier roller to deflect radially inwardly.

**52**. The tracked ATV of claim **49**, wherein the control arms and carrier rollers are mounted to a sub frame, which is coupled to the frame.

**53**. A tracked all-terrain vehicle (ATV), comprising:

a frame;

a track coupled to the frame;

a power source supported by the frame and drivingly coupled to the track;

a plurality of load sensors supported by the frame, each load sensor being operative to detect a load on the frame;

a display device operative to display an indication of payload distribution of the vehicle; and

a control unit in communication with the plurality of load sensors and the display device, the control unit being operative to calculate a payload distribution of the vehicle based on output from the plurality of load sensors and to determine a recommended payload adjustment based on the calculated payload distribution, the control unit being operative to transmit a signal to the display device representative of the recommend payload adjustment.

**54**. The tracked ATV of claim **53**, wherein the control unit is operative to compare the calculated payload distribution to a threshold payload distribution stored in memory accessible by the control unit to determine the recommended payload adjustment.

**55**. The tracked ATV of claim **53**, wherein the control unit is operative to determine payload distributions between a plurality of regions of a cargo portion of the vehicle corresponding to mounting locations of the plurality of load sensors.

**56**. The tracked ATV of claim **53**, further including a front cargo portion and a rear cargo portion each supported by the frame, wherein the plurality of sensors include a plurality of first sensors mounted to front cargo portion and a plurality of second sensors mounted to the rear cargo portion.

**57**. A method of managing payload distribution of a tracked all-terrain vehicle (ATV), the method comprising:

providing a tracked ATV including a frame, a track coupled to the frame, and a power source supported by the frame and drivingly coupled to the track;

detecting, by a plurality of load sensors, at least one load on the frame;

calculating, by a control unit, a payload distribution of the vehicle based on output from the plurality of load sensors;

determining, by the control unit, a recommended payload adjustment based on the calculated payload distribution; and

transmitting a signal to a display device representative of the recommend payload adjustment.

**58**. The method of claim **57**, further comprising comparing the calculated payload distribution to a threshold payload distribution stored in memory accessible by the control unit to determine the recommended payload adjustment.

**59**. The method of claim **57**, further comprising determining payload distributions between a plurality of regions of a cargo portion of the vehicle corresponding to mounting locations of the plurality of load sensors.

* * * * *

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# ELECTRONIC PAYMENT RECEIPT

| APPLICATION # | RECEIPT DATE / TIME | ATTORNEY DOCKET # |
|---|---|---|
| 90/019,107 | 08/31/2022 11:05:47 AM ET | 19061.0001USR2 |

## Title of Invention

AMPHIBIOUS PUMPING VEHICLE

## Application Information

| | | | |
|---|---|---|---|
| APPLICATION TYPE | Utility / ex parte reexam | PATENT # | 11358425 |
| CONFIRMATION # | 2912 | FILED BY | Robert Kalinsky |
| PATENT CENTER # | 60924844 | AUTHORIZED BY | - |
| CUSTOMER # | 59115 | FILING DATE | - |
| CORRESPONDENCE ADDRESS | - | FIRST NAMED INVENTOR | Ian Nuhn |

## Payment Information

| PAYMENT METHOD | PAYMENT TRANSACTION ID | PAYMENT AUTHORIZED BY |
|---|---|---|
| CARD / 4359 | E20228UB07121283 | Robert Kalinsky |

| PRE-AUTHORIZED ACCOUNT | PRE-AUTHORIZED CATEGORY |
|---|---|
| 132725 | 37 CFR 1.16 (National application filing, search, and examination fees); 37 CFR 1.17 (Patent application and reexamination processing fees); 37 CFR 1.19 (Document supply fees); 37 CFR 1.20 (Post Issuance fees); 37 CFR 1.21 (Miscellaneous fees and charges) |

| FEE CODE | DESCRIPTION | ITEM PRICE($) | QUANTITY | ITEM TOTAL($) |
|---|---|---|---|---|
| 2812 | REQUEST FOR EX PARTE REEXAM-NON-STREAMLINED | 6300.00 | 1 | 6300.00 |
| | | | TOTAL AMOUNT: | $6,300.00 |

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d)

and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

# EXHIBIT N

# '425 Reexamination – Ground 4
# Carrier II (U.S. Patent No. 7,478,817) & Puck (2014/0112093)
# 35 U.S.C. § 103

| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| 1. An amphibious vehicle comprising: | **Col. 1:10-16:** The present invention relates to a multi-purpose all-terrain vehicle. More specifically, the present invention is directed to an all-terrain hostile environment vehicle equipped with vari-ous aid units such as quick exchange medical, hazardous material, search, rescue, communications, fire fighting, and weapon units which can be deployed in remote areas or areas not accessible by paved roads.<br><br>**Col. 1:37-41:** The terrain may be sandy, mountainous, muddy, swampy, jungle, or covered with snow, ice, mines, obstructions, vegetation, trees and in cities the roads may be to narrow to traverse.<br><br>**Col. 1:66-67:** Another objective is to develop a small manned or unmanned robotic amphibious ground vehicle. | |
| A floatable vehicle body | **Col. 3:8-10:** The all terrain vehicle 10 includes a sealed hull 12 having a platform 14 operably disposed within the hull 12.<br><br>**Col. 3:26-28:** The hull 12 can be substantially sealably molded for pro-viding buoyancy for water crossings and provide way for necessary functional attachment of units.<br><br>**Col. 5:61-65:** Alternatively, in another embodiment the drive train housing 53 can be pivot-ally mounted to the platform 14, for example so that the same can be actuated between two modes, i.e., a land and a water use, as seen in FIGS. 4A and 4B.<br><br>**Figs. 4A, 4B:** | **Abstract:** A floating manure agitator that floats on the surface of a manure lagoon and that may be remotely controlled to agitate manure supernatant into a slurry with sludge settling on the bottom of the lagoon. The agitator is provided with a plurality of fluid outputs, the direction of which may be controlled to motivate and steer the agitator. The outputs are angled to develop vortices of supernatant into the sludge to further mix the materials into a slurry.<br><br>**[0001]** The present invention relates in general to a manure agitator and, more particularly, to a floating manure agitator for use in association with a manure lagoon.<br><br>**[0006]** It is also known in the art to provide a large vehicle that may be lowered into the lagoon. The vehicle may equipped with a fluid intake, a pump and a fluid output to draw supernatant into the pump and force the supernatant at high speed downward toward the sludge. The vehicle is typically moved with cables by operators on the shore. |

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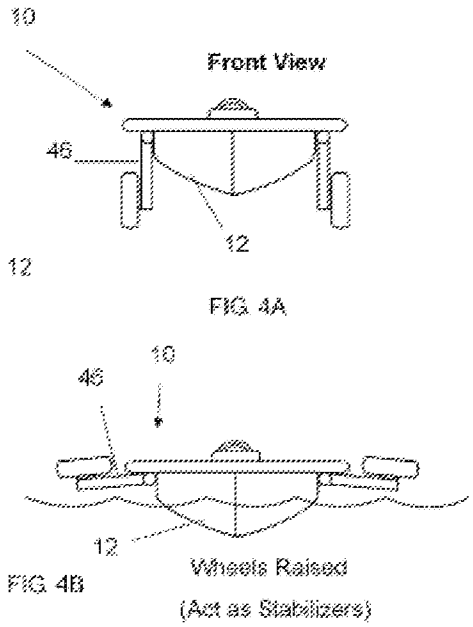
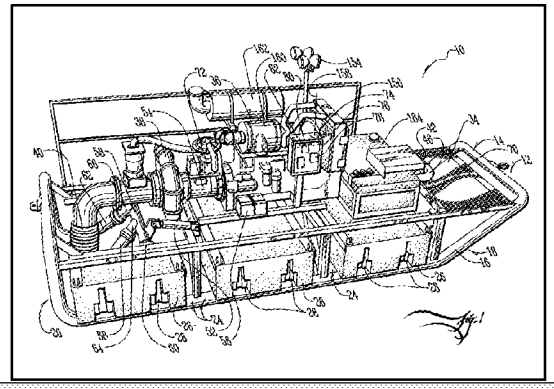
| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| |  | **[0008]** It would, therefore, be desirable to provide a vehicle which floats on the manure pond and which is maneuverable. It would also be desirable to provide the vehicle with multiple outlet nozzles to direct the fluid downward into the lagoon a sufficient distance to agitate the solids in the bottom of the lagoon into suspension and create vortices within the lagoon to assist in carrying solids within the sludge into suspension in the supernatant. It would additionally be desirable to direct the nozzles to create vortices that mix the solids of the sludge into suspension with the supernatant, while minimizing the amount of unpleasant smelling hydrogen sulfide rising to the surface and escaping into the air.<br><br>**Figure 1:**<br>  |
| Ground engaging propulsion structure comprising a plurality of ground engaging elements powered by a hydraulic motor; | **Col. 3:25-38:** The hull 12 can be substantially sealably molded for pro-viding buoyancy for water crossings and provide way for necessary functional attachment of units. For example, the hull 12 can optionally be molded with axle holes therethrough to provide for axle shafts to be passed therethrough and con-nect with one or more each wheels to provide a direct drive. The vehicle 10 can be direct all wheeled drive (8, 10, or 12 wheeled drive). All axles can be in a split splined design configuration ( one splined axle shaft along with a splined female mating coupling) can be permanently | |

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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | attached inside the vehicle hull 12 on a sub frame assembly, with the other splined axle shaft end being capable of being inserted into the splined female mating coupling enabling the splined axle shafts to be separated.<br><br>**Col. 4:33-40:** The vehicle 10 includes a self contained (main vehicle drive power plant), engine unit 18, (that can be P-8 compatible, gasoline, diesel, hybrid-electric, propane, natural gas or a combination thereof) and be of the scaleable engine tech-nology where as a specific horsepower engine can be used for instance 71 horsepower or 165 horsepower or 172 ½ horse-power etc. which can include engine housings with flanges 22 extending laterally from the engine for mounting.<br><br>**Col.6:3-6:** The treads 62 can include a band type track system having a high-performance, low maintenance alternative to segmented metal type tracks/treads that are traditionally used for tracked combat vehicles today.<br><br>**Col. 6:41 – Col. 7:11:** It is contemplated that a direct drive system can be employed wherein one or more wheels is driven by a drive shaft with suitable yoke connections, a hydrostatic drive transmission or via a hydraulic system as is known in the art. One or more drive systems can be employed on the vehicle 10 providing the user with multiple drive mechanism options. The drive train connection can be either/or a combination of/direct drive shaft utilizing a suitable yoke system, hydro-static, belt or chain. The direct shaft, hydro-static, belt or chain drive or drives or a combination thereof can connect to the driven axles within a housing which can be configured to be universally complementary with the chosen drive or drives, i.e., a chain system would utilize a suitable sprocket on each axle as the drive engagement mechanism. n objective achieved here is to incorporate a back up drive train for an "emergency switch-over" in the event one drive train becomes inoperable. This can be accomplished by using one or more | |



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| | methods: shaft over hydro-static, shaft over chain, shaft over belt, hydro-static over chain, hydro-static over belt, belt over chain. This can be accomplished by using a variety of mechanical components such as electromagnetic spring plates, electromagnetic clutches (such as the same used on simple automotive air conditioning systems), or air/hydraulic positive pressure clamps, centrifugal clutches using drive pulley to driven pulley (belt, chain, hydro-static actuated), power take off, (pto ), back up configured separately from the transmission, located on the engine to be connected to the drive train, to independently stacked hydro-static drives that can be mechanically driven by either the engine, electroni-cally or the transmission or both using a combination of manual over electronic solenoid valves in the event the sole-noid valve falls to open it can be opened manually. The drive train can also be configured in such a manner where as one or more wheels can be driven by one or more drive component systems. In example, the front two wheels can be belt driven, the next two wheels being hydro-statically driven, the next two wheels can be chain or direct drive shaft driven or electronically driven in a multitude of various configurations.<br><br>**Col. 7:46-54:** The transmission contem-plated by the invention can be of a type configured using a torque converter driven, 3, 6 or more speed power-shift trans-mission. The transmission can be controlled by a microprocessor which can respond from the shift lever position input. The transmission can be programmed to be fully automatic through all three, six or more speeds or manually controlled, 1st through 3rd, and then automatically in 4th through 6th or more, in a 6 or more speed transmission. | |
| a fluid pump for pumping liquid manure; | **Col. 4:14-32:** As is described herein, a plurality of platform mounting surface 24 can be formed on the frame system inside the hull 12 which can include a plurality of open surfaces and holes through which quick release connectors (pivot locks 26) can be inserted to attach and secure all functional mechanical components, weapons armaments, communications, fire-fighting equipment and | **[0001]** The present invention relates in general to a manure agitator and, more particular, a to a floating manure agitator for use in association with a manure lagoon.<br><br>**[0006]** It is also known in the art to provide a large vehicle that may be lowered into the lagoon. The vehicle may equipped with a fluid |



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| | pumps, pump engines, foam systems, dry chemical systems, split cell foam tanks, water hoses, nozzles, water tanks, special operations, laser, electrified water and or slippery slime tanks, microwave impulse equip-ment, water cannon, hazardous materials decontamination, search, rescue, medical, surveillance, cargo, transport, fuel ank, vehicle engine, transmission, wiring connectors, wire harnesses, instrument panels, access panels, computer, doors, windows, hatches, sensors, imaging equipment, etc, all of which can be equipped with mounting flanges 22 and pivot or shaft (single or double action) push button ball bearing positive locking pin system as used in the engine/transmission mounting platform described herein.<br><br>**Col. 10:51-56:** The use of a pump mounted to the all terrain vehicle which is capable of pumping water from a lake or stream onto a fire is another feature of the present invention. This feature reduces the need to transport water to the site of the fire or, in the alternative, makes it easier to transport water pumping equipment to the body of water to be used in fighting the fire. | intake, a pump and a fluid output to draw supernatant into the pump and force the supernatant at high speed downward toward the sludge. The vehicle is typically moved with cables by operators on the shore.<br><br>**[0026]** The slurry pump (38) is coupled to a liquid manure intake, such as a slurry intake, which is a downwardly directed intake pipe (40) in the preferred embodiment and is capable of handling manure crust, supernatant, sludge and the combined slurry. (FIGS. 1 and 4). If desired, the intake pipe (40) may be extensible to adjust the depth of the intake pipe (40). The intake pipe (40) is constructed to extend about twenty-four inches below the surface of the lagoon (22), but may be extended or retracted to any desired depth, including the entire depth of the lagoon (22).<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe ( 42) is a first slurry output ( 44). (FIG. 5). The first slurry output ( 44) is an angled pipe ( 46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe ( 46) is a tapered liquid manure nozzle ( 48) to increase the velocity of slurry (50) passing through the nozzle ( 48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles ( 48) may be coupled to the angled pipe ( 46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output ( 44). Coupled between the angled pipe ( 46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**Figure 6:** |

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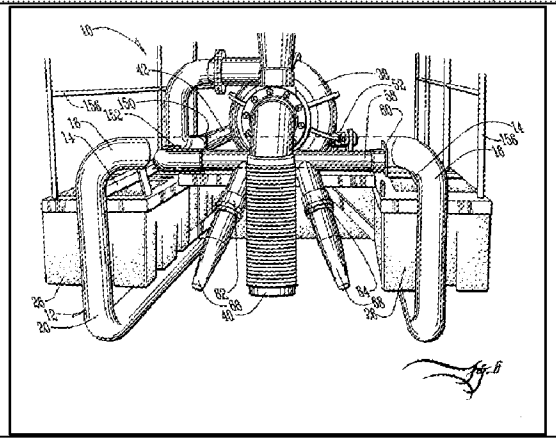
| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | |  |
| A power source connected to a hydraulic pump, the power source configured to provide power to both the ground engaging propulsion structure and the fluid pump; and, | **Col. 4:33 – 40:** The vehicle 10 includes a self contained (main vehicle drive power plant), engine unit 18, (that can be P-8 compatible, gasoline, diesel, hybrid-electric, propane, natural gas or a combination thereof) and be of the scaleable engine tech-nology where as a specific horsepower engine can be used for instance 71 horsepower or 165 horsepower or 172 ½ horse-power etc. which can include engine housings with flanges 22 extending laterally from the engine for mounting.<br><br>**Col. 5:40-43:** The unit 34 can be self powered (e.g., 40 independent engine) or can be powered by the vehicle engine unit 18 through stacked hydrostatic or hybrid electrical drive systems.<br><br>**Col. 5:53-56:** Chain or belt operably connects to wheels 52 within a housing 53 which are configured to be complementary with the chosen drive, for example, a chain system would utilize a suitable sprocket on each wheel 52 for engagement therewith.<br><br>**Col. 6:41-54:** It is contemplated that a direct drive system can be employed wherein one or more wheels is driven by a drive shaft with suitable yoke connections, a hydrostatic drive transmission or via a hydraulic system as is known in the art. One or more drive | **[0024]** The vessel (12) is provided with a deck (34) and a power source (36). (FIG.1). While the power source (36) may be any suitable power source, in the preferred embodiment the power source (36) is a John Deere Tier 3 diesel engine. Depending on the desired size and efficiency of the agitator (10), the power source (36) is preferably between twenty and two-thousand horsepower, more preferably between fifty and five hundred horsepower, and most preferably between one hundred fifty and two hundred fifty horsepower.<br><br>**[0025]** Coupled to the power source (36) is a liquid manure pump such as a slurry pump (38). In the preferred embodi-ment, the slurry pump (38) is a Cornell Redi-Prime centrifu-gal pump capable of handling both solid and liquid material. The slurry pump (38) is preferably designed to move between one thousand and twenty-four thousand liters of material per minute, more preferably between eight thousand and twenty thousand liters of material per minute, and most preferably about sixteen thousand liters of material per minute. |



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|---|---|---|
| | systems can be employed on the vehicle 10 providing the user with multiple drive mechanism options. The drive train connection can be either/or a combination of/direct drive shaft utilizing a suitable yoke system, hydro-static, belt or chain. The direct shaft, hydro-static, belt or chain drive or drives or a combination thereof can connect to the driven axles within a housing which can be configured to be universally complementary with the chosen drive or drives, i.e., a chain system would utilize a suitable sprocket on each axle as the drive engagement mechanism.<br><br>**Col. 6:60 – Col. 7:5:** This can be accomplished by using a variety of mechanical components such as electromagnetic spring plates, electromagnetic clutches (such as the same used on simple automotive air conditioning systems), or air/hydraulic positive pressure clamps, centrifugal clutches using drive pulley to driven pulley (belt, chain, hydro-static actuated), power take off, (pto), back up configured separately from the transmission, located on the engine to be connected to the drive train, to independently stacked hydro-static drives that can be mechanically driven by either the engine, electroni-cally or the transmission or both using a combination of manual over electronic solenoid valves in the event the sole-noid valve falls to open it can be opened manually.<br><br>**Col 8:54-58:** Engine unit 18 can be fueled by any number of fuels such as gasoline, diesel, propane, electric, hybrid electric, or natural gas and can be used to power the vehicle 10 as well as any of the other units described herein by using a suitable cou-pling.<br><br>**Col. 9:54-56:** In addition, the tank 34 can include a self-contained engine 16' and can be fueled from the same fuel tank or source of power that supplies vehicle 10'. | |
| A wireless remote control configured to enable an | **Col. 10: 2-5:** An adjustable electronic, electronic over air, air over hydraulic, air, hydraulic, automatic, automatic over manual valve system is provided to control the direction of flow of water, foam and dry chemicals through hoses. | **[0009]** It would further be desirable to provide a floating vehicle for the mixing of sludge solids into suspension with the supernatant that may be quickly and readily transported to a manure lagoon, launched into the lagoon, used to suspend sludge solids into suspension with |



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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| operator who is remote from the vehicle to: (1) control the ground engaging propulsion structure; (2) control a flow of liquid manure from the liquid pump; (3) control at least one of the speed and direction of the vehicle when the vehicle is ground engaging; and, (4) control at least one of the speed and direction of the vehicle when the vehicle is floating. | **Col 10:31-35:** The water cannon is as well capable to shoot streams of water (straight streams, fog, wide streams) of just water, foam, dry chemical or decon solutions in any combination and can be remotely controlled either wirelessly or wired in manned, unmanned and autonomous modes as well the water cannon can be operated manually in the case of a system failure.<br><br>**Col. 11:5-16:** The operations of each unit described herein can be per-formed by remote control unit 42 which is operably quick connectable to each unit on the vehicle 10 having suitable connections therewith. The remote control unit 42 is also equipped with manual controls thereon to provide for opera-tion of the vehicle 10 manually as well as a transceiver equip-ment enabling it to be reprogrammed on a need to need basis, as well as enabling the vehicle 10 to be remotely controlled via line of sight, gps, or by air via aircraft such as the Preditor. Remote control mechanics, servos, hardware, wiring har-nesses can be quick releasable to facilitate easy replacement of any faulty components in case of damage or failure.<br><br>**Col. 11:47-53:** All pertinent data transmissions can be sent back and forth allowing for all systems monitoring such as vehicle speed, rpm, water temperature, oil pressure, gear transmis-sion, electrical input and output, weapons diagnostics to include arming and disarming as well as including weapons selection if equipped with multiple weapons systems, water tank level, foam tank level, pump water pressure etc.<br><br>**Figure 7:** | the supernatant, and removed from the lagoon onto a trailer. It would also be desirable to provide a floating vehicle configured to the stan-dard, height, weight and width restrictions associated with highway travel. Additionally, it would be desirable to provide a floating manure agitation vehicle that may be remotely controlled and guided to specific portions of the lagoon to move solids of the sludge into suspension with the superna-tant as desired.<br><br>**[0011]** In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore.<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe ( 42) is a first slurry output ( 44). (FIG. 5). The first slurry output ( 44) is an angled pipe ( 46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe ( 46) is a tapered liquid manure nozzle ( 48) to increase the velocity of slurry (50) passing through the nozzle ( 48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles ( 48) may be coupled to the angled pipe ( 46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output ( 44). Coupled between the angled pipe ( 46) and the frame (14) is a steering control hydraulic cylinder (52). The |

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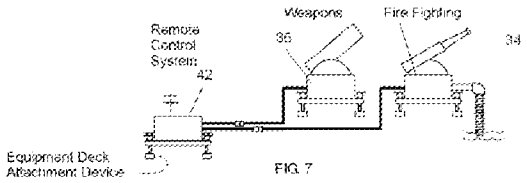
| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| |  FIG. 7 | hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**[0035]** Once the agitator (10) is floating in the lagoon (22), the remote control system (84) is used to activate the power source (36) to cause the slurry pump (38) to draw supernatant (128) into the intake pipe (40) and out the outputs (44), (62) and (64). The remote control system (84) is used to direct the pivot pipe (58) to angle the slurry outputs (62) and (64) aft to drive the agitator (10) forward. The remote control system (84) then actuates the control panel (7 4) to direct the hydrau-lic cylinder (52) to angle the first slurry output ( 44) to turn the agitator (10) port or starboard as desired. The remote control system (84) is thereafter used to direct the volume of super-natant (128) drawn into the intake pipe ( 40) and the direction at which the supernatant (128) is expelled from the slurry outputs (44), (62) and (64). By manipulating the direction of the slurry outputs (44), (62) and (64) with the remote control system (84), a user may direct the agitator (10) to any desired portion of the lagoon.<br><br>**[0037]** The remote control system (84) may be used to cause the slurry pump (38) to expel slurry (50) more slowly from the slurry outputs (44), (62) and (64) as the agitator (10) is near the shore (142) of the lagoon (22) so as not to penetrate the lining (144) of the lagoon (22) thereby allowing the slurry (50) to escape. As the agitator (10) moves towards the center of the lagoon (22) which may range from five to forty feet deep, or more, the remote control system (84) can be used to increase the speed at which the supernatant (128) is passed from the slurry outputs (44), (62) and (64) to adequately mix the sludge (130) at the deepest portions of the lagoon (22). The remote control system (84) is used to direct the agitator (10) to all desired portions of the lagoon until the crust (126) and supernatant (128) is adequately mixed with the sludge (130). |
| | | |

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|---|---|---|
| 2. The vehicle of claim 1, wherein the vehicle further comprises a conduit fluidly connected to the fluid pump. | **Col. 4:14-32:** As is described herein, a plurality of platform mounting surface 24 can be formed on the frame system inside the hull 12 which can include a plurality of open surfaces and holes through which quick release connectors (pivot locks 26) can be inserted to attach and secure all functional mechanical components, weapons armaments, communications, fire-fighting equipment and pumps, pump engines, foam systems, dry chemical systems, split cell foam tanks, water hoses, nozzles, water tanks, special operations, laser, electrified water and or slippery slime tanks, microwave impulse equip-ment, water cannon, hazardous materials decontamination, search, rescue, medical, surveillance, cargo, transport, fuel tank, vehicle engine, transmission, wiring connectors, wire harnesses, instrument panels, access panels, computer, doors, windows, hatches, sensors, imaging equipment, etc, all of which can be equipped with mounting flanges 22 and pivot or shaft (single or double action) push button ball bearing positive locking pin system as used in the engine/transmission mounting platform described herein.<br><br>**Col. 5:19-40:** The unit 34 can be equipped with quick release pump systems that can provide various pressure and volume outputs to flow sufficient volumes of water and or foam and or dry chemicals in a fire and or hazardous materials decontamination mission from a distance that can not endanger the operator or crew members of the vehicle 10 and enable one to quickly change from one flow rate and pressure to another as the mission dictates such as from fire to hazmat to weapons to DEW (Directed Energy Weapons) to crowd control in seconds. The unit 34 can include pump systems which have the capabilities to quickly change from flow rates and pressures of High 30 Pressure/Low Volume, to Low Pressure/High Volume, to Low Pressure/Low Volume, to Pressure/High Volume in 'joint" work together or independent pump systems and all pump systems can be draft capable, such as gross decontamination of men and equipment to include vehicles, downed aircraft, buildings, civilians, ect; in remote area's of the world during or after a | **[0011]** In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore.<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**[0035]** Once the agitator (10) is floating in the lagoon (22), the remote control system (84) is used to activate the power source (36) to cause the slurry pump (38) to draw supernatant (128) into the intake pipe (40) and out the outputs (44), (62) and (64). The remote control system (84) is used to direct the pivot pipe (58) to angle the |



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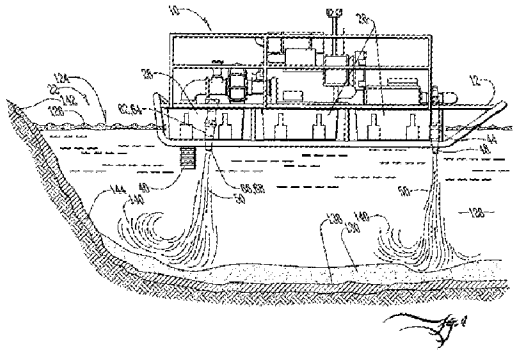
| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | chemical agent and or gas agent (Dirty Bomb), release by an opposing enemy or terrorist cell. Hose and attachment therewith can preferably be equipped to have quick release couplings.<br><br>**Col. 8:45-53:** The tank 34 is equipped with a pump for providing various pressure and volume outputs to shoot sufficient volumes of water and/or foam and/or dry chemicals towards a fire from a distance that can not endanger the operator of the vehicle 10. The user/operator can thereby quickly switch from one flow rate and/or pressure to another as needed. Hoses can preferably be provided with tank 34 and are of a quick connect end couplings as is known in the art.<br><br>**Col. 9:13-30:** For controlling the flow of water in the case where a series of valves and hoses are used, a first valve controls the flow of water through a first hose from tank 34 to a pump; a second valve controls the flow of the water from a second hose through the tank filter; and a third valve prevents water from flowing from master drain. If there is a convenient nearby source of water, such as a lake or stream, the water from the available source can be pumped directly by pump into the fire hoses, or the tank at the same time refilling the tanks water supply and continuing to supply water to the hoses, water tank and cannon thereby providing a continuous uninterrupted supply or flow of water by removing an end cap from pump and simple valve manipulations feeding water therethrough. The water cannon is capable of flowing water, and or foamed water and or dry chemicals at the same time or independently through a dual chambered water cannon with the appropriate corresponding nozzle affixed to each independent chambers output end.<br><br>**Col. 9:60-62:** The hose can be fluidly attached to the pump.<br><br>**Col. 10:51-56:** The use of a pump mounted to the all terrain vehicle which is capable of pumping water from a lake or stream onto a fire is another feature of the present invention. This feature reduces the | slurry outputs (62) and (64) aft to drive the agitator (10) forward. The remote control system (84) then actuates the control panel (7 4) to direct the hydrau-lic cylinder (52) to angle the first slurry output (44) to turn the agitator (10) port or starboard as desired. The remote control system (84) is thereafter used to direct the volume of super-natant (128) drawn into the intake pipe (40) and the direction at which the supernatant (128) is expelled from the slurry outputs (44), (62) and (64). By manipulating the direction of the slurry outputs (44), (62) and (64) with the remote control system (84), a user may direct the agitator (10) to any desired portion of the lagoon.<br><br>**Figure 4:**<br>  <br><br>**Figure 5:** |

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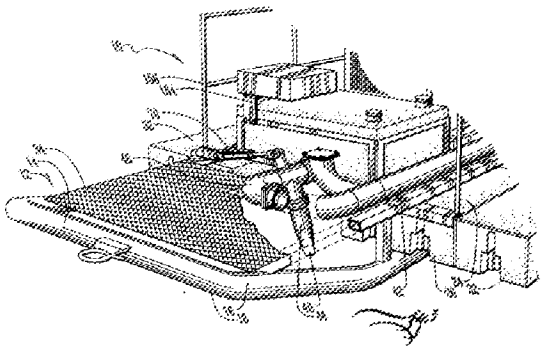
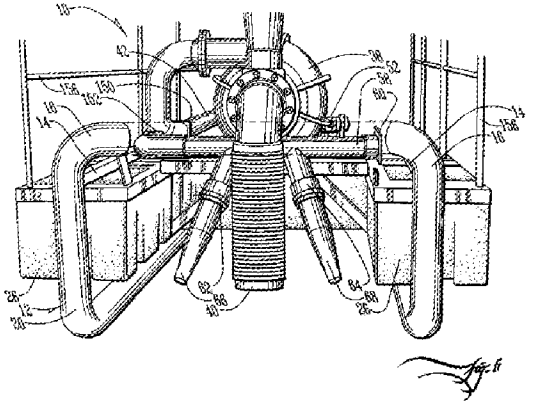
| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | need to transport water to the site of the fire or, in the alternative, makes it easier to transport water pumping equipment to the body of water to be used in fighting the fire. |  **Figure 6:**  |
| 3. The vehicle of claim 2, wherein the conduit comprises an opening at an end thereof. | **Col. 5:19-40:** The unit 34 can be equipped with quick release pump systems that can provide various pressure and volume outputs to flow sufficient volumes of water and or foam and or dry chemicals in a fire and or hazardous materials decontamination mission from a distance that can not endanger the operator or crew members of the vehicle 10 and enable one to quickly change from one flow rate | **[0027]** Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and |



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|---|---|---|
| | and pressure to another as the mission dictates such as from fire to hazmat to weapons to DEW (Directed Energy Weapons) to crowd control in seconds. The unit 34 can include pump systems which have the capabilities to quickly change from flow rates and pressures of High 30 Pressure/Low Volume, to Low Pressure/High Volume, to Low Pressure/Low Volume, to Pressure/High Volume in 'joint" work together or independent pump systems and all pump systems can be draft capable, such as gross decontamination of men and equipment to include vehicles, downed aircraft, buildings, civilians, ect; in remote area's of the world during or after a chemical agent and or gas agent (Dirty Bomb), release by an opposing enemy or terrorist cell. Hose and attachment therewith can preferably be equipped to have quick release couplings.<br><br>**Col. 9:13-30:** For controlling the flow of water in the case where a series of valves and hoses are used, a first valve controls the flow of water through a first hose from tank 34 to a pump; a second valve controls the flow of the water from a second hose through the tank filter; and a third valve prevents water from flowing from master drain. If there is a convenient nearby source of water, such as a lake or stream, the water from the available source can be pumped directly by pump into the fire hoses, or the tank at the same time refilling the tanks water supply and continuing to supply water to the hoses, water tank and cannon thereby providing a continuous uninterrupted supply or flow of water by removing an end cap from pump and simple valve manipulations feeding water therethrough. The water cannon is capable of flowing water, and or foamed water and or dry chemicals at the same time or independently through a dual chambered water cannon with the appropriate corresponding nozzle affixed to each independent chambers output end. | configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5). |
| | | |
| 4. The vehicle of claim 3, wherein the wireless | **Col. 9:13-30:** For controlling the flow of water in the case where a series of valves and hoses are used, a first valve controls the flow of water through a first hose from tank 34 to a pump; a second valve | **[0027]** Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). |

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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| remote control is configured to control an orientation of the opening. | controls the flow of the water from a second hose through the tank filter; and a third valve prevents water from flowing from master drain. If there is a convenient nearby source of water, such as a lake or stream, the water from the available source can be pumped directly by pump into the fire hoses, or the tank at the same time refilling the tanks water supply and continuing to supply water to the hoses, water tank and cannon thereby providing a continuous uninterrupted supply or flow of water by removing an end cap from pump and simple valve manipulations feeding water therethrough. The water cannon is capable of flowing water, and or foamed water and or dry chemicals at the same time or independently through a dual chambered water cannon with the appropriate corresponding nozzle affixed to each independent chambers output end.<br><br>**Col. 10: 2-5:** An adjustable electronic, electronic over air, air over hydraulic, air, hydraulic, automatic, automatic over manual valve system is provided to control the direction of flow of water, foam and dry chemicals through hoses.<br><br>**Col. 11:5-16:** The operations of each unit described herein can be per-formed by remote control unit 42 which is operably quick connectable to each unit on the vehicle 10 having suitable connections therewith. The remote control unit 42 is also equipped with manual controls thereon to provide for operation of the vehicle 10 manually as well as a transceiver equipment enabling it to be reprogrammed on a need to need basis, as well as enabling the vehicle 10 to be remotely controlled via line of sight, gps, or by air via aircraft such as the Preditor. Remote control mechanics, servos, hardware, wiring har-nesses can be quick releasable to facilitate easy replacement of any faulty components in case of damage or failure. | Releasably coupled to the angled pipe (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**[0033]** If desired, the remote control system (84) may be provided with a first gate close button (114) that closes a valve (115) on the transport pipe (42) positioned between the fluid intake pipe (40) and forward nozzle (48). A gate open button (116) is also provided to open the valve (150). Similarly, a close gate button (118) and open gate button (120) are pro-vided to open and close a valve (152) provided between the fluid intake pipe (40) and the nozzles (66) and (68). The gate buttons (114), (116), (118) and (120) allow a user to selec-tively supply fluid through one, two or three of the nozzles (48), (66) and (68) as is desired to appropriately agitate the fluid (128) within which the agitator (10) is floating. The remote control system (84) is also provided with a button (122) to actuate lights (154) provided on the agitator (10) if it is desired to use the agitator (10) in circumstances where additional lighting is desired. The remote control system (84) may be configured to receive feedback from the control panel (74), such as system status, latitude, longitude and height coordinates.<br><br>**[0035]** Once the agitator (10) is floating in the lagoon (22), the remote control system (84) is used to activate the power source (36) to cause the slurry pump (38) to draw supernatant (128) into the intake pipe (40) and out the outputs (44), (62) and (64). The remote control system (84) is used to direct the pivot pipe (58) to angle the slurry outputs (62) and (64) aft to drive the agitator (10) forward. The remote control system (84) then actuates the control panel (7 4) to |



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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | | direct the hydrau-lic cylinder (52) to angle the first slurry output ( 44) to turn the agitator (10) port or starboard as desired. The remote control system (84) is thereafter used to direct the volume of super-natant (128) drawn into the intake pipe ( 40) and the direction at which the supernatant (128) is expelled from the slurry outputs (44), (62) and (64). By manipulating the direction of the slurry outputs (44), (62) and (64) with the remote control system (84), a user may direct the agitator (10) to any desired portion of the lagoon.<br><br>**[0037]** The remote control system (84) may be used to cause the slurry pump (38) to expel slurry (50) more slowly from the slurry outputs (44), (62) and (64) as the agitator (10) is near the shore (142) of the lagoon (22) so as not to penetrate the lining (144) of the lagoon (22) thereby allowing the slurry (50) to escape. As the agitator (10) moves towards the center of the lagoon (22) which may range from five to forty feet deep, or more, the remote control system (84) can be used to increase the speed at which the supernatant (128) is passed from the slurry outputs (44), (62) and (64) to adequately mix the sludge (130) at the deepest portions of the lagoon (22). The remote control system (84) is used to direct the agitator (10) to all desired portions of the lagoon until the crust (126) and supernatant (128) is adequately mixed with the sludge (130).<br><br>**Figure 7:** |

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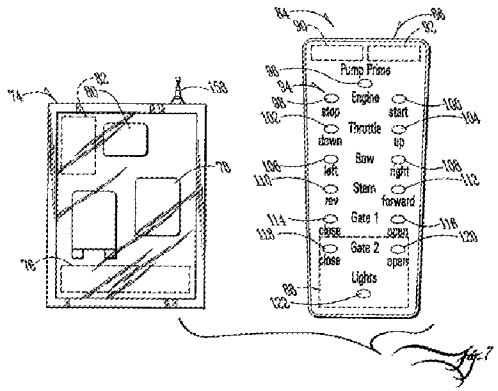
| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | |  |
| 5. The vehicle of claim 4, wherein the vehicle further comprises a nozzle at the end of the conduit. | **Col. 4:14-32:** As is described herein, a plurality of platform mounting surface 24 can be formed on the frame system inside the hull 12 which can include a plurality of open surfaces and holes through which quick release connectors (pivot locks 26) can be inserted to attach and secure all functional mechanical components, weapons armaments, communications, fire-fighting equipment and pumps, pump engines, foam systems, dry chemical systems, split cell foam tanks, water hoses, nozzles, water tanks, special operations, laser, electrified water and or slippery slime tanks, microwave impulse equip-ment, water cannon, hazardous materials decontamination, search, rescue, medical, surveillance, cargo, transport, fuel tank, vehicle engine, transmission, wiring connectors, wire harnesses, instrument panels, access panels, computer, doors, windows, hatches, sensors, imaging equipment, etc, all of which can be equipped with mounting flanges 22 and pivot or shaft (single or double action) push button ball bearing positive locking pin system as used in the engine/transmission mounting platform described herein.<br><br>**Col. 9:26-30:** The water cannon is capable of flowing water, and or foamed water and or dry chemicals at the same time or | **[0008]** It would, therefore, be desirable to provide a vehicle which floats on the manure pond and which is maneuverable. It would also be desirable to provide the vehicle with multiple outlet nozzles to direct the fluid downward into the lagoon a sufficient distance to agitate the solids in the bottom of the lagoon into suspension and create vortices within the lagoon to assist in carrying solids within the sludge into suspension in the supernatant. It would additionally be desirable to direct the nozzles to create vortices that mix the solids of the sludge into suspension with the supernatant, while minimizing the amount of unpleasant smelling hydrogen sulfide rising to the surface and escaping into the air.<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and |

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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | independently through a dual chambered water cannon with the appropriate corresponding nozzle affixed to each independent chambers output end. | the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**[0029]** Releasably coupled to the second slurry output (62) and third slurry output (64) are a pair of nozzles (66) and (68) pivotably coupled to the vessel (12). The second slurry output (62) and third slurry output (64) are oriented and configured to direct the slurry (50) as desired and to increase the velocity with which the slurry (50) exits the nozzles (66) and (68). The second slurry output (62) is preferably directed between five and eighty degrees port, more preferably directed between ten and sixty degrees port and, most preferably, between fifteen and forty-five degrees port. The third slurry output (64) is preferably directed between five and eighty degrees star-board, more preferably between ten and sixty degrees star-board and, most preferably, between fifteen and forty-five degrees starboard. The intake pipe (40) is preferably posi-tioned between the first slurry output (44) and the second slurry output (62).<br><br>**[0033]** If desired, the remote control system (84) may be provided with a first gate close button (114) that closes a valve (115) on the transport pipe (42) positioned between the fluid intake pipe ( 40) and forward nozzle ( 48). A gate open button (116) is also provided to open the valve (150). Similarly, a close gate button (118) and open gate button (120) are pro-vided to open and close a valve (152) provided between the fluid intake pipe (40) and the nozzles (66) and (68). The gate buttons (114), (116), (118) and (120) allow a user to selec-tively supply fluid through one, two or three of the nozzles (48), (66) and (68) as is desired to appropriately agitate the fluid (128) within which the agitator (10) is floating. The remote control system (84) is also provided with a button(122) to actuate lights (154) provided on the agitator (10) if it is desired to use the agitator (10) in circumstances where additional lighting is desired. The remote control system (84) may be configured to receive feedback |

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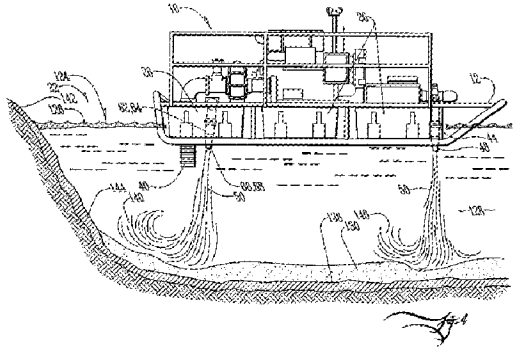
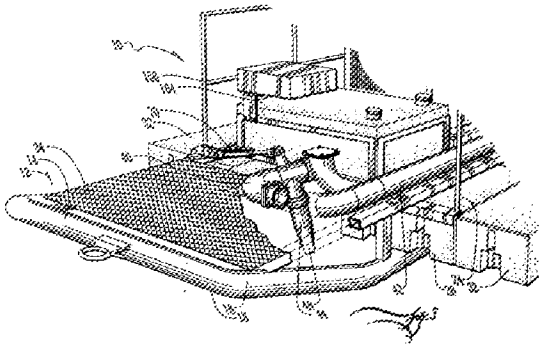
| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | | from the control panel (74), such as system status, latitude, longitude and height coordinates.<br><br>**Figure 4:**<br>  <br><br>**Figure 5:**<br>  <br><br>**Figure 6:** |

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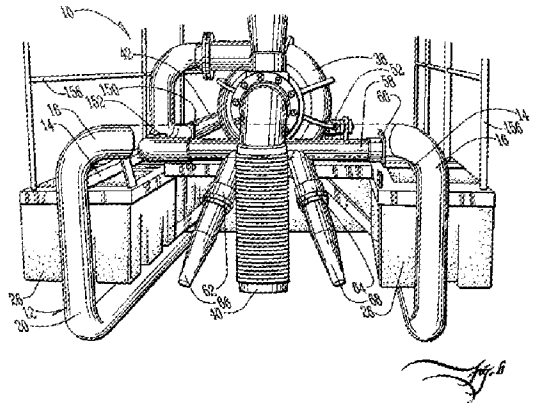
| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | |  |
| | | |
| 6. The vehicle of claim 2, wherein the vehicle further comprises a nozzle at the end of the conduit. | **Col. 4:14-32:** As is described herein, a plurality of platform mounting surface 24 can be formed on the frame system inside the hull 12 which can include a plurality of open surfaces and holes through which quick release connectors (pivot locks 26) can be inserted to attach and secure all functional mechanical components, weapons armaments, communications, fire-fighting equipment and pumps, pump engines, foam systems, dry chemical systems, split cell foam tanks, water hoses, nozzles, water tanks, special operations, laser, electrified water and or slippery slime tanks, microwave impulse equip-ment, water cannon, hazardous materials decontamination, search, rescue, medical, surveillance, cargo, transport, fuel tank, vehicle engine, transmission, wiring connectors, wire harnesses, instrument panels, access panels, computer, doors, windows, hatches, sensors, imaging equipment, etc, all of which can be equipped with mounting flanges 22 and pivot or shaft (single or double action) push button ball bearing positive locking pin system as used in the engine/transmission mounting platform described herein. | **[0008]** It would, therefore, be desirable to provide a vehicle which floats on the manure pond and which is maneuverable. It would also be desirable to provide the vehicle with multiple outlet nozzles to direct the fluid downward into the lagoon a sufficient distance to agitate the solids in the bottom of the lagoon into suspension and create vortices within the lagoon to assist in carrying solids within the sludge into suspension in the supernatant. It would additionally be desirable to direct the nozzles to create vortices that mix the solids of the sludge into suspension with the supernatant, while minimizing the amount of unpleasant smelling hydrogen sulfide rising to the surface and escaping into the air.<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the |

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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | **Col. 9:26-30:** The water cannon is capable of flowing water, and or foamed water and or dry chemicals at the same time or independently through a dual chambered water cannon with the appropriate corresponding nozzle affixed to each independent chambers output end. | first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**[0029]** Releasably coupled to the second slurry output (62) and third slurry output (64) are a pair of nozzles (66) and (68) pivotably coupled to the vessel (12). The second slurry output (62) and third slurry output (64) are oriented and configured to direct the slurry (50) as desired and to increase the velocity with which the slurry (50) exits the nozzles (66) and (68). The second slurry output (62) is preferably directed between five and eighty degrees port, more preferably directed between ten and sixty degrees port and, most preferably, between fifteen and forty-five degrees port. The third slurry output (64) is preferably directed between five and eighty degrees star-board, more preferably between ten and sixty degrees star-board and, most preferably, between fifteen and forty-five degrees starboard. The intake pipe (40) is preferably posi-tioned between the first slurry output (44) and the second slurry output (62).<br><br>**[0033]** If desired, the remote control system (84) may be provided with a first gate close button (114) that closes a valve (115) on the transport pipe (42) positioned between the fluid intake pipe ( 40) and forward nozzle ( 48). A gate open button (116) is also provided to open the valve (150). Similarly, a close gate button (118) and open gate button (120) are pro-vided to open and close a valve (152) provided between the fluid intake pipe (40) and the nozzles (66) and (68). The gate buttons (114), (116), (118) and (120) allow a user to selec-tively supply fluid through one, two or three of the nozzles (48), (66) and (68) as is desired to appropriately agitate the fluid (128) within which the agitator (10) is floating. The remote control system (84) is also provided with a button(122) to actuate lights (154) provided on the agitator (10) if it is desired to use the agitator (10) in circumstances where additional lighting is desired. The remote control system (84) may be configured to receive feedback |



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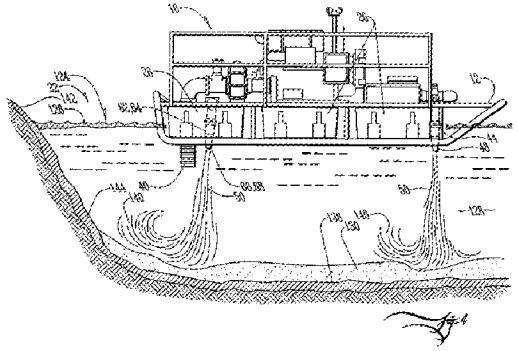
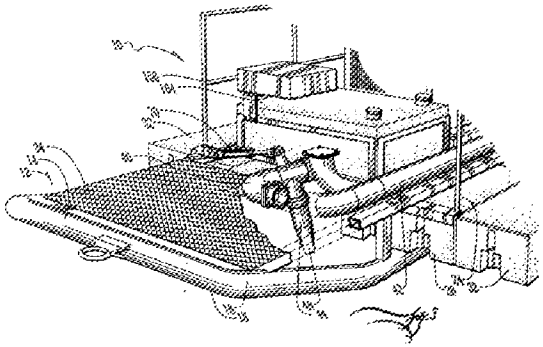
| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | | from the control panel (74), such as system status, latitude, longitude and height coordinates.<br><br>**Figure 4:**<br>  <br><br>**Figure 5:**<br>  <br><br>**Figure 6:** |

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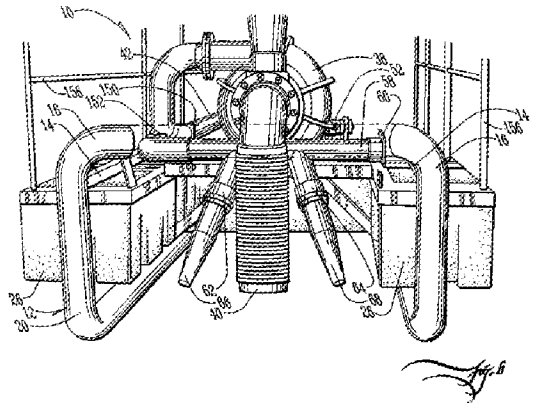
| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | |  |
| | | |
| 7. The vehicle of claim 1, wherein the at least one of speed and direction of the vehicle when the vehicle is floating is 65 controlled by a fluid mover. | **Col. 8:16-18:** The vehicle 10 is designed to be drivable on uneven ground, on mud, through deep water, or on other surfaces a regular automobile cannot be driven on.<br><br>**Col. 8:27-28:** The transmission unit 32 can include a quick connect 66 for a propeller unit 68 to operate in water. | **Abstract:** A floating manure agitator that floats on the surface of a manure lagoon and that may be remotely controlled to agitate manure supernatant into a slurry with sludge settling on the bottom of the lagoon. The agitator is provided with a plurality of fluid outputs, the direction of which may be controlled to motivate and steer the agitator. The outputs are angled to develop vortices of supernatant into the sludge to further mix the materials into a slurry<br><br>**[0011]** In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the |



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|---|---|---|
| | | supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore.<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**[0029]** Releasably coupled to the second slurry output (62) and third slurry output (64) are a pair of nozzles (66) and (68) pivotably coupled to the vessel (12). The second slurry output (62) and third slurry output (64) are oriented and configured to direct the slurry (50) as desired and to increase the velocity with which the slurry (50) exits the nozzles (66) and (68). The second slurry output (62) is preferably directed between five and eighty degrees port, more preferably directed between ten and sixty degrees port and, most preferably, between fifteen and forty-five degrees port. The third slurry output (64) is preferably directed between five and eighty degrees star-board, more preferably between ten and sixty degrees star-board and, most preferably, between fifteen and forty-five degrees starboard. The intake pipe (40) is preferably posi-tioned between the first slurry output (44) and the second slurry output (62).<br><br>**[0032]** The remote control system (64) also includes an engine stop button (98), start button (100), a throttle down button (102) and throttle up button (104). To steer the agitator (10) the remote control |



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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | | system (84) is provided with a bow left button (106) and bow right button (108). The bow left button (106) causes the steering control hydraulic cylinder (52) to extend, thereby directing the nozzle (48) to starboard and driving the agitator (10) port. The remote control system (84) is also provided with a bow right button (108) to retract the hydraulic cylinder (52) and steer the agitator (10) star-board. The remote control system (84) is provided with a reverse button (110) which causes the hydraulic cylinder (70) to extend, thereby forcing the pivot pipe (58) to direct the slurry outputs (62) and (64) toward the bow (18) of the agi-tator (10), thereby driving the vessel (12) rearward. Similarly, a forward button (112) causes the hydraulic cylinder (70) to retract and drive the agitator (10) forward.<br><br>**[0035]** Once the agitator (10) is floating in the lagoon (22), the remote control system (84) is used to activate the power source (36) to cause the slurry pump (38) to draw supernatant (128) into the intake pipe (40) and out the outputs (44), (62) and (64). The remote control system (84) is used to direct the pivot pipe (58) to angle the slurry outputs (62) and (64) aft to drive the agitator (10) forward. The remote control system (84) then actuates the control panel (74) to direct the hydrau-lic cylinder (52) to angle the first slurry output (44) to turn the agitator (10) port or starboard as desired. The remote control system (84) is thereafter used to direct the volume of super-natant (128) drawn into the intake pipe (40) and the direction at which the supernatant (128) is expelled from the slurry outputs (44), (62) and (64). By manipulating the direction of the slurry outputs (44), (62) and (64) with the remote control system (84), a user may direct the agitator (10) to any desired portion of the lagoon. |
| | | |
| **8.** The vehicle of claim **1,** further comprising a plurality of fluid nozzles fluidly | **Col. 9:26-30:** The water cannon is capable of flowing water, and or foamed water and or dry chemicals at the same time or independently through a dual chambered water cannon with the appropriate corresponding nozzle affixed to each independent chambers output end. | **[0008]** It would, therefore, be desirable to provide a vehicle which floats on the manure pond and which is maneuverable. It would also be desirable to provide the vehicle with multiple outlet nozzles to direct the fluid downward into the lagoon a sufficient distance to agitate the solids in the bottom of the lagoon into suspension and |

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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| connected to the fluid pump. | | create vortices within the lagoon to assist in carrying solids within the sludge into suspension in the supernatant. It would additionally be desirable to direct the nozzles to create vortices that mix the solids of the sludge into suspension with the supernatant, while minimizing the amount of unpleasant smelling hydrogen sulfide rising to the surface and escaping into the air.<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**[0029]** Releasably coupled to the second slurry output (62) and third slurry output (64) are a pair of nozzles (66) and (68) pivotably coupled to the vessel (12). The second slurry output (62) and third slurry output (64) are oriented and configured to direct the slurry (50) as desired and to increase the velocity with which the slurry (50) exits the nozzles (66) and (68). The second slurry output (62) is preferably directed between five and eighty degrees port, more preferably directed between ten and sixty degrees port and, most preferably, between fifteen and forty-five degrees port. The third slurry output (64) is preferably directed between five and eighty degrees star-board, more preferably between ten and sixty degrees star-board and, most preferably, between fifteen and forty-five degrees starboard. The intake pipe (40) is preferably posi-tioned between the first slurry output (44) and the second slurry output (62). |



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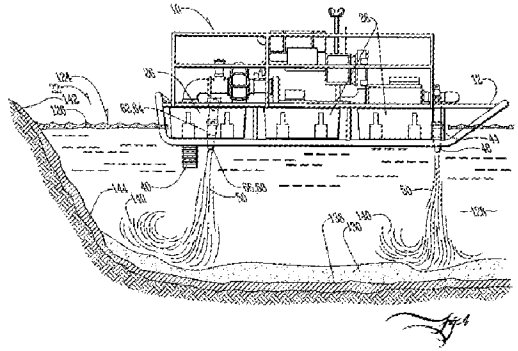
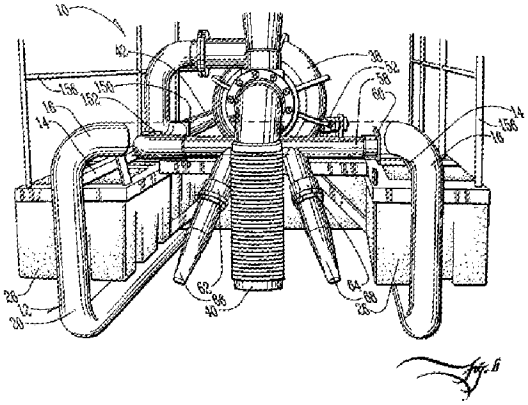
| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | | **Figure 4:**<br>  <br>**Figure 6:**<br>  |
| 9. The vehicle of claim 8, wherein the wireless remote control is | | **Abstract:** A floating manure agitator that floats on the surface of a manure lagoon and that may be remotely controlled to agitate manure supernatant into a slurry with sludge settling on the bottom of the lagoon. The agitator is provided with a plurality of fluid |



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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| configured to control the plurality of fluid nozzles to control the at least one of speed and direction of the vehicle when the vehicle is floating. | | outputs, the direction of which may be controlled to motivate and steer the agitator. The outputs are angled to develop vortices of supernatant into the sludge to further mix the materials into a slurry.<br><br>**[0011]** In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore.<br><br>**[0032]** The remote control system (64) also includes an engine stop button (98), start button (100), a throttle down button (102) and throttle up button (104). To steer the agitator (10) the remote control system (84) is provided with a bow left button (106) and bow right button (108). The bow left button (106) causes the steering control hydraulic cylinder (52) to extend, thereby directing the nozzle ( 48) to starboard and driving the agitator (10) port. The remote control system (84) is also provided with a bow right button (108) to retract the hydraulic cylinder (52) and steer the agitator (10) star-board. The remote control system (84) is provided with a reverse button (110) which causes the hydraulic cylinder (70) to extend, thereby forcing the pivot pipe (58) to direct the slurry outputs (62) and (64) toward the bow (18) of the agi-tator (10), thereby driving the vessel (12) rearward. Similarly, a forward button (112) causes the hydraulic cylinder (70) to retract and drive the agitator (10) forward. |

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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | | **[0033]** If desired, the remote control system (84) may be provided with a first gate close button (114) that closes a valve (115) on the transport pipe (42) positioned between the fluid intake pipe (40) and forward nozzle (48). A gate open button (116) is also provided to open the valve (150). Similarly, a close gate button (118) and open gate button (120) are provided to open and close a valve (152) provided between the fluid intake pipe (40) and forward nozzle (48). A gate open button (116) is also provided to open the valve (150). Similarly, a close gate button (118) and open gate button (120) are provided to open and close a valve (152) provided between the fluid intake pipe (40) and the nozzles (66) and (68). The gate buttons (114), (116), (118), and (120) allow a user to selectively supply fluid through one, two or three of the nozzles (48), (66) and (68) as is desired to appropriately agitate the fluid (128) within which the agitator (10) is floating. The remote control system (84) is also provided with a button (122) to actuate lights (154) provided on the agitator (10) if it is desired to use the agitator (10) in circumstances where additional lighting is desired. The remote control system (84) may be configured to receive feedback from the control panel (74), such as system status, latitude, longitude and height coordinates.<br><br>**[0035]** Once the agitator (10) is floating in the lagoon (22), the remote control system (84) is used to activate the power source (36) to cause the slurry pump (38) to draw supernatant (128) into the intake pipe (40) and out the outputs (44), (62) and (64). The remote control system (84) is used to direct the pivot pipe (58) to angle the slurry outputs (62) and (64) aft to drive the agitator (10) forward. The remote control system (84) then actuates the control panel (7 4) to direct the hydrau-lic cylinder (52) to angle the first slurry output ( 44) to turn the agitator (10) port or starboard as desired. The remote control system (84) is thereafter used to direct the volume of super-natant (128) drawn into the intake pipe ( 40) and the direction at which the supernatant (128) is expelled from the slurry outputs (44), (62) and (64). By manipulating the direction of the slurry |



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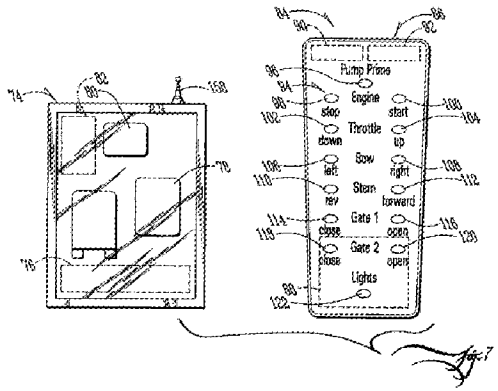
| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | | outputs (44), (62) and (64) with the remote control system (84), a user may direct the agitator (10) to any desired portion of the lagoon.<br><br>**[0037]** The remote control system (84) may be used to cause the slurry pump (38) to expel slurry (50) more slowly from the slurry outputs (44), (62) and (64) as the agitator (10) is near the shore (142) of the lagoon (22) so as not to penetrate the lining (144) of the lagoon (22) thereby allowing the slurry (50) to escape. As the agitator (10) moves towards the center of the lagoon (22) which may range from five to forty feet deep, or more, the remote control system (84) can be used to increase the speed at which the supernatant (128) is passed from the slurry outputs (44), (62) and (64) to adequately mix the sludge (130) at the deepest portions of the lagoon (22). The remote control system (84) is used to direct the agitator (10) to all desired portions of the lagoon until the crust (126) and supernatant (128) is adequately mixed with the sludge (130).<br><br>**Figure 7:**<br>  |
| 10. The vehicle of claim 4, further | **Col. 4:14-32:** As is described herein, a plurality of platform mounting surface 24 can be formed on the frame system inside the | **[0008]** It would, therefore, be desirable to provide a vehicle which floats on the manure pond and which is maneuverable. It would also |



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| comprising a plurality of fluid nozzles fluidly connected to the fluid pump. | hull 12 which can include a plurality of open surfaces and holes through which quick release connectors (pivot locks 26) can be inserted to attach and secure all functional mechanical components, weapons armaments, communications, fire-fighting equipment and pumps, pump engines, foam systems, dry chemical systems, split cell foam tanks, water hoses, nozzles, water tanks, special operations, laser, electrified water and or slippery slime tanks, microwave impulse equip-ment, water cannon, hazardous materials decontamination, search, rescue, medical, surveillance, cargo, transport, fuel tank, vehicle engine, transmission, wiring connectors, wire harnesses, instrument panels, access panels, computer, doors, windows, hatches, sensors, imaging equipment, etc, all of which can be equipped with mounting flanges 22 and pivot or shaft (single or double action) push button ball bearing positive locking pin system as used in the engine/transmission mounting platform described herein.<br><br>**Col. 5:19-40:** The unit 34 can be equipped with quick release pump systems that can provide various pressure and volume outputs to flow sufficient volumes of water and or foam and or dry chemicals in a fire and or hazardous materials decontamination mission from a distance that can not endanger the operator or crew members of the vehicle 10 and enable one to quickly change from one flow rate and pressure to another as the mission dictates such as from fire to hazmat to weapons to DEW (Directed Energy Weapons) to crowd control in seconds. The unit 34 can include pump systems which have the capabilities to quickly change from flow rates and pressures of High 30 Pressure/Low Volume, to Low Pressure/High Volume, to Low Pressure/Low Volume, to Pressure/High Volume in 'joint" work together or independent pump systems and all pump systems can be draft capable, such as gross decontamination of men and equipment to include vehicles, downed aircraft, buildings, civilians, ect; in remote area's of the world during or after a chemical agent and or gas agent (Dirty Bomb), release by an | be desirable to provide the vehicle with multiple outlet nozzles to direct the fluid downward into the lagoon a sufficient distance to agitate the solids in the bottom of the lagoon into suspension and create vortices within the lagoon to assist in carrying solids within the sludge into suspension in the supernatant. It would additionally be desirable to direct the nozzles to create vortices that mix the solids of the sludge into suspension with the supernatant, while minimizing the amount of unpleasant smelling hydrogen sulfide rising to the surface and escaping into the air.<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**[0029]** Releasably coupled to the second slurry output (62) and third slurry output (64) are a pair of nozzles (66) and (68) pivotably coupled to the vessel (12). The second slurry output (62) and third slurry output (64) are oriented and configured to direct the slurry (50) as desired and to increase the velocity with which the slurry (50) exits the nozzles (66) and (68). The second slurry output (62) is preferably directed between five and eighty degrees port, more preferably directed between ten and sixty degrees port and, most preferably, between fifteen and forty-five degrees port. The third slurry output (64) is preferably directed between five and eighty degrees star-board, more preferably between ten and sixty degrees star-board and, most preferably, between fifteen and forty-five degrees |



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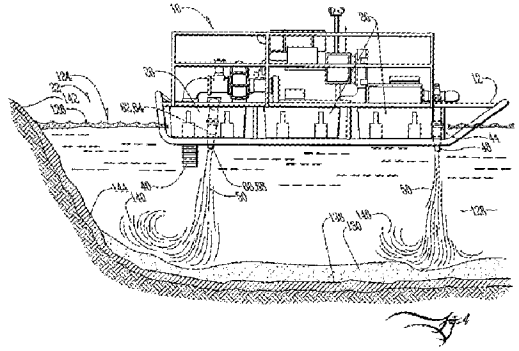
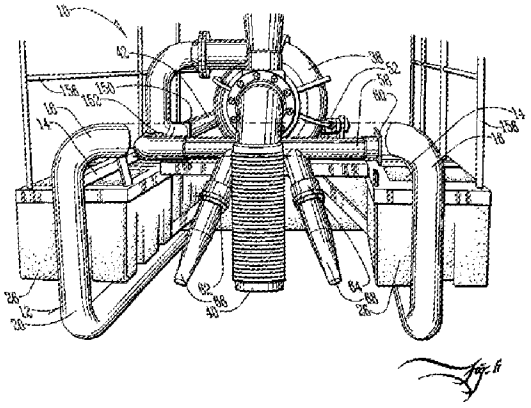
| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | opposing enemy or terrorist cell. Hose and attachment therewith can preferably be equipped to have quick release couplings.<br><br>**Col. 8:45-53:** The tank 34 is equipped with a pump for providing various pressure and volume outputs to shoot sufficient volumes of water and/or foam and/or dry chemicals towards a fire from a distance that can not endanger the operator of the vehicle 10. The user/operator can thereby quickly switch from one flow rate and/or pressure to another as needed. Hoses can preferably be provided with tank 34 and are of a quick connect end couplings as is known in the art.<br><br>**Col. 9:26-30:** The water cannon is capable of flowing water, and or foamed water and or dry chemicals at the same time or independently through a dual chambered water cannon with the appropriate corresponding nozzle affixed to each independent chambers output end.<br><br>**Col. 9:60-62:** The hose can be fluidly attached to the pump.<br><br>**Col. 10:51-56:** The use of a pump mounted to the all terrain vehicle which is capable of pumping water from a lake or stream onto a fire is another feature of the present invention. This feature reduces the need to transport water to the site of the fire or, in the alternative, makes it easier to transport water pumping equipment to the body of water to be used in fighting the fire. | starboard. The intake pipe (40) is preferably posi-tioned between the first slurry output (44) and the second slurry output (62).<br><br>**Figure 4:**<br>  <br><br>**Figure 6:**<br>  |

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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| 11. The vehicle of claim 10, wherein the wireless remote control is configured to control the plurality of fluid nozzles to control the at least one of speed and direction of the vehicle when the vehicle is floating. | | **Abstract:** A floating manure agitator that floats on the surface of a manure lagoon and that may be remotely controlled to agitate manure supernatant into a slurry with sludge settling on the bottom of the lagoon. The agitator is provided with a plurality of fluid outputs, the direction of which may be controlled to motivate and steer the agitator. The outputs are angled to develop vortices of supernatant into the sludge to further mix the materials into a slurry.<br><br>**[0009]** It would further be desirable to provide a floating vehicle for the mixing of sludge solids into suspension with the supernatant that may be quickly and readily transported to a manure lagoon, launched into the lagoon, used to suspend sludge solids into suspension with the supernatant, and removed from the lagoon onto a trailer. It would also be desirable to provide a floating vehicle configured to the standard, height, weight and width restrictions associated with highway travel. Additionally, it would be desirable to provide a floating manure agitation vehicle that may be remotely controlled and guided to specific portions of the lagoon to move solids of the sludge into suspension with the supernatant as desired.<br><br>**[0011]** In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore. |



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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | | **[0032]** The remote control system (64) also includes an engine stop button (98), start button (100), a throttle down button (102) and throttle up button (104). To steer the agitator (10) the remote control system (84) is provided with a bow left button (106) and bow right button (108). The bow left button (106) causes the steering control hydraulic cylinder (52) to extend, thereby directing the nozzle ( 48) to starboard and driving the agitator (10) port. The remote control system (84) is also provided with a bow right button (108) to retract the hydraulic cylinder (52) and steer the agitator (10) star-board. The remote control system (84) is provided with a reverse button (110) which causes the hydraulic cylinder (70) to extend, thereby forcing the pivot pipe (58) to direct the slurry outputs (62) and (64) toward the bow (18) of the agi-tator (10), thereby driving the vessel (12) rearward. Similarly, a forward button (112) causes the hydraulic cylinder (70) to retract and drive the agitator (10) forward.<br><br>**[0033]** If desired, the remote control system (84) may be provided with a first gate close button (114) that closes a valve (115) on the transport pipe (42) positioned between the fluid intake pipe (40) and forward nozzle (48). A gate open button (116) is also provided to open the valve (150). Similarly, a close gate button (118) and open gate button (120) are provided to open and close a valve (152) provided between the fluid intake pipe (40) and forward nozzle (48). A gate open button (116) is also provided to open the valve (150). Similarly, a close gate button (118) and open gate button (120) are provided to open and close a valve (152) provided between the fluid intake pipe (40) and the nozzles (66) and (68). The gate buttons (114), (116), (118), and (120) allow a user to selectively supply fluid through one, two or three of the nozzles (48), (66) and (68) as is desired to appropriately agitate the fluid (128) within which the agitator (10) is floating. The remote control system (84) is also provided with a button (122) to actuate lights (154) provided on the agitator (10) if it is desired to use the agitator (10) in circumstances where additional lighting is desired. The remote control system (84) |



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|---|---|---|
| | | may be configured to receive feedback from the control panel (74), such as system status, latitude, longitude and height coordinates.<br><br>**[0035]** Once the agitator (10) is floating in the lagoon (22), the remote control system (84) is used to activate the power source (36) to cause the slurry pump (38) to draw supernatant (128) into the intake pipe (40) and out the outputs (44), (62) and (64). The remote control system (84) is used to direct the pivot pipe (58) to angle the slurry outputs (62) and (64) aft to drive the agitator (10) forward. The remote control system (84) then actuates the control panel (7 4) to direct the hydrau-lic cylinder (52) to angle the first slurry output ( 44) to turn the agitator (10) port or starboard as desired. The remote control system (84) is thereafter used to direct the volume of super-natant (128) drawn into the intake pipe ( 40) and the direction at which the supernatant (128) is expelled from the slurry outputs (44), (62) and (64). By manipulating the direction of the slurry outputs (44), (62) and (64) with the remote control system (84), a user may direct the agitator (10) to any desired portion of the lagoon.<br><br>**[0037]** The remote control system (84) may be used to cause the slurry pump (38) to expel slurry (50) more slowly from the slurry outputs (44), (62) and (64) as the agitator (10) is near the shore (142) of the lagoon (22) so as not to penetrate the lining (144) of the lagoon (22) thereby allowing the slurry (50) to escape. As the agitator (10) moves towards the center of the lagoon (22) which may range from five to forty feet deep, or more, the remote control system (84) can be used to increase the speed at which the supernatant (128) is passed from the slurry outputs (44), (62) and (64) to adequately mix the sludge (130) at the deepest portions of the lagoon (22). The remote control system (84) is used to direct the agitator (10) to all desired portions of the lagoon until the crust (126) and supernatant (128) is adequately mixed with the sludge (130). |
| | | |

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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| 12. The vehicle of claim 4, wherein the power source is connected to the hydraulic pump by a mechanical drive and connected to the fluid pump by the mechanical drive. | **Col. 5:40-43:** The unit 34 can be self powered (e.g., 40 independent engine) or can be powered by the vehicle engine unit 18 through stacked hydrostatic or hybrid electrical drive systems.<br><br>**Col. 6:41-54:** It is contemplated that a direct drive system can be employed wherein one or more wheels is driven by a drive shaft with suitable yoke connections, a hydrostatic drive transmission or via a hydraulic system as is known in the art. One or more drive systems can be employed on the vehicle 10 providing the user with multiple drive mechanism options. The drive train connection can be either/or a combination of/direct drive shaft utilizing a suitable yoke system, hydro-static, belt or chain. The direct shaft, hydro-static, belt or chain drive or drives or a combination thereof can connect to the driven axles within a housing which can be configured to be universally complementary with the chosen drive or drives, i.e., a chain system would utilize a suitable sprocket on each axle as the drive engagement mechanism.<br><br>**Col. 6:60 – Col. 7:5:** This can be accomplished by using a variety of mechanical components such as electromagnetic spring plates, electromagnetic clutches (such as the same used on simple automotive air conditioning systems), or air/hydraulic positive pressure clamps, centrifugal clutches using drive pulley to driven pulley (belt, chain, hydro-static actuated), power take off, (pto), back up configured separately from the transmission, located on the engine to be connected to the drive train, to independently stacked hydro-static drives that can be mechanically driven by either the engine, electroni-cally or the transmission or both using a combination of manual over electronic solenoid valves in the event the sole-noid valve falls to open it can be opened manually.<br><br>**Col. 9:54-56:** In addition, the tank 34 can include a self-contained engine 16' and can be fueled from the same fuel tank or source of power that supplies vehicle 10'. | **[0011]** In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore.<br><br>**[0024]** The vessel (12) is provided with a deck (34) and a power source (36). (FIG.1). While the power source (36) may be any suitable power source, in the preferred embodiment the power source (36) is a John Deere Tier 3 diesel engine. Depending on the desired size and efficiency of the agitator (10), the power source (36) is preferably between twenty and two-thousand horsepower, more preferably between fifty and five hundred horsepower, and most preferably between one hundred fifty and two hundred fifty horsepower.<br><br>**[0025]** Coupled to the power source (36) is a liquid manure pump such as a slurry pump (38). In the preferred embodi-ment, the slurry pump (38) is a Cornell Redi-Prime centrifu-gal pump capable of handling both solid and liquid material. The slurry pump (38) is preferably designed to move between one thousand and twenty-four thousand liters of material per minute, more preferably between eight thousand and twenty thousand liters of material per minute, and most preferably about sixteen thousand liters of material per minute. |

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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | | [0027] Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output ( 44). (FIG. 5). The first slurry output ( 44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5). |
| | | |
| 13. The vehicle of claim 12, wherein the wireless remote control is configured to operate the hydraulic motor to operate the ground engaging propulsion structure at variable speed. | Col. 5:40-46: The unit 34 can be self powered (e.g., independent engine) or can be powered by the vehicle engine unit 18 through stacked hydrostatic or hybrid electrical drive systems. Vehicle and secondary engines of the combustion type can be electronically started and all engine horse powers can be predetermined to be capable of the necessary power to drive the intended function(s) of the engine.<br><br>Col. 6:41- Col. 7:11: It is contemplated that a direct drive system can be employed wherein one or more wheels is driven by a drive shaft with suitable yoke connections, a hydrostatic drive transmission or via a hydraulic system as is known in the art. One or more drive systems can be employed on the vehicle 10 providing the user with multiple drive mechanism options. The drive train connection can be either for a combination of direct drive shaft utilizing a suitable yoke system, hydro static, belt or chain. The direct shaft, hydro-static, belt or chain drive or drives or a combination thereof can connect to the driven axles within a housing which can be configured to be universally complementary with the chosen drive or drives, i.e., a chain system would utilize a suitable sprocket on each axle as the drive engagement mechanism. | |

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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | An objective achieved here is to incorporate a back up drive train for an "emergency switch-over in the event one drive train becomes inoperable. This can be accomplished by using one or more methods: shaft over hydro-static, shaft over chain, shaft over belt, hydro-static over chain, hydro-static over belt, belt over chain. This can be accomplished by using a variety of mechanical components such as electromagnetic spring plates, electromagnetic clutches (such as the same used on simple automotive air conditioning systems), or air/hydraulic positive pressure clamps, centrifugal clutches using drive pulley to driven pulley (belt, chain, hydro-static actuated), power take off (pto), back up configured separately from the transmission, located on the engine to be connected to the drive train, to independently stacked hydro-static drives that can be mechanically driven by either the engine, electronically or the transmission or both using a combination of manual over electronic solenoid valves in the event the solenoid valve falls to open it can be opened manually. The drive train can also be configured in Such a manner where as one or more wheels can be driven by one or more drive component systems. In example, the front two wheels can be belt driven, the next two wheels being hydro-statically driven, the next two wheels can be chain or direct drive shaft driven or electronically driven in a multitude of various configurations<br><br>**Col. 11:5-16:** The operations of each unit described herein can be per-formed by remote control unit 42 which is operably quick connectable to each unit on the vehicle 10 having suitable connections therewith. The remote control unit 42 is also equipped with manual controls thereon to provide for opera-tion of the vehicle 10 manually as well as a transceiver equip-ment enabling it to be reprogrammed on a need to need basis, as well as enabling the vehicle 10 to be remotely controlled via line of sight, gps, or by air via aircraft such as the Preditor. Remote control mechanics, servos, hardware, wiring har-nesses can be quick releasable to facilitate easy replacement of any faulty components in case of damage or failure. | |



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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| 14. The vehicle of claim 13, wherein the ground engaging propulsion structure comprises a set of wheels. | **Col. 3:25-38:** The hull 12 can be substantially sealably molded for pro-viding buoyancy for water crossings and provide way for necessary functional attachment of units. For example, the hull 12 can optionally be molded with axle holes therethrough to provide for axle shafts to be passed therethrough and con-nect with one or more each wheels to provide a direct drive. The vehicle 10 can be direct all wheeled drive (8, 10, or 12 wheeled drive). All axles can be in a split splined design configuration (one splined axle shaft along with a splined female mating coupling) can be permanently attached inside the vehicle hull 12 on a sub frame assembly, with the other splined axle shaft end being capable of being inserted into the splined female mating coupling enabling the splined axle shafts to be separated.<br><br>**Col. 5:51-56:** The drive train 46 can be chain or belt driven in this embodiment. Chain or belt 50 operably connects to wheels 52 within a housing 53 which are configured to be complementary with the chosen drive, for example, a chain system would utilize a suitable sprocket on each wheel 52 for engagement therewith.<br><br>**Col. 6:25-32:** Shock absorbers can be employed on the vehicle 10 with quick release capabilities. Alternatively, it may be preferred to use low pressure tires (15 to 25 psi) that provide both shock absorption as well as a very low ground pressure achieving a 10 to 15 psi ground pressure using only the tires and 5 to 10 psi with the read/track system employed. This would enable the vehicle 10 to operate with or without a shock absorption system.<br><br>**Col. 6:41-54:** It is contemplated that a direct drive system can be employed wherein one or more wheels is driven by a drive shaft with suitable yoke connections, a hydrostatic drive transmission or via a hydraulic system as is known in the art. One or more drive systems can be employed on the vehicle 10 providing the user with multiple drive mechanism options. The drive train connection can | |



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|---|---|---|
| | be either/or a combination of/direct drive shaft utilizing a suitable yoke system, hydro-static, belt or chain. The direct shaft, hydro-static, belt or chain drive or drives or a combination thereof can connect to the driven axles within a housing which can be configured to be universally complementary with the chosen drive or drives, i.e., a chain system would utilize a suitable sprocket on each axle as the drive engagement mechanism. | |
| | | |
| 15. The vehicle of claim 14, wherein the set of wheels comprises at least two powered wheels. | **Col. 7:5-11:** The drive train can also be configured in such a manner where as one or more wheels can be driven by one or more drive component systems. In example, the front two wheels can be belt driven, the next two wheels being hydro-statically driven, the next two wheels can be chain or direct drive shaft driven or electronically driven in a multitude of various configurations. | |
| | | |
| 16. The vehicle of claim 14, wherein the set of wheels comprises four powered wheels, each wheel of the set of wheels is independently powered and is operable at variable speed. | **Col. 6:41 – Col. 7:11:** It is contemplated that a direct drive system can be employed wherein one or more wheels is driven by a drive shaft with suitable yoke connections, a hydrostatic drive transmission or via a hydraulic system as is known in the art. One or more drive systems can be employed on the vehicle 10 providing the user with multiple drive mechanism options. The drive train connection can be either/or a combination of/direct drive shaft utilizing a suitable yoke system, hydro-static, belt or chain. The direct shaft, hydro-static, belt or chain drive or drives or a combination thereof can connect to the driven axles within a housing which can be configured to be universally complementary with the chosen drive or drives, i.e., a chain system would utilize a suitable sprocket on each axle as the drive engagement mechanism. an objective achieved here is to incorporate a back up drive train for an "emergency switch-over" in the event one drive train becomes inoperable. This can be accomplished by using one or more methods: shaft over hydro-static, shaft over chain, shaft over belt, hydro-static over chain, hydro-static over belt, belt over chain. | |

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| | This can be accomplished by using a variety of mechanical components such as electromagnetic spring plates, electromagnetic clutches (such as the same used on simple automotive air conditioning systems), or air/hydraulic positive pressure clamps, centrifugal clutches using drive pulley to driven pulley (belt, chain, hydro-static actuated), power take off, (pto), back up configured separately from the transmission, located on the engine to be connected to the drive train, to independently stacked hydro-static drives that can be mechanically driven by either the engine, electroni-cally or the transmission or both using a combination of manual over electronic solenoid valves in the event the sole-noid valve falls to open it can be opened manually. The drive train can also be configured in such a manner where as one or more wheels can be driven by one or more drive component systems. In example, the front two wheels can be belt driven, the next two wheels being hydro-statically driven, the next two wheels can be chain or direct drive shaft driven or electronically driven in a multitude of various configurations.<br><br>**Col. 7:46-54:** The transmission contem-plated by the invention can be of a type configured using a torque converter driven, 3, 6 or more speed power-shift transmission. The transmission can be controlled by a microprocessor which can respond from the shift lever position input. The transmission can be programmed to be fully automatic through all three, six or more speeds or manually controlled, 1st through 3rd, and then automatically in 4th through 6th or more, in a 6 or more speed transmission. | |
| | | |
| 17. The vehicle of claim 16, wherein the wheels are operable at variable speed by | **Col. 6:41 – Col. 7:11:** It is contemplated that a direct drive system can be employed wherein one or more wheels is driven by a drive shaft with suitable yoke connections, a hydrostatic drive transmission or via a hydraulic system as is known in the art. One or more drive systems can be employed on the vehicle 10 providing the user with multiple drive mechanism options. The drive train | |



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|---|---|---|
| the hydraulic motor. | connection can be either/or a combination of/direct drive shaft utilizing a suitable yoke system, hydro-static, belt or chain. The direct shaft, hydro-static, belt or chain drive or drives or a combination thereof can connect to the driven axles within a housing which can be configured to be universally complementary with the chosen drive or drives, i.e., a chain system would utilize a suitable sprocket on each axle as the drive engagement mechanism. an objective achieved here is to incorporate a back up drive train for an "emergency switch-over" in the event one drive train becomes inoperable. This can be accomplished by using one or more methods: shaft over hydro-static, shaft over chain, shaft over belt, hydro-static over chain, hydro-static over belt, belt over chain. This can be accomplished by using a variety of mechanical components such as electromagnetic spring plates, electromagnetic clutches (such as the same used on simple automotive air conditioning systems), or air/hydraulic positive pressure clamps, centrifugal clutches using drive pulley to driven pulley (belt, chain, hydro-static actuated), power take off, (pto), back up configured separately from the transmission, located on the engine to be connected to the drive train, to independently stacked hydro-static drives that can be mechanically driven by either the engine, electroni-cally or the transmission or both using a combination of manual over electronic solenoid valves in the event the sole-noid valve falls to open it can be opened manually. The drive train can also be configured in such a manner where as one or more wheels can be driven by one or more drive component systems. In example, the front two wheels can be belt driven, the next two wheels being hydro-statically driven, the next two wheels can be chain or direct drive shaft driven or electronically driven in a multitude of various configurations.<br><br>**Col. 7:46-54:** The transmission contem-plated by the invention can be of a type configured using a torque converter driven, 3, 6 or more speed power-shift transmission. The transmission can be controlled by a microprocessor which can respond from the shift lever position | |



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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | input. The transmission can be programmed to be fully automatic through all three, six or more speeds or manually controlled, 1st through 3rd, and then automatically in 4th through 6th or more, in a 6 or more speed transmission. | |
| | | |
| 18. The vehicle of claim 17, wherein the vehicle further comprises a nozzle at the end of the conduit. | **Col. 4:14-32:** As is described herein, a plurality of platform mounting surface 24 can be formed on the frame system inside the hull 12 which can include a plurality of open surfaces and holes through which quick release connectors (pivot locks 26) can be inserted to attach and secure all functional mechanical components, weapons armaments, communications, fire-fighting equipment and pumps, pump engines, foam systems, dry chemical systems, split cell foam tanks, water hoses, nozzles, water tanks, special operations, laser, electrified water and or slippery slime tanks, microwave impulse equip-ment, water cannon, hazardous materials decontamination, search, rescue, medical, surveillance, cargo, transport, fuel tank, vehicle engine, transmission, wiring connectors, wire harnesses, instrument panels, access panels, computer, doors, windows, hatches, sensors, imaging equipment, etc, all of which can be equipped with mounting flanges 22 and pivot or shaft (single or double action) push button ball bearing positive locking pin system as used in the engine/transmission mounting platform described herein.<br><br>**Col. 9:26-30:** The water cannon is capable of flowing water, and or foamed water and or dry chemicals at the same time or independently through a dual chambered water cannon with the appropriate corresponding nozzle affixed to each independent chambers output end. | |
| | | |
| 19. The vehicle of claim 17, wherein the at least one of | **Col. 8:16-18:** The vehicle 10 is designed to be drivable on uneven ground, on mud, through deep water, or on other surfaces a regular automobile cannot be driven on. | **Abstract:** A floating manure agitator that floats on the surface of a manure lagoon and that may be remotely controlled to agitate manure supernatant into a slurry with sludge settling on the bottom of the lagoon. The agitator is provided with a plurality of fluid |



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| speed and direction of the vehicle when the vehicle is floating is controlled by a fluid mover. | **Col. 8:27-28:** The transmission unit 32 can include a quick connect 66 for a propeller unit 68 to operate in water. | outputs, the direction of which may be controlled to motivate and steer the agitator. The outputs are angled to develop vortices of supernatant into the sludge to further mix the materials into a slurry<br><br>**[0011]** In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore.<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**[0029]** Releasably coupled to the second slurry output (62) and third slurry output (64) are a pair of nozzles (66) and (68) pivotably |



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|---|---|---|
| | | coupled to the vessel (12). The second slurry output (62) and third slurry output (64) are oriented and configured to direct the slurry (50) as desired and to increase the velocity with which the slurry (50) exits the nozzles (66) and (68). The second slurry output (62) is preferably directed between five and eighty degrees port, more preferably directed between ten and sixty degrees port and, most preferably, between fifteen and forty-five degrees port. The third slurry output (64) is preferably directed between five and eighty degrees star-board, more preferably between ten and sixty degrees star-board and, most preferably, between fifteen and forty-five degrees starboard. The intake pipe (40) is preferably posi-tioned between the first slurry output (44) and the second slurry output (62).<br><br>**[0032]** The remote control system (64) also includes an engine stop button (98), start button (100), a throttle down button (102) and throttle up button (104). To steer the agitator (10) the remote control system (84) is provided with a bow left button (106) and bow right button (108). The bow left button (106) causes the steering control hydraulic cylinder (52) to extend, thereby directing the nozzle (48) to starboard and driving the agitator (10) port. The remote control system (84) is also provided with a bow right button (108) to retract the hydraulic cylinder (52) and steer the agitator (10) star-board. The remote control system (84) is provided with a reverse button (110) which causes the hydraulic cylinder (70) to extend, thereby forcing the pivot pipe (58) to direct the slurry outputs (62) and (64) toward the bow (18) of the agi-tator (10), thereby driving the vessel (12) rearward. Similarly, a forward button (112) causes the hydraulic cylinder (70) to retract and drive the agitator (10) forward.<br><br>**[0035]** Once the agitator (10) is floating in the lagoon (22), the remote control system (84) is used to activate the power source (36) to cause the slurry pump (38) to draw supernatant (128) into the intake pipe (40) and out the outputs (44), (62) and (64). The remote control system (84) is used to direct the pivot pipe (58) to angle the slurry outputs (62) and (64) aft to drive the agitator (10) forward. The |



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|---|---|---|
| | | remote control system (84) then actuates the control panel (74) to direct the hydrau-lic cylinder (52) to angle the first slurry output (44) to turn the agitator (10) port or starboard as desired. The remote control system (84) is thereafter used to direct the volume of super-natant (128) drawn into the intake pipe (40) and the direction at which the supernatant (128) is expelled from the slurry outputs (44), (62) and (64). By manipulating the direction of the slurry outputs (44), (62) and (64) with the remote control system (84), a user may direct the agitator (10) to any desired portion of the lagoon. |
| | | |
| 20. The vehicle of claim 17, further comprising a plurality of fluid nozzles fluidly connected to the fluid pump. | **Col. 9:26-30:** The water cannon is capable of flowing water, and or foamed water and or dry chemicals at the same time or independently through a dual chambered water cannon with the appropriate corresponding nozzle affixed to each independent chambers output end. | **[0008]** It would, therefore, be desirable to provide a vehicle which floats on the manure pond and which is maneuverable. It would also be desirable to provide the vehicle with multiple outlet nozzles to direct the fluid downward into the lagoon a sufficient distance to agitate the solids in the bottom of the lagoon into suspension and create vortices within the lagoon to assist in carrying solids within the sludge into suspension in the supernatant. It would additionally be desirable to direct the nozzles to create vortices that mix the solids of the sludge into suspension with the supernatant, while minimizing the amount of unpleasant smelling hydrogen sulfide rising to the surface and escaping into the air.<br><br>**[0011]** In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the |

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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | | supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore.<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe ( 42) is a first slurry output ( 44). (FIG. 5). The first slurry output ( 44) is an angled pipe ( 46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe ( 46) is a tapered liquid manure nozzle ( 48) to increase the velocity of slurry (50) passing through the nozzle ( 48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles ( 48) may be coupled to the angled pipe ( 46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output ( 44). Coupled between the angled pipe ( 46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**[0029]** Releasably coupled to the second slurry output (62) and third slurry output (64) are a pair of nozzles (66) and (68) pivotably coupled to the vessel (12). The second slurry output (62) and third slurry output (64) are oriented and configured to direct the slurry (50) as desired and to increase the velocity with which the slurry (50) exits the nozzles (66) and (68). The second slurry output (62) is preferably directed between five and eighty degrees port, more preferably directed between ten and sixty degrees port and, most preferably, between fifteen and forty-five degrees port. The third slurry output (64) is preferably directed between five and eighty degrees star-board, more preferably between ten and sixty degrees star-board and, most preferably, between fifteen and forty-five degrees starboard. The intake pipe (40) is preferably posi-tioned between the first slurry output (44) and the second slurry output (62).<br><br>**[0035]** Once the agitator (10) is floating in the lagoon (22), the remote control system (84) is used to activate the power source (36) to cause the slurry pump (38) to draw supernatant (128) into the |

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| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | | intake pipe (40) and out the outputs (44), (62) and (64). The remote control system (84) is used to direct the pivot pipe (58) to angle the slurry outputs (62) and (64) aft to drive the agitator (10) forward. The remote control system (84) then actuates the control panel (7 4) to direct the hydrau-lic cylinder (52) to angle the first slurry output ( 44) to turn the agitator (10) port or starboard as desired. The remote control system (84) is thereafter used to direct the volume of super-natant (128) drawn into the intake pipe ( 40) and the direction at which the supernatant (128) is expelled from the slurry outputs (44), (62) and (64). By manipulating the direction of the slurry outputs (44), (62) and (64) with the remote control system (84), a user may direct the agitator (10) to any desired portion of the lagoon.<br><br>**[0037]** The remote control system (84) may be used to cause the slurry pump (38) to expel slurry (50) more slowly from the slurry outputs (44), (62) and (64) as the agitator (10) is near the shore (142) of the lagoon (22) so as not to penetrate the lining (144) of the lagoon (22) thereby allowing the slurry (50) to escape. As the agitator (10) moves towards the center of the lagoon (22) which may range from five to forty feet deep, or more, the remote control system (84) can be used to increase the speed at which the supernatant (128) is passed from the slurry outputs (44), (62) and (64) to adequately mix the sludge (130) at the deepest portions of the lagoon (22). The remote control system (84) is used to direct the agitator (10) to all desired portions of the lagoon until the crust (126) and supernatant (128) is adequately mixed with the sludge (130).<br><br>**Figure 4:** |

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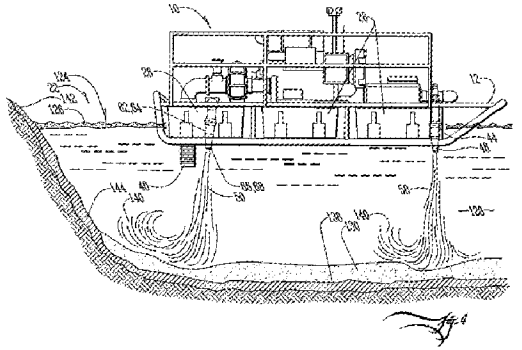
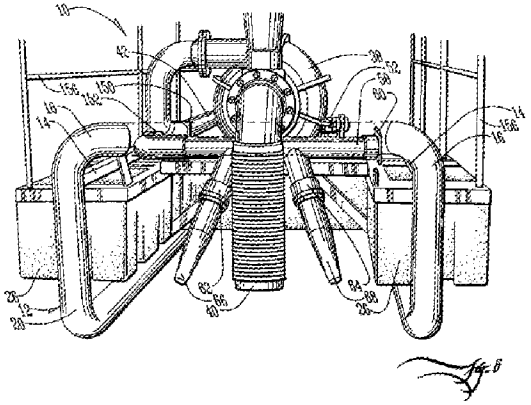
| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | |  <br>**Figure 6:**<br>  |
| 21. The vehicle of claim 20, wherein the wireless remote control is | | **Abstract:** A floating manure agitator that floats on the surface of a manure lagoon and that may be remotely controlled to agitate manure supernatant into a slurry with sludge settling on the bottom of the lagoon. The agitator is provided with a plurality of fluid outputs, the direction of which may be controlled to motivate and |



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| configured to control the plurality of fluid nozzles to control the at least one of speed and direction of the vehicle when the vehicle is floating. | | steer the agitator. The outputs are angled to develop vortices of supernatant into the sludge to further mix the materials into a slurry.<br><br>**[0011]** In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore.<br><br>**[0032]** The remote control system (64) also includes an engine stop button (98), start button (100), a throttle down button (102) and throttle up button (104). To steer the agitator (10) the remote control system (84) is provided with a bow left button (106) and bow right button (108). The bow left button (106) causes the steering control hydraulic cylinder (52) to extend, thereby directing the nozzle ( 48) to starboard and driving the agitator (10) port. The remote control system (84) is also provided with a bow right button (108) to retract the hydraulic cylinder (52) and steer the agitator (10) star-board. The remote control system (84) is provided with a reverse button (110) which causes the hydraulic cylinder (70) to extend, thereby forcing the pivot pipe (58) to direct the slurry outputs (62) and (64) toward the bow (18) of the agi-tator (10), thereby driving the vessel (12) rearward. Similarly, a forward button (112) causes the hydraulic cylinder (70) to retract and drive the agitator (10) forward. |

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|---|---|---|
| | | **[0033]** If desired, the remote control system (84) may be provided with a first gate close button (114) that closes a valve (115) on the transport pipe (42) positioned between the fluid intake pipe (40) and forward nozzle (48). A gate open button (116) is also provided to open the valve (150). Similarly, a close gate button (118) and open gate button (120) are provided to open and close a valve (152) provided between the fluid intake pipe (40) and forward nozzle (48). A gate open button (116) is also provided to open the valve (150). Similarly, a close gate button (118) and open gate button (120) are provided to open and close a valve (152) provided between the fluid intake pipe (40) and the nozzles (66) and (68). The gate buttons (114), (116), (118), and (120) allow a user to selectively supply fluid through one, two or three of the nozzles (48), (66) and (68) as is desired to appropriately agitate the fluid (128) within which the agitator (10) is floating. The remote control system (84) is also provided with a button (122) to actuate lights (154) provided on the agitator (10) if it is desired to use the agitator (10) in circumstances where additional lighting is desired. The remote control system (84) may be configured to receive feedback from the control panel (74), such as system status, latitude, longitude and height coordinates.<br><br>**[0035]** Once the agitator (10) is floating in the lagoon (22), the remote control system (84) is used to activate the power source (36) to cause the slurry pump (38) to draw supernatant (128) into the intake pipe (40) and out the outputs (44), (62) and (64). The remote control system (84) is used to direct the pivot pipe (58) to angle the slurry outputs (62) and (64) aft to drive the agitator (10) forward. The remote control system (84) then actuates the control panel (7 4) to direct the hydrau-lic cylinder (52) to angle the first slurry output ( 44) to turn the agitator (10) port or starboard as desired. The remote control system (84) is thereafter used to direct the volume of super-natant (128) drawn into the intake pipe ( 40) and the direction at which the supernatant (128) is expelled from the slurry outputs (44), (62) and (64). By manipulating the direction of the slurry |

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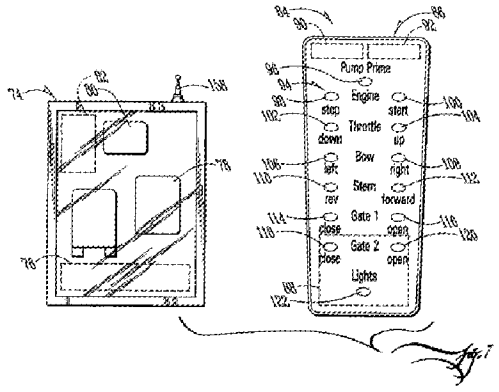
| Claim | Carrier (U.S. Pat. No. 7,478,817) | Puck (2014/0112093) |
|---|---|---|
| | | outputs (44), (62) and (64) with the remote control system (84), a user may direct the agitator (10) to any desired portion of the lagoon.<br><br>**[0037]** The remote control system (84) may be used to cause the slurry pump (38) to expel slurry (50) more slowly from the slurry outputs (44), (62) and (64) as the agitator (10) is near the shore (142) of the lagoon (22) so as not to penetrate the lining (144) of the lagoon (22) thereby allowing the slurry (50) to escape. As the agitator (10) moves towards the center of the lagoon (22) which may range from five to forty feet deep, or more, the remote control system (84) can be used to increase the speed at which the supernatant (128) is passed from the slurry outputs (44), (62) and (64) to adequately mix the sludge (130) at the deepest portions of the lagoon (22). The remote control system (84) is used to direct the agitator (10) to all desired portions of the lagoon until the crust (126) and supernatant (128) is adequately mixed with the sludge (130).<br>**Figure 7:**<br>  |

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# ELECTRONIC ACKNOWLEDGEMENT RECEIPT

| APPLICATION # | RECEIPT DATE / TIME | ATTORNEY DOCKET # |
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| **90/019,107** | **08/31/2022 11:05:47 AM ET** | **19061.0001USR2** |

## Title of Invention

AMPHIBIOUS PUMPING VEHICLE

## Application Information

| | | | |
|---|---|---|---|
| APPLICATION TYPE | Utility / ex parte reexam | PATENT # | 11358425 |
| CONFIRMATION # | 2912 | FILED BY | Robert Kalinsky |
| PATENT CENTER # | 60924844 | FILING DATE | - |
| CUSTOMER # | 59115 | FIRST NAMED INVENTOR | Ian Nuhn |
| CORRESPONDENCE ADDRESS | - | AUTHORIZED BY | - |

## Documents

**TOTAL DOCUMENTS: 20**

| DOCUMENT | PAGES | DESCRIPTION | SIZE (KB) |
|---|---|---|---|
| 2022 08 30 Reexam req - 19061.0001USR2.PDF | 81 | Receipt of Original Ex Parte Request by Third Party | 1008 KB |
| 2022-08-29--IDS--19061.0001USR2.PDF | 4 | Information Disclosure Statement (IDS) Form (SB08) | 1234 KB |
| EXHIBIT A - Nuhn US11358425.PDF | 15 | Copy of patent for which reexamination is requested | 1119 KB |
| EXHIBIT B - Carrier I US20120185129A1.PDF | 18 | Other reference-Patent/Application/Search Documents | 1849 KB |
| EXHIBIT C - Puck US20140112093A1.PDF | 15 | Other reference-Patent/Application/Search | 1123 KB |

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|---|---|---|---|
| | | Documents | |
| EXHIBIT D - Carrier II US7478817.PDF | 16 | Other reference-Patent/Application/Search Documents | 1679 KB |
| EXHIBIT E - Bennett US20140288763A1.PDF | 45 | Other reference-Patent/Application/Search Documents | 4982 KB |
| EXHIBIT F - _425 Prosecution History.PDF | 236 | Other reference-Patent/Application/Search Documents | 9408 KB |
| EXHIBIT G - _557 Reexamination Request.PDF | 64 | Other reference-Patent/Application/Search Documents | 998 KB |
| EXHIBIT H - _557 Reexam History - new.PDF | 24 | Other reference-Patent/Application/Search Documents | 735 KB |
| Exhibit I - 557 Patent Prosecution History - new.PDF | 252 | Other reference-Patent/Application/Search Documents | 10268 KB |
| Exhibit J - Ground 1 - 102 Claim Chart Carrier I US 20120185129.PDF | 28 | Receipt of Original Ex Parte Request by Third Party | 365 KB |
| Exhibit K - Ground 2 - 103 Claim Chart Carrier I in view of Puck.PDF | 82 | Receipt of Original Ex Parte Request by Third Party | 981 KB |
| EXHIBIT L - Complaint.PDF | 13 | Other reference-Patent/Application/Search Documents | 1078 KB |
| Exhibit N - Ground 4 -103 Claim Charts Carrier II in view | 52 | Receipt of Original Ex Parte Request by Third Party | 844 KB |

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| of Puck.PDF | | | |
| Exhibit O - Ground 5 - 103 Claim Chart Puck_Bennett.PDF | 72 | Receipt of Original Ex Parte Request by Third Party | 1277 KB |
| EXHIBIT P - Kinsman US20130033070A1.PDF | 121 | Other reference-Patent/Application/Search Documents | 7585 KB |
| 2022 08 31 Transmittal - 19061.0001USR2.PDF | 4 | Transmittal of New Application | 438 KB |
| 2022 08 31 Cert of service - 19061.0001USR2.pdf | 1 | Reexam Certificate of Service | 87 KB |
| Exhibit M - Ground 3 - 102 Claim Charts Carrier II U.S. Patent No. 7,478,817.PDF | 16 | Receipt of Original Ex Parte Request by Third Party | 300 KB |

## Digest

| DOCUMENT | MESSAGE DIGEST(SHA-512) |
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| 2022 08 30 Reexam req - 19061.0001USR2.PDF | 63F8C643CA1BD5DBF310D4FBF779FF7C34E8CFC38F7978701 9EBF047FB6DD06D9093B06DA2BB9410053DFE7C3905F35E1F 80F7494F66FCD79FB70AF3C9819A45 |
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| EXHIBIT F - _425 Prosecution History.PDF | 43AAF7F26B39BB07F042AE79F8FB2972380FDF75EEB749C7CD92CBFE1E1931E21B67C1CBBB7B899942809E0D899C492920690D856E779664D574BC1A5E68DA2F |
| EXHIBIT G - _557 Reexamination Request.PDF | 3437F7D68455426D7442F8E8A49D3105DE03D120941824F6FB805EF9D51EDC60AF20B4AD06928F8D7383C3D1B3D24DDA6706BA90230E2A683D6ABF3F9EE22666 |
| EXHIBIT H - _557 Reexam History - new.PDF | 8DE07E7CE1EBE71911B47818A48FED3BF1EA75126E3702EF16BCC3131ECBC2A2168E3CD7ACBE378C337BDEE62066528562B80F29191987D5299DE53635A49ABB |
| Exhibit I - 557 Patent Prosecution History - new.PDF | A0A456883AD85C7A4F128F0AE5525428B325690BEF86E876A6501E79A6E821F4FAABF8CC8B209C035DBE219E4B645396EA9AFBC9A67C7AE60F02688CE039F31C |
| Exhibit J - Ground 1 - 102 Claim Chart Carrier I US 20120185129.PDF | 284F5DECE6FAAE5A348A129E58CB8D8EF43F7781EFBC54F355CFCF7DA2E7615B2F30BB7D34DCA3EB36B8ACB6F8BACF8C1FD303538196B8030B88C91278769D25 |
| Exhibit K - Ground 2 - 103 Claim Chart Carrier I in view of Puck.PDF | EC99ACB208AE4CFFC3244EDC062277789EB5DC3D3479995111F5A78FEF312BF4D07C4529848096A5C67BE8284B8DE629094466572A4430D7C509B7B8F18574AC |
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| Exhibit M - Ground 3 - 102 Claim Charts Carrier II U.S. Patent No. 7,478,817.PDF | 6004927196F2F9DF68C38DCDF2D1FF6C3DC1EDD9964407A76A5329234C948F623EC701C3D84EFF3DD9ED5E07764AB404B5BF50DB4868D0D2EE6556638270BA00 |

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

# EXHIBIT A

US011358425B1

(12) **United States Patent**
**Nuhn**

(10) **Patent No.: US 11,358,425 B1**
(45) **Date of Patent: *Jun. 14, 2022**

(54) **AMPHIBIOUS PUMPING VEHICLE**

(71) Applicant: **Nuhn Industries Ltd.**, Sebringville (CA)

(72) Inventor: **Ian Nuhn**, Sebringville (CA)

(73) Assignee: **Nuhn Industries Ltd.**, Sebringville (CA)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **17/590,125**

(22) Filed: **Feb. 1, 2022**

**Related U.S. Application Data**

(63) Continuation of application No. 17/201,100, filed on Mar. 15, 2021, which is a continuation of application
(Continued)

(51) **Int. Cl.**

| | |
|---|---|
| ***B60F 3/00*** | (2006.01) |
| ***A01C 23/04*** | (2006.01) |
| ***A01C 3/02*** | (2006.01) |
| ***B63H 25/02*** | (2006.01) |
| ***F04D 13/02*** | (2006.01) |

(52) **U.S. Cl.**
CPC ..... ***B60F 3/0061*** (2013.01); ***A01C 3/026*** (2013.01); ***A01C 23/045*** (2013.01); ***B60F 3/003*** (2013.01); ***B60F 3/0007*** (2013.01); ***B60F 3/0038*** (2013.01); ***B63H 25/02*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC ..... B60F 3/0061; B60F 3/00; B60F 2301/00; B63H 25/02; B63H 2025/028; F04D 13/02; A01C 3/026; A01C 23/045
See application file for complete search history.

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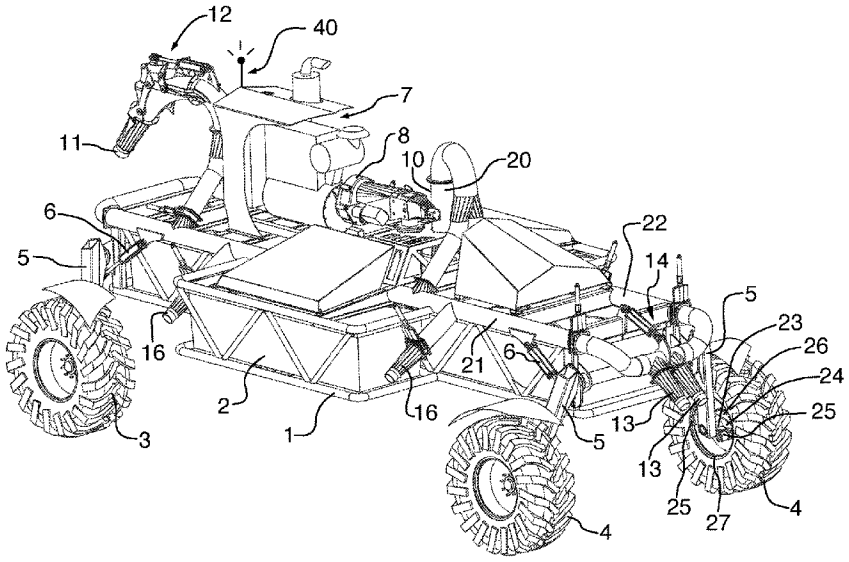
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*Primary Examiner* — Stephen P Avila
(74) *Attorney, Agent, or Firm* — Brunet & Co. Ltd.; Robert Brunet; Hans Koenig

(57) **ABSTRACT**

An amphibious vehicle has a floatable vehicle body; ground engaging propulsion structure having a plurality of ground engaging elements powered by a hydraulic motor; a fluid pump for pumping liquid manure; a power source connected to a hydraulic pump and configured to provide power to both the ground engaging propulsion structure and the fluid pump; and, remote control structure for controlling the ground engaging propulsion structure and a flow of fluid from the fluid pump. The speed and/or direction of the vehicle is remotely controllable by an operator remote from the vehicle when the vehicle is ground engaging and when the vehicle is floating.

**21 Claims, 7 Drawing Sheets**



**Related U.S. Application Data**

No. 16/891,627, filed on Jun. 3, 2020, now Pat. No. 10,974,557, which is a continuation of application No. 16/157,950, filed on Oct. 11, 2018, now Pat. No. 10,710,422, which is a continuation of application No. 15/586,493, filed on May 4, 2017, now Pat. No. 10,124,638, which is a continuation of application No. 15/044,905, filed on Feb. 16, 2016, now Pat. No. 9,694,636, which is a continuation of application No. PCT/CA2014/050789, filed on Aug. 18, 2014.

(60) Provisional application No. 61/867,598, filed on Aug. 19, 2013.

(52) **U.S. Cl.**
CPC ..... ***F04D 13/02*** (2013.01); *B60F 2301/00* (2013.01); *B63H 2025/028* (2013.01)

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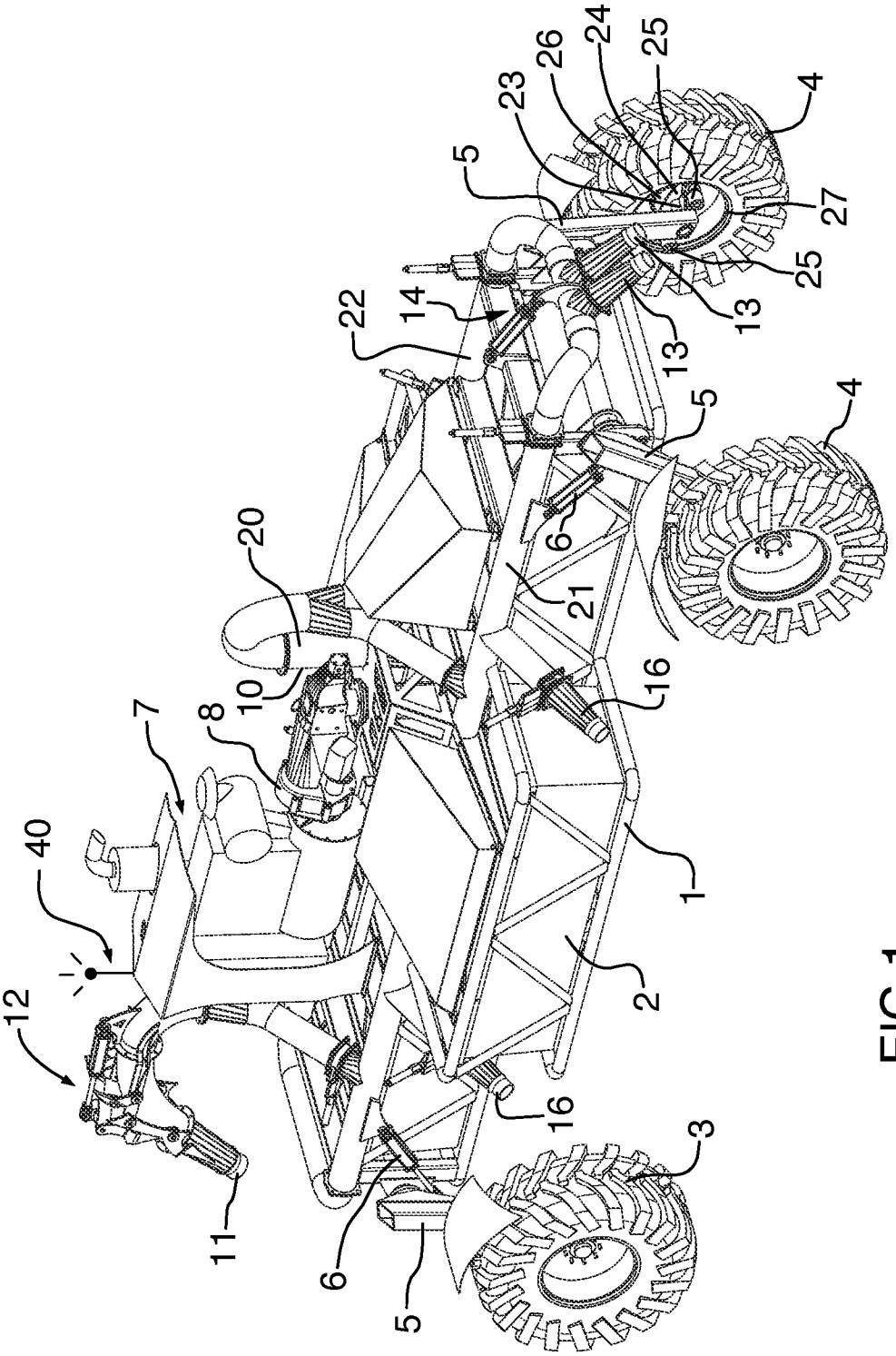



FIG.1

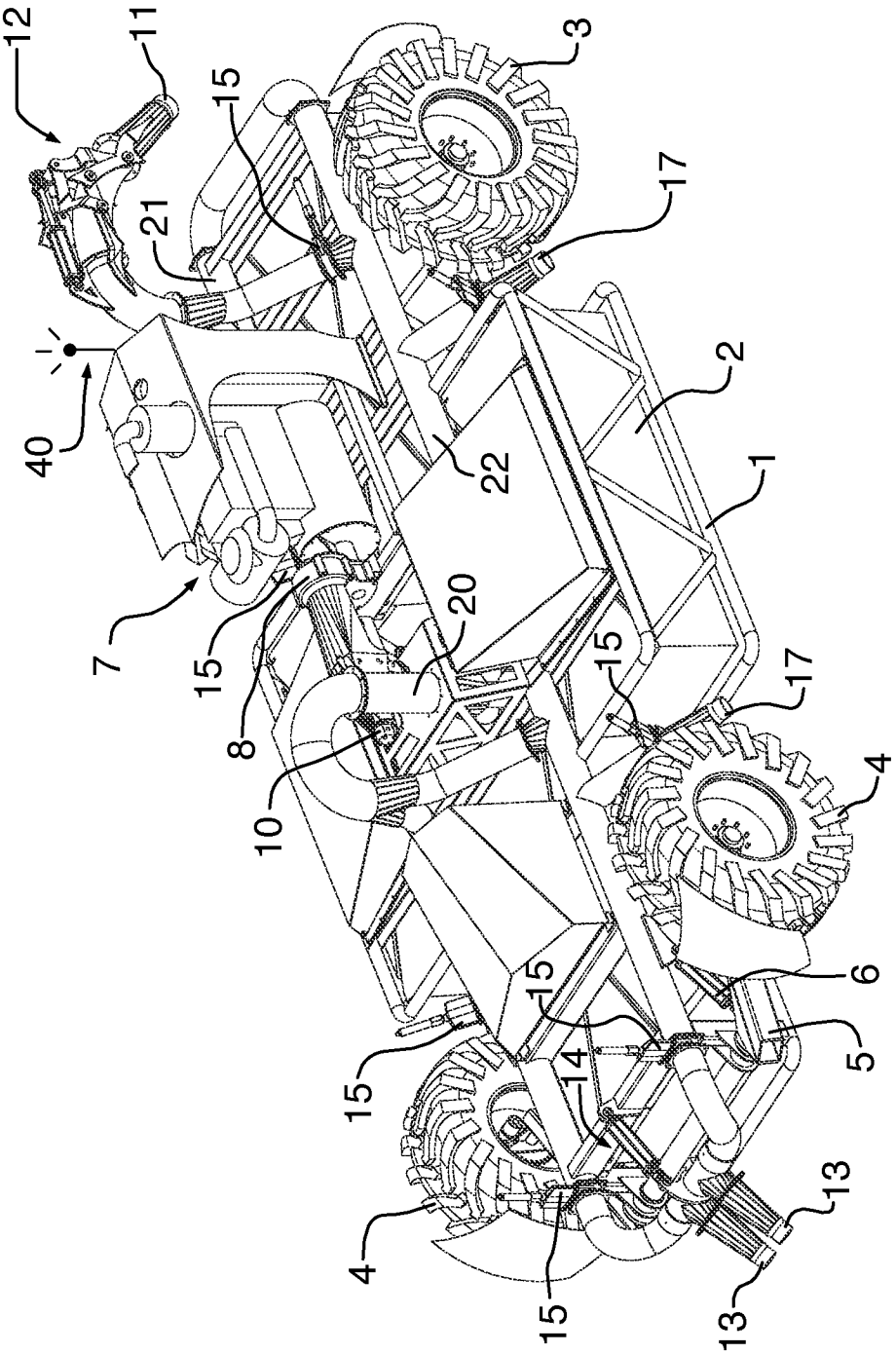



FIG.2

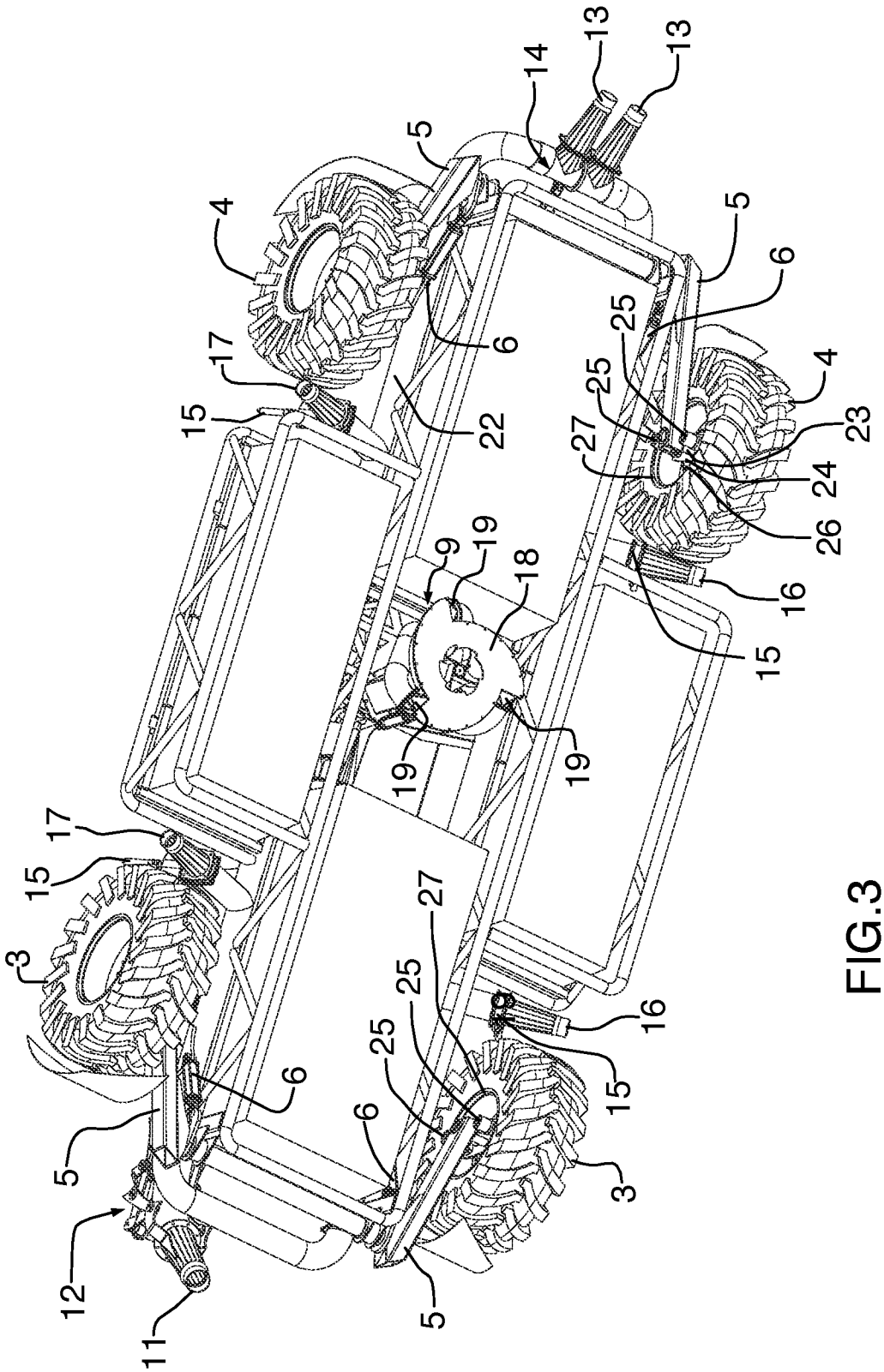

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FIG.3

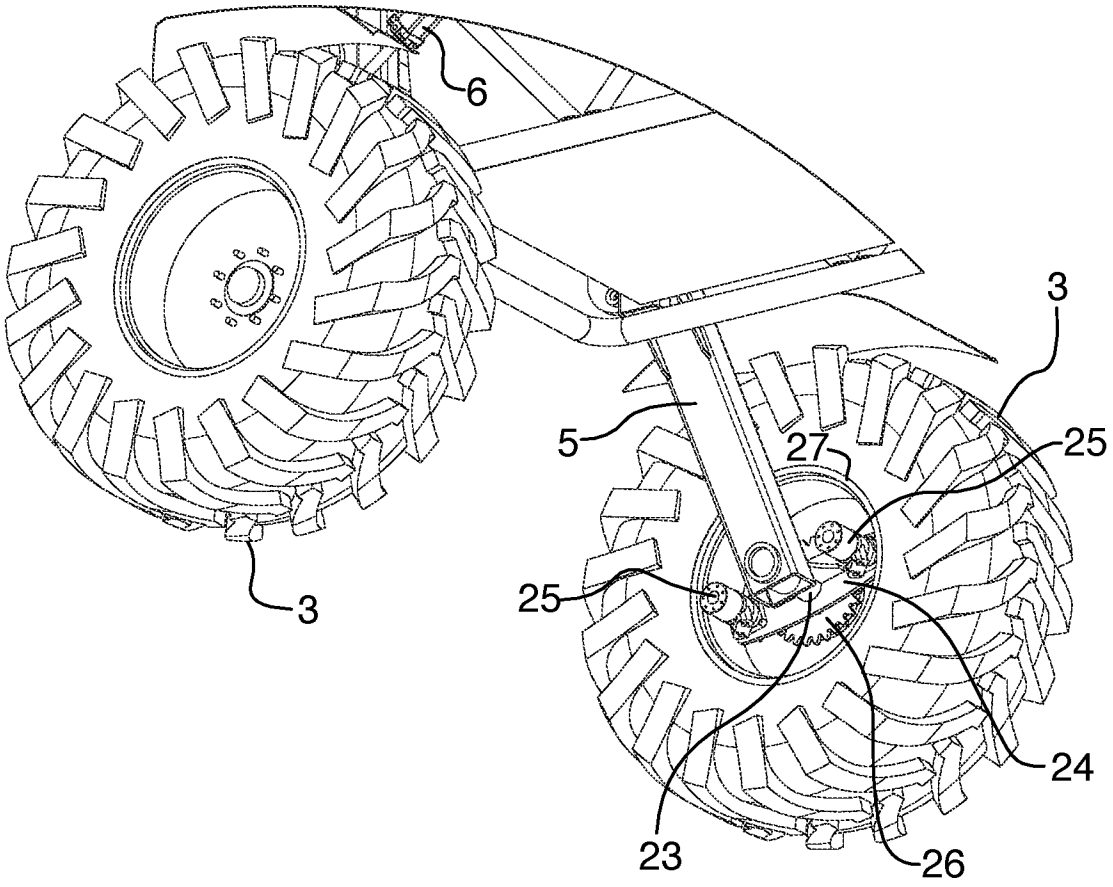



FIG.4

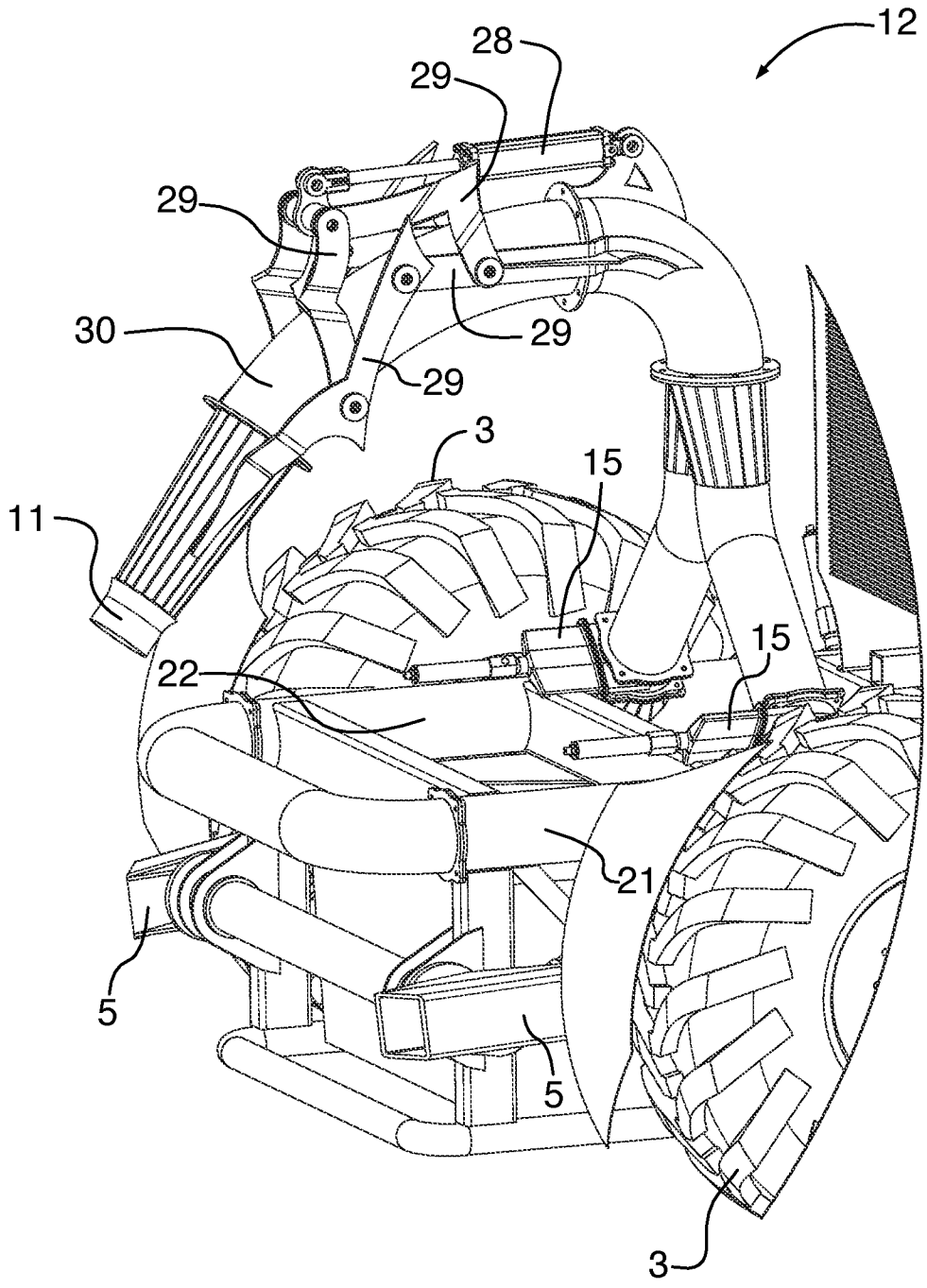



FIG.5

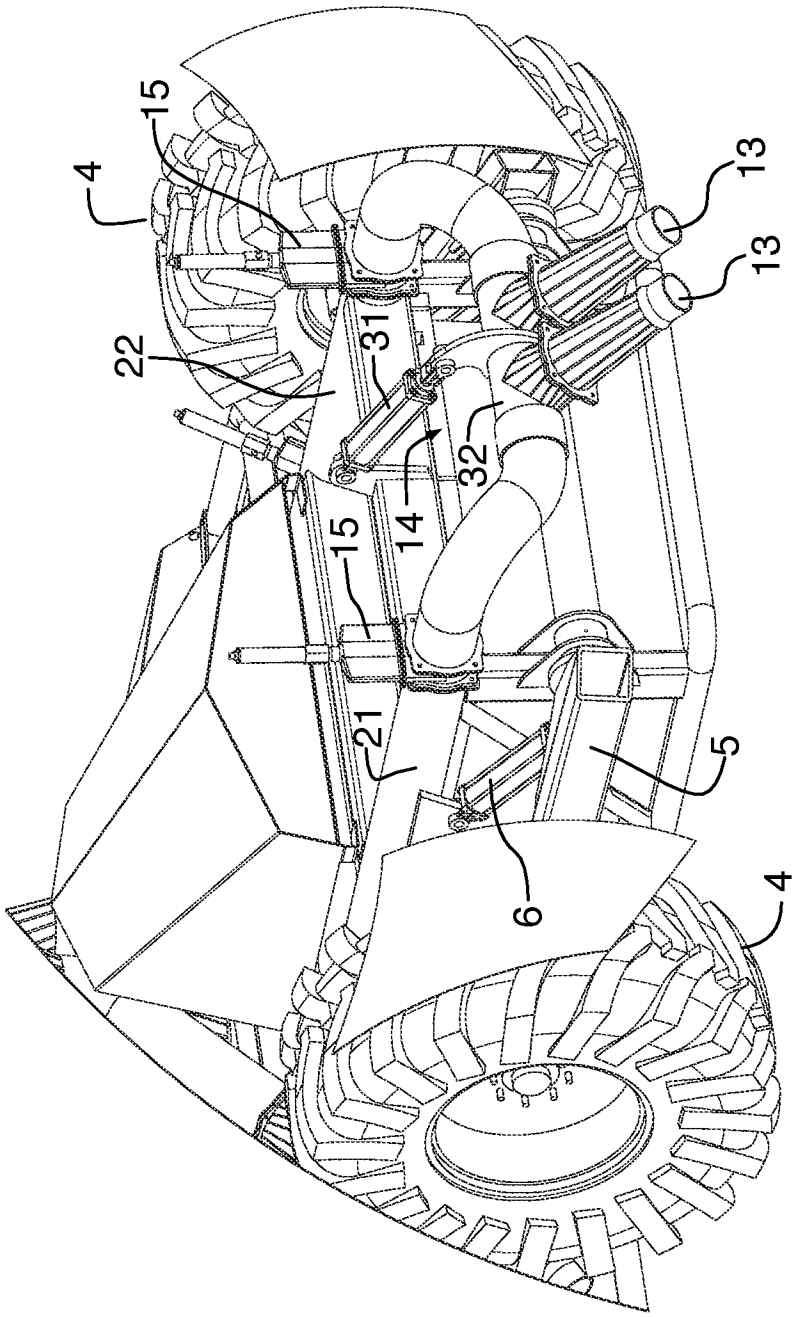



FIG.6

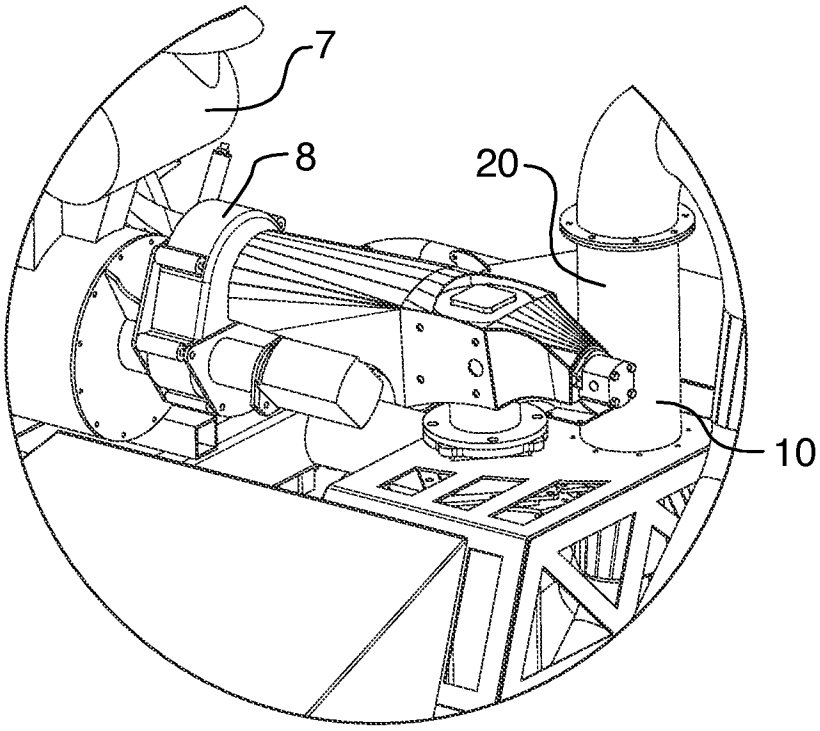



FIG.7

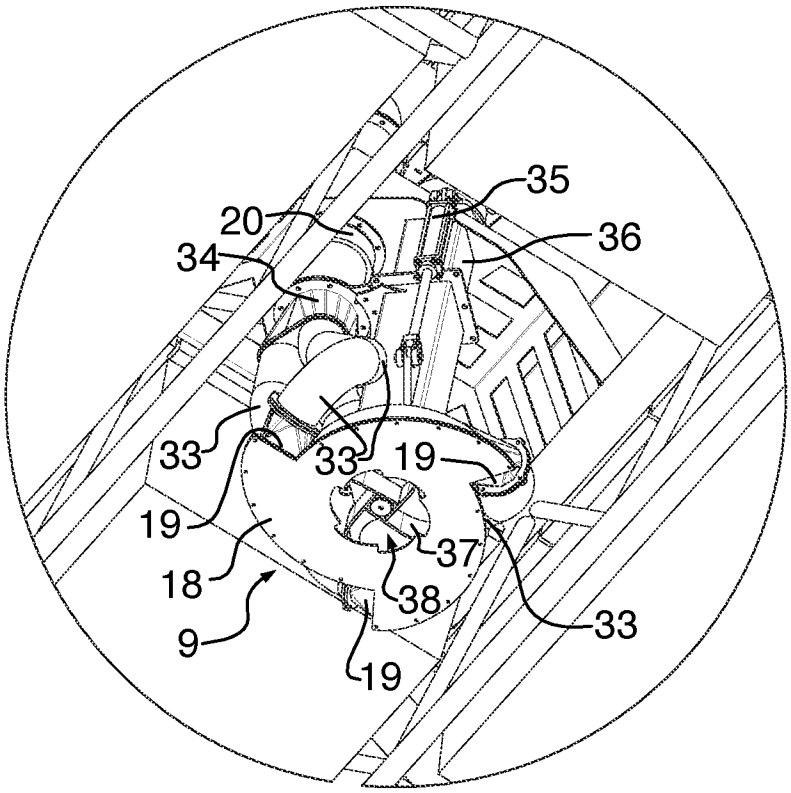



FIG.8

# AMPHIBIOUS PUMPING VEHICLE

## CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 17/201,100 filed Mar. 15, 2021, which is a continuation of U.S. patent application Ser. No. 16/891,627 filed Jun. 3, 2020, which is a continuation of U.S. patent application Ser. No. 16/157,950, filed Oct. 11, 2018 now issued under U.S. Pat. No. 10,710,422 on Jul. 14, 2020, which is a continuation of U.S. Ser. No. 15/586,493 filed May 4, 2017, now issued under U.S. Pat. No. 10,124,638 on Nov. 13, 2018, which is a continuation of U.S. patent application Ser. No. 15/044,905 filed Feb. 16, 2016 now issued under U.S. Pat. No. 9,694,636 on Jul. 4, 2017, which is a continuation of international patent application PCT/CA2014/050789, filed Aug. 18, 2014, which claims the benefit of U.S. patent application 61/867,598 filed Aug. 19, 2013, the entire contents of which are herein incorporated by reference.

## TECHNICAL FIELD

The invention relates to pumps and vehicles equipped for pumping. In particular, the invention relates to manure pumps and amphibious vehicles equipped for pumping liquid manure, such as animal manure contained in a farm lagoon.

## BACKGROUND

Manure produced during animal husbandry, particularly hog and cattle manure, is transferred by washing to a pit or lagoon for storage prior to removal for land application or further processing. During storage, a crust can develop on the surface of the pit or lagoon that must be disrupted prior to or during removal of the manure. Pumps are employed for this purpose with jets that return a percentage of the manure back to the pit or lagoon in the form of a high volume spray to disrupt the crust and recirculate the manure. Pumps for use in recirculating manure from smaller pits are known; however, these pumps are typically suitable for accessing the pit or lagoon from its edge and are connected to a tractor or similar land vehicle for operational power. They are therefore limited in their ability to recirculate manure to the middle of large lagoons, which are becoming increasing common as the size of animal husbandry operations increases.

Accordingly, there is a need for improved pumps and vehicles equipped for pumping, particularly pumps and vehicles suitable for use with large manure lagoons.

## SUMMARY OF THE INVENTION

According to the invention, there is provided an amphibious pumping vehicle comprising: a floatable vehicle body; ground engaging propulsion structure configured to raise and lower relative to the vehicle body; a fluid pump; a first fluid nozzle configured to direct fluid through the air, the fluid nozzle connected by a fluid conduit to the fluid pump; and, a power source configured to provide power to both the ground engaging propulsion structure and the fluid pump.

The floatable vehicle body may be in the shape of a mono-hull, a catamaran or a barge. Floatation of the vehicle body may be provided by a displacement hull, pontoon elements, or buoyant elements, for example foam filled buoyant chambers, such as are used for supporting floating docks. The vehicle body may be made using a variety of suitable materials, for example, fiberglass, aluminum, plastics, steel, etc.



The ground engaging propulsion structure may comprise ground engaging elements of the type suitable for powering a vehicle across wet or muddy terrain. For example, the ground engaging propulsion structure may comprise an endless track or a set of wheels. The set of wheels may comprise two or more wheels, for example four wheels, six wheels or eight wheels. May be provided in pairs with one wheel of each pair disposed on opposite sides of the vehicle. When the vehicle comprises a set of wheels, any number of the wheels may be driven in order to provide propulsion for the vehicle. Although at least two wheels may be driven, it is preferred that at least four wheels are driven. Although the vehicle may be provided with steering structure configured to change direction of one or more pairs of wheels, it is preferred that the wheels are independently driven at variable speeds, allowing them to be fixed in direction relative to the vehicle body. This provides directional control of the vehicle, even in wet or muddy conditions where conventional steering is likely to be ineffective due to sliding of the steerable set of wheels. A variety of drive mechanisms may be used to operate the wheels independently at variable speed; for example, at least one motor may be connected to each wheel that is hydraulically or electrically operable at variable speed. A transmission may alternatively be provided with structure configured to allow each wheel to be operated at variable speeds.

The ground engaging propulsion structure is configured to raise and lower relative to the vehicle body. Raising and lowering may be provided by telescoping structure or lever structure configured to pivot relative to the vehicle body. The lever structure may comprise a linear actuator that is driven, for example hydraulically, to cause pivoting of the lever arm relative to the vehicle body and thereby raise or lower the wheels. Each wheel is preferably raised or lowered at the same time. Alternatively, the lever structure may comprise a planetary drive that is either mechanically or hydraulically powered to cause pivoting of the lever arm.

The vehicle further comprises a power source configured to provide power to both the ground engaging propulsion structure and the fluid pump. The power source may be self-contained on the vehicle or may be linked to shore. For example, the power source may comprise an internal combustion engine, a fuel-cell, electric batteries, etc. The power source may comprise an electric motor that may be driven from shore via an electrical cable. The power source may be connected to a generator for supplying electrical power to electrical systems on board the vehicle. The power source may be connected to a hydraulic pump for supplying hydraulic fluid pressure to hydraulic systems on board the vehicle. The power source may be connected to the fluid pump hydraulically, electrically, or via a mechanical drive. A single power source may be used to provide power to all vehicle systems, including the fluid pump. In one embodiment, the power source is an internal combustion engine that is connected to the fluid pump and a hydraulic pump via a mechanical drive. The mechanical drive may comprise a gearbox to provide an appropriate rotational speed for the fluid pump. The mechanical drive may comprise a gearbox to provide an appropriate rotational speed for the hydraulic pump. The fluid pump and hydraulic pump may be operated at the same or different rotational speeds.

The fluid pump may comprise a pump housing configured for immersion within the fluid. The pump housing may

comprise a bottom fluid inlet and at least two tangential fluid outlets. A greater number of tangential fluid outlets may be provided, for example three fluid outlets. The tangential fluid outlets may be combined into a single fluid conduit for directing the combined output of the fluid pump to a desired location. The vehicle may comprise structure configured to cause raising and lowering of the fluid pump, especially the fluid pump housing, relative to the vehicle body. For example, a hydraulically or electrically driven linear actuator may be provided on the vehicle and configured to raise and lower the fluid pump. This may be accomplished via a telescoping structure or a lever structure of the vehicle. The tangential fluid outlets may be equipped with flexible or telescoping connections to the single fluid conduit. Lowering the fluid pump for immersion into the fluid obviates the need for priming the fluid pump, which can be problematic when the fluid is manure comprising solid materials that can plug the pump or priming structure. Immersion of the pump also simplifies intermittent operation of the pump, due to eliminating potential loss of prime, and reduces the need for pump maintenance.

The vehicle comprises a first fluid nozzle configured to direct fluid through the air. The fluid nozzle is connected by fluid conduit to the fluid pump. The fluid conduit connecting the fluid nozzle to the fluid pump may comprise the single fluid conduit that is connected to the tangential fluid outlets of the pump. The vehicle may further comprise a plurality of fluid nozzles comprising the first fluid nozzle and at least one second fluid nozzle connected to the fluid conduit. The first fluid nozzle may comprise a front nozzle and the second fluid conduit may comprise the rear nozzle or a pair of rear nozzles. The plurality of fluid nozzles may comprise at least two side fluid nozzles on opposite sides of vehicle connected to the fluid conduit. The at least two side fluid nozzles may comprise a pair of fluid nozzles on opposite sides of the vehicle connected to the fluid conduit; thus, the at least two side fluid nozzles may comprise a total of four fluid nozzles. The vehicle may further comprise valve structure configured to proportion fluid flow between the plurality of fluid nozzles. The valve structure may comprise a valve corresponding to each fluid nozzle. The valve corresponding to each fluid nozzle may be actuatable, for example hydraulically or electrically. The valve structure may be actuatable remotely.

The plurality of fluid nozzles and the valve structure may cooperate to provide directional control, motive power, or a combination thereof for the vehicle when floating. For example, by closing valve structure associated with the fluid nozzle(s) on the right side of the vehicle, fluid flow is directed to the nozzle(s) on the left side of the vehicle, causing the vehicle to turn to the right. In one embodiment, steering is achieved solely by cooperation of the plurality of fluid nozzles and the valve structure; accordingly, the vehicle does not comprise a rudder. In one embodiment, movement of the vehicle while floating is achieved solely by cooperation of at least the second fluid nozzle and the valve structure; accordingly, the vehicle does not comprise a propeller.

One or more fluid nozzles may comprise adjustment structure that is powered and configured to adjust an angle of the fluid nozzle relative to the floatable vehicle body. For example, the first fluid nozzle may comprise first adjustment structure and the second fluid nozzle(s) may comprise second adjustment structure, each adjustment structure configured to adjust an angular orientation of its respective fluid nozzle(s) in a vertical and/or horizontal plane. In one embodiment, both the first fluid nozzle and the second fluid nozzle(s) are adjustable in a vertical plane. The second fluid nozzle(s) is/are adjustable in the vertical plane by an amount sufficient to cause forward or backward movement of the vehicle when floating. In other words, the second fluid nozzle(s) is/are adjustable to point at least partially toward the front of the vehicle at least partially toward the rear of the vehicle. The second fluid nozzle(s) may be configured to direct fluid through the air in a substantially downward direction. The first fluid nozzle may be configured to direct fluid through the air in a substantially upward direction. The side fluid nozzle(s) may be configured to direct fluid through the air in a substantially downward direction. One or more side fluid nozzle(s) may comprise adjustment structure configured to adjust an angular orientation of its respective side fluid nozzle(s) in a vertical plane.

The location of at least the ground engaging propulsion structure, the power source and the fluid pump may be selected to provide a desired location for a center of gravity of the vehicle. The desired location for the center of gravity of the vehicle may be selected to improve handling characteristics of the vehicle while floating. The center of gravity may be located along the longitudinal centerline of the vehicle. The center of gravity may be located substantially in the middle of the vehicle, for example at an intersection of longitudinal centerline of the vehicle and the transverse centerline of the vehicle. The center of gravity may be located rearward of the transverse centerline of the vehicle. The center of gravity may be located forward of the transverse centerline of the vehicle. Thus the ground engaging propulsion structure, power source, and fluid pump cooperate together to improve handling characteristics of the vehicle.

The vehicle may comprise remote control structure configured to cause the vehicle to be remotely controllable by an operator remote from the vehicle. The vehicle may be remotely controllable by an operator remote from the vehicle when the vehicle is ground engaging and when the vehicle is floating. The remote control structure may comprise a wireless transmitter and a wireless receiver. The remote control structure may be configured to control the speed and or direction of the vehicle when ground engaging and when floating. The remote control structure may be configured to control an amount of fluid flow from at least the first nozzle. The remote control structure may be configured to control an angular orientation of at least the first nozzle relative to the vehicle body. The remote control structure may be configured to control an amount of fluid flow from at least the second nozzle(s). The remote control structure may be configured to control an angular orientation of at least the second nozzle(s) relative to the vehicle body. The remote control structure may be configured to control the valve structure in order to proportion fluid flow between the plurality of fluid nozzles. The remote control structure may be configured to control rotational speed of the fluid pump. The remote control structure may be configured to raise and lower the fluid pump. The remote control structure may be configured to raise and lower the ground engaging propulsion structure. The remote control structure may be configured to start and stop the power source.

Further features of the invention will be described or will become apparent in the course of the following description.

## BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be more clearly understood, embodiments thereof will now be described in detail by way of example, with reference to the accompanying drawings, in which:

FIG. **1** shows a perspective view of an embodiment of the vehicle with wheels lowered;

FIG. **2** shows another perspective view of the vehicle with wheels raised;

FIG. **3** shows a perspective view of the underside of the vehicle; and,

FIG. **4** shows a perspective view of a set of wheels of the vehicle from the underside of the vehicle;

FIG. **5** shows a perspective view of the first fluid nozzle of vehicle;

FIG. **6** shows a perspective view of a second fluid nozzle of the vehicle;

FIG. **7** shows a perspective view of a mechanical drive connecting the power source of the vehicle to the fluid pump and a hydraulic pump of the vehicle;

FIG. **8** shows a perspective view of the fluid pump from the underside of the vehicle.

## DETAILED DESCRIPTION

In describing the figures, like features are referred to by like reference numerals. Although not all features indicated on a particular drawing are necessarily described with reference to that drawing, all of the features are described with reference to at least one of the drawings.

Referring to FIGS. **1-3**, an amphibious vehicle comprises a vehicle body **1** incorporating buoyant elements **2**. The buoyant elements comprise flotation tanks of the type that may be foam filled and used, for example, in the construction of floating docks. The vehicle comprises a ground engaging propulsion structure comprising two sets of wheels **3**, **4**. Each wheel is rotatably mounted to lever structure **5** that is pivotally attached to the vehicle body. Each lever structure **5** is driven by a hydraulic actuator **6** that is operable to cause raising and lowering of the wheels **3**, **4** by pivoting of the lever structure **5**. A power source **7** comprising an internal combustion engine, for example a diesel engine, is mounted to the vehicle body. A mechanical drive **8** connects the power source **7** to the fluid pump **9** and a hydraulic pump **10** that is used to provide hydraulic system fluid pressure for the vehicle.

The fluid pump **9** comprises a pump housing **18** with three tangential fluid outlets **19** that are combined into a single fluid conduit **20**. The single fluid conduit **20** is then split into left side **21** and right side **22** fluid conduits which connect at the front and rear of the vehicle to form a complete circuit. The fluid pump **9** is thus fluidically connected to all fluid nozzles of the vehicle via the fluid conduits **20-22**.

A first fluid nozzle **11** is provided at a front of the vehicle. The first fluid nozzle **11** comprises first articulation means **12** that is hydraulically powered to cause the nozzle to change angular orientation relative to the vehicle body **1** in a vertical plane. A pair of second fluid nozzles **13** is provided at a rear of the vehicle. The second fluid nozzles **13** comprise a second articulation means **14** that is hydraulically powered to cause the nozzles to change angular orientation relative to the vehicle body **1** in a vertical plane. The first and second fluid nozzles are part of a plurality of fluid nozzles of the vehicle. The plurality of fluid nozzles further comprises side fluid nozzles **16**, **17** on opposite sides of the vehicle. A pair of left side fluid nozzles **16** and a pair of right side fluid nozzles **17** are provided.

Valve structure comprising a valve **15** corresponding to each fluid nozzle **11**, **13**, **16**, **17** is also provided. The valves **15** are powered and operable to open or close. The valves **15** may be opened fully or partially to proportion flow between the plurality of fluid nozzles. Cooperation between the valves **15** and the plurality of fluid nozzles is used to provide directional control and motive power for the vehicle while floating. For example, proportioning fluid flow from the right side fluid nozzles **17** to the left side fluid nozzles **16** causes the vehicle to turn to the right will floating. Similarly, fluid flow may be proportioned between the first fluid nozzle **11** and the second fluid nozzles **13** to cause the vehicle to move forward or backward. By rotating the second fluid nozzles **13** fully downwardly and then up toward the front of the vehicle using the second articulation means **14**, the vehicle may also be directed rearward and/or slowed in its forward movement speed. Thus, the combination of proportioning flow between the plurality of fluid nozzles using the valve structure and/or articulating the nozzles may be used to control forward, rearward, left and right movement and speed of the vehicle. The flow rate of the fluid pump **9** may also be adjusted to enhance directional and speed control via the plurality of nozzles while floating.

Referring additionally to FIG. **4**, each wheel of the front set of wheels **3** is rotatably attached to its corresponding lever **5** by a spindle **23**. Fixedly mounted to lever **5** is a bracket **24** supporting a pair of hydraulic motors **25**. Each hydraulic motor **25** has an output gear (not shown) that is engaged with a drive gear **26**. The drive gear **26** is fixedly attached to a rim **27** of each wheel **3** concentric with the spindle **23**. Referring to the right side wheel of the set of wheels **3** (showing an interior of the rim **27**), operation of the hydraulic motors **25** in a clockwise direction causes the drive gear **26** to rotate in a counterclockwise direction, moving the vehicle forward. Reversing the direction of operation of the hydraulic motors **25** causes the vehicle to move rearward. By increasing the rotational speed of the hydraulic motors **25** on the right side relative to the motors **25** on the left side, the vehicle is caused to turn to the left. The motors **25** connected to the rear set of wheels **4** work in a similar manner to those described for the front set of wheels **3**. Thus, directional and motive control of the vehicle (forward/reverse) while on land is controlled by varying the relative speed and rotational direction of the hydraulic motors **25**.

Turning now to FIG. **5**, the first fluid nozzle **11** is able to change angular direction in a vertical plane relative to the vehicle body **1** through operation of a powered first articulation means **12**. The first articulation means **12** comprises a hydraulic first articulation cylinder **28** that is coupled to a four bar linkage **29**. The four bar linkage serves to amplify the effective stroke length of the first articulation cylinder **28** to cause the nozzle to move through a larger degree of motion in the vertical plane than if the linkage **29** were not present. The first fluid nozzle **11** is connected to the fluid conduits **21**, **22** via a flexible conduit **30** that permits articulation of the nozzle. Valves **15** are provided to proportion flow to the first fluid nozzle in a manner as described previously.

Referring to FIG. **6**, the second fluid nozzles **13** are connected to the fluid conduits **21**, **22** by articulation means **14** that comprises a hydraulic second articulation cylinder **31** mounted to the vehicle body **1** and connected to a rotatable conduit section **32**. Actuation of the second articulation cylinder **31** causes the rotatable conduit section **32** to rotate relative to the first and second fluid conduits **21**, **22**. The second fluid nozzles **13** are provided on rotatable conduit section **32** and thus rotate with the conduit section **32** upon actuation of the articulation cylinder **31**. This causes the nozzles **13** to change angular orientation relative to the vehicle body **1** in a vertical plane. The geometry of the second articulation cylinder **31** and the rotatable conduit

section **32** is such that the nozzles **13** may be rotated fully downwardly and then upwardly towards the front of the vehicle. This allows an operator to change the amount of forward movement to slow or even reverse forward movement of the vehicle. When operated in conjunction with the valves **15**, the nozzles **13** and second articulation structure **14** provide a high degree of control over forward and reverse movement of the vehicle.

Referring to FIG. **7**, the power source **7** comprises an internal combustion engine connected to a mechanical drive **8** that delivers power to the pump **9** (not shown in FIG. **7**) and also to the hydraulic pump **10** that is used to provide hydraulic fluid pressure to the vehicle's hydraulic systems. A transmission is provided within the mechanical drive **8** that allows the rotational speed of the fluid pump **9** to be adjusted independently of the rotational speed of the hydraulic pump **10**. The power source **7** is thus mechanically connected to both the fluid pump **9** and the hydraulic pump **10**.

Referring to FIG. **8**, the fluid pump **9** comprises a pump housing **18** comprising three tangential fluid outlets **19** that are connected via flexible pump outlet conduits **33** to a combiner **34** that is used to combine the fluid output of the tangential fluid outlets **19** into the single conduit **20**. A pump actuation cylinder **35** is provided to cause raising and lowering of the pump **9** and especially the pump housing **18** relative to the vehicle body **1**. A telescoping pump support structure **36** is provided for use in combination with the pump actuation cylinder **35**. A mechanical drive shaft (not shown) runs through the telescoping pump support structure **36** to provide power to the pump impeller **37**. When powered, the impeller **37** draws the fluid to be pumped through an enlarged bottom fluid opening **38** of the pump housing **18**. By immersing the pump housing **18** in the fluid, fluid is allowed to enter the pump housing, thereby obviating the need for priming the pump. Raising the pump **9** via the pump actuation cylinder **35** and telescoping pump support structure **36** allows the vehicle to exit the lagoon (or similar fluid reservoir) without damaging the pump. Thus, these structures cooperate with the ground engaging propulsion structure to allow the vehicle to operate on land.

An example of a pump **9** suitable for use with the vehicle is disclosed in co-pending U.S. patent application Ser. No. 13/038,189 filed Mar. 1, 2011, entitled Pump for Immersion Within a Fluid Reservoir, which is incorporated herein by reference.

The location of at least the ground engaging propulsion structure, the power source and the fluid pump are selected to provide a desired location for a center of gravity of the vehicle. The desired location for the center of gravity of the vehicle is selected to improve handling characteristics of the vehicle while floating. The center of gravity is located along the longitudinal centerline of the vehicle, substantially in the middle of the vehicle.

A remote control structure **40** comprises an antenna configured to cause the vehicle to be remotely controllable by an operator remote from the vehicle. The remote control structure comprises a wireless transmitter used by the operator and a wireless receiver on the vehicle. The wireless receiver interfaces with a hydraulic control center on the vehicle to permit control of hydraulically operated components, such as hydraulic cylinders, valves, motors, etc. This allows the operator to control vehicle speed and direction on land or when floating, to raise the wheels and to change the angular orientation of the first and second fluid nozzles. A wireless engine starter is provided to control operation of the internal combustion engine used as a power source. A set of hydraulic controls is optionally provided to modulate engine speed and/or fluid pump rotational speed. Thus, a variety of functions may be controlled remotely that allow the vehicle to operate on land or when floating.

In operation, an operator uses the remote controls to maneuver the vehicle to the lagoon entrance, drive the vehicle into the lagoon, raise the ground engaging propulsion structure (wheels), lower the fluid pump, begin pumping fluid with the fluid pump through the fluid conduits and selectively open at least the second fluid nozzles to cause the vehicle to move out on to the surface of the lagoon. The valves associated with the side fluid nozzles may also be opened or closed to provide directional control of the vehicle on the lagoon. Once the vehicle is in the desired position, the valves associated with the first fluid nozzle are opened and the first articulation structure is used to position the first fluid nozzle at a desired angular orientation relative to the vehicle body. This is generally an upward orientation so that the fluid is sprayed widely to break crusts of material floating on the surface of the lagoon. In this manner, fluid is recirculated and directed to desired locations in the lagoon. As fluid is emptied from the lagoon, the floating vehicle is permitted to lower with the fluid level. When the lagoon has been sufficiently emptied, the operator is able to reverse the foregoing process in order to maneuver the vehicle to the lagoon exit, lower the wheels, and drive the vehicle up the muddy bank out of the lagoon.

The novel features will become apparent to those of skill in the art upon examination of the description. It should be understood, however, that the scope of the claims should not be limited by the embodiments, but are intended by the inventor to be given the broadest interpretation consistent with the wording of the claims and the specification as a whole.

The invention claimed is:

**1**. An amphibious vehicle comprising:

a floatable vehicle body;

ground engaging propulsion structure comprising a plurality of ground engaging elements powered by a hydraulic motor;

a fluid pump for pumping liquid manure;

a power source connected to a hydraulic pump, the power source configured to provide power to both the ground engaging propulsion structure and the fluid pump; and,

a wireless remote control configured to enable an operator who is remote from the vehicle to: (1) control the ground engaging propulsion structure; (2) control a flow of liquid manure from the fluid pump; (3) control at least one of the speed and direction of the vehicle when the vehicle is ground engaging; and, (4) control at least one of the speed and direction of the vehicle when the vehicle is floating.

**2**. The vehicle of claim **1**, wherein the vehicle further comprises a conduit fluidly connected to the fluid pump.

**3**. The vehicle of claim **2**, wherein the conduit comprises an opening at an end thereof.

**4**. The vehicle of claim **3**, wherein the wireless remote control is configured to control an orientation of the opening.

**5**. The vehicle of claim **4**, wherein the vehicle further comprises a nozzle at the end of the conduit.

**6**. The vehicle of claim **2**, wherein the vehicle further comprises a nozzle at the end of the conduit.

**7**. The vehicle of claim **1**, wherein the at least one of speed and direction of the vehicle when the vehicle is floating is controlled by a fluid mover.

**8**. The vehicle of claim **1**, further comprising a plurality of fluid nozzles fluidly connected to the fluid pump.

9. The vehicle of claim 8, wherein the wireless remote control is configured to control the plurality of fluid nozzles to control the at least one of speed and direction of the vehicle when the vehicle is floating.

10. The vehicle of claim 4, further comprising a plurality of fluid nozzles fluidly connected to the fluid pump.

11. The vehicle of claim 10, wherein the wireless remote control is configured to control the plurality of fluid nozzles to control the at least one of speed and direction of the vehicle when the vehicle is floating.

12. The vehicle of claim 4, wherein the power source is connected to the hydraulic pump by a mechanical drive and connected to the fluid pump by the mechanical drive.

13. The vehicle of claim 12, wherein the wireless remote control is configured to operate the hydraulic motor to operate the ground engaging propulsion structure at variable speed.

14. The vehicle of claim 13, wherein the ground engaging propulsion structure comprises a set of wheels.

15. The vehicle of claim 14, wherein the set of wheels comprises at least two powered wheels.

16. The vehicle of claim 14, wherein the set of wheels comprises four powered wheels, each wheel of the set of wheels is independently powered and is operable at variable speed.

17. The vehicle of claim 16, wherein the wheels are operable at variable speed by the hydraulic motor.

18. The vehicle of claim 17, wherein the vehicle further comprises a nozzle at the end of the conduit.

19. The vehicle of claim 17, wherein the at least one of speed and direction of the vehicle when the vehicle is floating is controlled by a fluid mover.

20. The vehicle of claim 17, further comprising a plurality of fluid nozzles fluidly connected to the fluid pump.

21. The vehicle of claim 20, wherein the wireless remote control is configured to control the plurality of fluid nozzles to control the at least one of speed and direction of the vehicle when the vehicle is floating.

* * * * *

# EXHIBIT J

| Claim | Carrier I (US 2012/0185129) |
|---|---|
| 1. An amphibious vehicle comprising: | **[003]** The present invention relates to a multi-purpose all-terrain vehicle. More specifically, the present invention is directed to an all-terrain hostile environment vehicle equipped with various aid units such as quick exchange medical, hazardous material, construction, search, rescue, com-munications, fire fighting, tracking and weapon units which can be deployed in remote areas or areas not accessible by paved roads.<br><br>**[0009]** It is an object of the invention to provide an improved all-terrain vehicle.<br><br>**[0010]** An object is to provide for a multi-independent drive wheel system for an all-terrain vehicle.<br><br>**[0026]** In another embodiment of the invention, the vehicle includes more than four wheels, such as six and preferably eight wheels but can contain an even greater number of wheels which are connected to the vehicle and powered by independent hydraulic or other propulsion power such as electric, chain, belt drive, wheel motors. The wheel motors likewise operably connect to an engine on the vehicle via a transmission and or hydraulic pump, which is operably inter-connected to the hydraulic or other propel drive means to the wheel motors and engine via hydraulic lines and preferably connects to a flow divider and or combination flow divider manifolds to regulate hydraulic flow to the wheel motors and other hydraulic components. Similarly, there can be a plural-ity of flow dividers and or combination of flow divider mani-folds to regulate and distribute flow in the hydraulic lines to each motor on an equalized basis. Isolation valves can be operably interposed between the wheel motors and aforesaid components. Additionally, sensors can be provided to detect when there is a pressure differential change in the connections and the system can preferably automatically and or manually actuate the appropriate isolation valves in a manner to main-tain flow equilibration in the system. Stability can be accom-plished when traveling over rough ground and includes a frame having a sealed hull to provide the vehicle with buoy-ancy. A platform exists on the frame above the hull which includes a plurality of open surfaces through which a quick release connector may be inserted to secure a functional unit or aid unit to the platform.<br><br>**[0058]** The vehicle 100 is designed to be drivable on uneven ground, on mud, through deep water, or on other surfaces a regular automobile or truck cannot be driven on. To achieve this effect, the vehicle can be relatively lightweight, having eight, ten or twelve-wheel drive or more, which can prefer-ably be sealed against water intrusion to critical engine and transmission parts. Weight reduction can be achieved by using various polymers which also have ballistic proof capa-bility.<br><br>**[0074]** Each of the structural components can preferably be made of ballistic proof material, steel or other suitable material to enable the multiple functions of land and water use to be carried out. Each of the units described is exemplary for use with the invention and not intended to so limit the invention, rather modifications of these units are intended to be covered hereby. |

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| Claim | Carrier I (US 2012/0185129) |
|---|---|
| | **[0079]** The hull (bottom section) of the vehicle 100 can preferably be shaped in such a configuration as that of a boat in a slight curved V shape with angles from 1 degree to 95 degrees and may be greater that accomplish two separate tasks. (Task!) The hull of vehicle 100 can facilitate amphibious operations that accomplish three different sub tasks being (1) eliminating water drag on the vehicle as it moves through the water, (2) water build up distribution in front of and to the sides of the vehicle 100 (which slows the movement and turning capabilities of the vehicle 100), (3) significantly enhances both the movement directional speed i.e. forward or reverse and significantly enhances the turning capabilities left or right as well of vehicle 100. (Task 2) Upper body 105 and lower body 107 of vehicle 100 can facilitate land and sea borne operations in relationship to ballistic resistant proper-ties and Explosive Energy Dispersion, (EED), in relationship to IED's (Improvised Explosive Devices) and other explosive devices i.e. (land mines and or water mines), that accomplish two sub tasks. (Sub-Task 1) The hull uses angles of 1 degree to 95 degrees or greater significantly enhance ballistic pro-jectile defeat by creating a ricochet effect thereby increasing the effectiveness of the used method of armor. Using varying degrees of angles in different configurations using different thicknesses within the armors configuration can create a pocket and or channel the trajectory path of the munition into this pocket to catch or trap the munition or channel and deflect the munition into a different trajectory away from a crucial portion of the vehicle 100. (Sub-Task 2) The hull can use the same 1 degree to 95 degree angles or greater incorporated into configuration geometry into both the upper and lower body of vehicle 100 which accomplishes explosive blast energy dis-persion away from the vehicle 100. The lower body of vehicle 100 would also incorporate blast ducts using 1 degree to 95 degree angles in a shape configuration of duct channels formed within or incorporated onto the lower body of vehicle 100 that would give the energy and or pressure release of the blast a directional path to follow leading away from the vehicle 100 and critical components of the underbody and side components of the vehicle 100 such as wheel mounting hubs, tires and other critical components. |
| A floatable vehicle body | **Abstract:** A first chassis and second chassis hingedly connects to the first chassis, wherein each of the first and second chassis includes a plurality of wheels which are operably connected to a hydraulic motor. The hydraulic motor operably connects to an engine which is operably connected to the first chassis. A transmission pump operably interconnects the hydraulic motor and the engine and a flow divider operably interconnects the transmission pump and the hydraulic motor to regulate hydraulic flow to the hydraulic motor.<br><br>**[0026]** In another embodiment of the invention, the vehicle includes more than four wheels, such as six and preferably eight wheels but can contain an even greater number of wheels which are connected to the vehicle and powered by independent hydraulic or other propulsion power such as electric, chain, belt drive, wheel motors. The wheel motors likewise operably connect to an engine on the vehicle via a transmission and or hydraulic pump, which is operably inter-connected to the hydraulic or other propel drive means to the wheel motors and engine via hydraulic lines and preferably connects to a flow divider and or combination flow divider manifolds to regulate hydraulic flow to the wheel motors and other hydraulic components. Similarly, there can be a plural-ity of flow dividers and or combination of flow divider mani-folds to regulate and distribute flow in the hydraulic lines to each motor on an equalized basis. Isolation valves can be operably interposed between the wheel motors and aforesaid components. Additionally, sensors can be |

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|---|---|
| | provided to detect when there is a pressure differential change in the connections and the system can preferably automatically and or manually actuate the appropriate isolation valves in a manner to main-tain flow equilibration in the system. Stability can be accom-plished when traveling over rough ground and includes a frame having a sealed hull to provide the vehicle with buoy-ancy. A platform exists on the frame above the hull which includes a plurality of open surfaces through which a quick release connector may be inserted to secure a functional unit or aid unit to the platform.<br><br>**[0058]** The vehicle 100 is designed to be drivable on uneven ground, on mud, through deep water, or on other surfaces a regular automobile or truck cannot be driven on. To achieve this effect, the vehicle can be relatively lightweight, having eight, ten or twelve-wheel drive or more, which can prefer-ably be sealed against water intrusion to critical engine and transmission parts. Weight reduction can be achieved by using various polymers which also have ballistic proof capa-bility.<br><br>**[0079]** The hull (bottom section) of the vehicle 100 can preferably be shaped in such a configuration as that of a boat in a slight curved V shape with angles from 1 degree to 95 degrees and may be greater that accomplish two separate tasks. (Task!) The hull of vehicle 100 can facilitate amphibi-ous operations that accomplish three different sub tasks being (1) eliminating water drag on the vehicle as it moves through the water, (2) water build up distribution in front of and to the sides of the vehicle 100 (which slows the movement and turning capabilities of the vehicle 100), (3) significantly enhances both the movement directional speed i.e. forward or reverse and significantly enhances the turning capabilities left or right as well of vehicle 100. (Task 2) Upper body 105 and lower body 107 of vehicle 100 can facilitate land and sea borne operations in relationship to ballistic resistant proper-ties and Explosive Energy Dispersion, (EED), in relationship to IED's (Improvised Explosive Devices) and other explosive devices i.e. (land mines and or water mines), that accomplish two sub tasks. (Sub-Task 1) The hull uses angles of 1 degree to 95 degrees or greater significantly enhance ballistic pro-jectile defeat by creating a ricochet effect thereby increasing the effectiveness of the used method of armor. Using varying degrees of angles in different configurations using different thicknesses within the armors configuration can create a pocket and or channel the trajectory path of the munition into this pocket to catch or trap the munition or channel and deflect the munition into a different trajectory away from a crucial portion of the vehicle 100. (Sub-Task 2) The hull can use the same 1 degree to 95 degree angles or greater incorporated into configuration geometry into both the upper and lower body of vehicle 100 which accomplishes explosive blast energy dis-persion away from the vehicle 100. The lower body of vehicle 100 would also incorporate blast ducts using 1 degree to 95 degree angles in a shape configuration of duct channels formed within or incorporated onto the lower body of vehicle 100 that would give the energy and or pressure release of the blast a directional path to follow leading away from the vehicle 100 and critical components of the underbody and side components of the vehicle 100 such as wheel mounting hubs, tires and other critical components. |
| Ground engaging propulsion structure comprising a plurality | **[0007]** There is a need for an all terrain vehicle to be as lightweight with variable alternative power to propel vehicle directional travel and be as mobile as possible, i.e. hydraulic, drive shaft, electric, hydraulic over electric, drive shaft over chain driven gear and or spiral worm gear and using variable fuel sources such as electrical, LP gases, gasoline, diesel, bio chemical and even nuclear fuels |

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|---|---|
| of ground engaging elements powered by a hydraulic motor; | etc. There is a need for a solution for a quick directional travel change in the vehicle's steering mobility in the field. There is also a need for improved remote weapons systems. There is a further need for improved vehicle durability for an all-terrain vehicle, during periods of hostile environments such as forest fire or war.<br><br>**[0024]** Accordingly, the present invention is an improve-ment on the prior invention and is directed to an all-terrain vehicle. One embodiment of the vehicle includes a first chas-sis and second chassis hingedly connected to the first chassis, each of the first and second chassis including a plurality of wheels which are operably connected to a hydraulic motor (or other propelling means, such as electric wheel). In this regard, the connection can be made for up and down movement (vertical) (oscillation) for unlevel terrain movement compen-sation and or cross hingedly connected for both up and down movement (vertical) (oscillation) as well as side to side move-ment (horizontal)(oscillation) for unlevel terrain movement compensation. The hydraulic motor is operably connected to an engine which is operably connected to the first chassis and can also be connected to the second chassis.<br><br>**[0026]** In another embodiment of the invention, the vehicle includes more than four wheels, such as six and preferably eight wheels but can contain an even greater number of wheels which are connected to the vehicle and powered by independent hydraulic or other propulsion power such as electric, chain, belt drive, wheel motors. The wheel motors likewise operably connect to an engine on the vehicle via a transmission and or hydraulic pump, which is operably inter-connected to the hydraulic or other propel drive means to the wheel motors and engine via hydraulic lines and preferably connects to a flow divider and or combination flow divider manifolds to regulate hydraulic flow to the wheel motors and other hydraulic components. Similarly, there can be a plural-ity of flow dividers and or combination of flow divider mani-folds to regulate and distribute flow in the hydraulic lines to each motor on an equalized basis. Isolation valves can be operably interposed between the wheel motors and aforesaid components. Additionally, sensors can be provided to detect when there is a pressure differential change in the connections and the system can preferably automatically and or manually actuate the appropriate isolation valves in a manner to main-tain flow equilibration in the system. Stability can be accom-plished when traveling over rough ground and includes a frame having a sealed hull to provide the vehicle with buoy-ancy. A platform exists on the frame above the hull which includes a plurality of open surfaces through which a quick release connector may be inserted to secure a functional unit or aid unit to the platform.<br><br>**[0039]** Each of the first and second chassis 102 and 104 include a plurality of wheels 120 and 122, respectively, which can each preferably be operably connected to a hydraulic or other propel means wheel motor 124 and 126, respectively. The hydraulic or other propel means wheel motors 124 and 126 can preferably be of a direct wheel mount type, such as the Bosch Rexroth MCRS-380 which are operably connected a transmission and or hydraulic pump or a combination of pumps which are operably connected to an engine 130 which can preferably be operably connected to the first chassis 102 or optionally second chassis 104. The engine 130 can be a relatively low horsepower diesel unit, such as 166 horse power (124 KW) @3500 RPM FPT (Fiat Power Train) diesel engine. |

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| | **[0040]** Transmission and or tandem combination hydraulic pumps 132 and 134 can operably interconnect to the hydraulic (and or other propel means) wheel motors 124 and 126 and engine 130 via hydraulic lines 136A and 136B and 138A and 138B, wherein lines 136A and 138A can preferably connect to flow divider 140 and 142 (and or combination of flow divider manifolds) to regulate hydraulic flow to the wheel motors 124 and 126 and lines 136B and 138B are return lines to the respective pumps 132 and 134.<br><br>**[0041]** There can be a plurality of flow dividers and or combination of flow divider manifolds 140 and 142 to regulate and distribute flow in the hydraulic lines 136A and 136B and 138A and 138B, respectively, to motors 124 and 126 on an equalized basis. Operably interposed between the flow dividers 140 and 142, pumps 132 and 134, and motors 124 and 126 are flushing valves 146 for flushing hydraulic fluid to aid in fluid cooling and excess fluid.<br><br>**[0042]** FIGS. 5-7 depict half of the hydraulic system and thus it is understood that components not mentioned here are likewise operatively disposed in the vehicle 100. Recirculation valves 150 can be operably interposed between the wheel motors 124 and 126 and high speed shift valves 154 operably connect to one flow divider and or combination of flow divider manifolds 140. A second speed valve 156 and brake valve 157 can be operably interposed between pump 130 and one of each of the wheel motors 124 and 126.<br><br>**[0045]** Importantly, the ability to control the power system provides for counter rotation of wheels 120 and 122 (e.g. left) rotate and or drive in forward motion while wheels 120 and 122 (e.g., right) rotate and or drive in reverse motion or vice versa, skid steering where one side (e.g. left) of wheels 120 and 122 are precluded from moving and the other side (e.g., right) wheels 120 and 122 are under power of movement, as well as forward and reverse movement of wheels 120 and 122 and turn steer capabilities where as wheels 120 and 122 (e.g., left) rotate or drive forward at full power and wheels 120 and 122 (e.g., right) rotate or drive at a reduced power or vice versa which creates a slow, smooth gradual turning like that of an automobile. Preferably, a joy stick 164 can be operably connected to the control processor 160 and be equipped with contact switches such that actuation of the joy stick in a predetermined quadrant direction or part thereof will initiate one of the aforementioned operations of the control processor. For example, the forward movement of the stick 164 moves the vehicle 100 forward, backward movement moves vehicle 100 back, left or right movement produces a turn steer and or skid steer of one or the other side wheels 120 or 122 to effect a turn based on the position of the joy stick at the moment (e.g. from the point of neutral, half way through the axis of side travel of the joystick the vehicle will be in turn steer mode. As the operator or driver passes the half way axis point the vehicle 100 transitions into the skid steer mode then onto the counter-rotation mode), a diagonal movement produces a turn steer mode of the wheels disposed on opposite sides of the vehicle 100. The vehicle 100 includes more than four wheels, such as six and preferably eight wheels but could be of even a greater number of wheels which are connected to the vehicle and powered by independent hydraulic and or other propel means wheel motors. |

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| | **[0054]** It is contemplated that a direct drive system can be employed wherein one or more wheels is driven by a drive shaft with suitable yoke connections, a hydrostatic drive transmission or via a hydraulic system as is known in the art. One or more drive systems can be employed on the vehicle 100 providing the user with multiple drive mechanism options. |
| a fluid pump for pumping liquid manure; | **[0050]** The chassis 104 can include functional engines fire-fighting equipment 200 including a water tank, 201, dual engine pumps 202 and hoses with nozzles 204 all of which are operatively interconnected. Additionally, foam systems, dry chemical systems, split cell foam tanks, mechanical compo-nents, electrified water and or slippery slime tanks, micro-wave impulse equipment, water cannon, hazardous materials decontamination, weapons armaments, construction aid tools and packages can be provided.<br><br>**[0051]** The firefighting equipment 200 preferably includes cross over capabilities to perform hazardous material decon-tamination operations by merely the flip of an electronic switch and or a manual over-ride to the valve flow system. The fighting equipment 200 can be equipped with quick release pump systems that can provide various pressure and volume outputs to flow sufficient volumes of water and or foam and or dry chemicals in a fire and or hazardous materials decontami-nation mission from a distance that can not endanger the operator of the vehicle 100 and enable one to quickly change from one flow rate and pressure to another as the mission dictates such as from fire to hazmat to weapons to DEW (Directed Energy Weapons) to crowd control in seconds. The fighting equipment 200 can include pump systems which have the capabilities to quickly change from flow rates and pressures of High Pressure/Low Volume, to Low Pressure/ High Volume, to Low Pressure/Low Volume, to High Pres-sure/High Volume in "joint" work together or independent pump systems and all pump systems can be draft capable, such as gross decontamination of men and equipment to include vehicles, downed aircraft, buildings, civilians, ect; in remote areas of the world during or after a chemical agent and or gas agent (Dirty Bomb), release by an opposing enemy or terrorist cell. Hose and attachment therewith can preferably be equipped to have quick release couplings. The fighting equipment 200 can be self powered (i.e., dual engines 202) or can be powered by the vehicle engine 130 through stacked hydrostatic PTO (Power Take Off) or hybrid electrical drive systems. Vehicle and secondary engines of the combustion type can be electrically started and all engine horse powers can be predetermined to be capable to give the necessary power to drive the intended function(s) of the engine.<br><br>**[0052]** The tank 201 can be used for fire-fighting and includes a sloshless baffle system. The baffle system includes a plurality of panels disposed transversely to one another using both horizontal and vertical plates of various thick-nesses depending on the size of the tank (for structural sta-bility) utilizing varying sized holes in each panel (e.g., hole sizes of less than about an inch can be used). The baffle system provides for relatively constant fluid level within the tank 201. The baffle system prevents uncontrolled upward, downward and side to side fluid movement in rough terrains, sudden stops and starts, and most importantly sudden or quick turns that suddenly transfers the fluids weight energy dangerously in different directions. This also provides the vehicle 100 better stabilization and control characteristics at higher speeds during tight or sharp maneuvering as well as on rough, steep or unleveled terrains. The tank 201 is equipped with pump 202 for providing various pressure and volume outputs to shoot sufficient volumes of water and/or foam and or/dry chemicals toward a fire from a distance that can not endanger the operator of vehicle 100. The user/operator can |

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| | thereby quickly switch from one flow rate and/or pressure to another as needed. Hoses can preferably be provided with tank 201 and are of a quick connect end couplings as is known in the art.<br><br>**[0059]** This combination also has several important advan-tages, such as the ability to transport a pump or other device to direct the water, foam and dry chemicals at the fire, as well as decontamination solutions for decon missions. For example, the pump can force the water, foam and dry chemi-cal and decon solutions through the hose at a higher velocity, thus allowing the firefighters to attack the fire or decon objec-tive from a greater distance than if they were on foot. Further-more, while it is not practical for a firefighter or group of firefighters to carry a water cannon and then hold and operate it by hand, the present invention does permit the transporta-tion of the water cannon, thus enabling the firefighters to attack the fire or decon objective from an even greater dis-tance. The water cannon is as well capable to shoot streams of water (straight streams, fog, wide streams) of just water, foam, dry chemical or decon solutions in any combination and can be remotely controlled either wirelessly or wired in manned, unmanned and autonomous modes as well the water cannon can be operated manually in the case of a system failure.<br><br>**[0061]** The use of a pump mounted to the all terrain vehicle which is capable of pumping water from a lake or stream onto a fire is another feature of the present invention. This feature reduces the need to transport water to the site of the fire or, in the alternative, makes it easier to transport water pumping equipment to the body of water to be used infighting the fire.<br><br>**[0063]** The tank 201 can preferably have a recessed top for storage of hoses, multiple 100-foot hoses, and a large fill orifice, a screen to filter debris that would otherwise clog hoses, pump 202 to refill the tank 201 from lakes, ponds, or streams. Additionally, the tank 201 includes a master drain for flushing and cleaning the tank. In addition, a water cannon may be provided with vehicle 100 and located adjacent the operator to enable use thereof. |
| A power source connected to a hydraulic pump, the power source configured to provide power to both the ground engaging propulsion structure and the fluid pump; and, | **[0024]** Accordingly, the present invention is an improve-ment on the prior invention and is directed to an all-terrain vehicle. One embodiment of the vehicle includes a first chas-sis and second chassis hingedly connected to the first chassis, each of the first and second chassis including a plurality of wheels which are operably connected to a hydraulic motor (or other propelling means, such as electric wheel). In this regard, the connection can be made for up and down movement (vertical) (oscillation) for unlevel terrain movement compen-sation and or cross hingedly connected for both up and down movement (vertical) (oscillation) as well as side to side move-ment (horizontal)(oscillation) for unlevel terrain movement compensation. The hydraulic motor is operably connected to an engine which is operably connected to the first chassis and can also be connected to the second chassis.<br><br>**[0025]** A transmission pump operably interconnects the hydraulic motors and engine via hydraulic lines and prefer-ably connects to a flow divider and or a combination of flow divider manifolds to regulate hydraulic flow to the wheel motors and other hydraulic components. There can be a plu-rality of flow dividers and or flow divider manifolds to regu-late and distribute flow in the hydraulic lines to each wheel motor on an equalized basis. Isolation valves can be operably interposed between the wheel motors and aforesaid |

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| | compo-nents. These valves could either manually or automatically be sensing pressure changes and isolate a damaged wheel motor from the rest of the hydraulic system preventing loss of power and hydraulic fluid from the rest of the hydraulic system. Additionally, sensors can be provided to detect when there is a pressure differential change in the connections and the system can preferably automatically as well as manually actuate the appropriate isolation valves in a manner to main-tain flow equilibration in the system. Thus, if there is a leak in one wheel motor or other hydraulic component, this can be stopped and hydraulic fluid redirected to the remaining wheel motors and other hydraulic components thereby providing drive and PTO (Power Take Off) for the remaining wheel motors and other hydraulic components. The vehicle thus enables a series of backup drive mechanisms. A central con-trol processor can be provided on the vehicle and is operably connected to the sensors and Isolation and speed shift valves and power system, such as that provided by the engine or separate battery, to control operation of each of the aforemen-tioned movable components. Importantly, this provides for counter rotation of wheels where one side of wheels turn in a forward motion while at the exact same time the other side of wheels tum in a reverse motion and vice versa depending on which direction the operator decides to execute the counter rotation e.g. (left or right, in forward or reverse), skid steering where one side of wheels are precluded from moving and the other side wheels are under power of movement tum steer like an automobile where one side receives less power than the other at the wheel motors thereby creating a smooth left or right turn, as well as forward and reverse movement of wheels. Preferably, a joy stick can be operably connected to the control processor and be equipped with contact switches such that actuation of the joy stick in a predetermined quad-rant direction or part thereof will initiate one of the aforementioned operations of the control processor thereof will initiate one of the aforementioned operations of the control processor.<br><br>**[0039]** Each of the first and second chassis 102 and 104 include a plurality of wheels 120 and 122, respectively, which can each preferably be operably connected to a hydraulic or other propel means wheel motor 124 and 126, respectively. The hydraulic or other propel means wheel motors 124 and 126 can preferably be of a direct wheel mount type, such as the Bosch Rexroth MCR5-380 which are operably connected a transmission and or hydraulic pump or a combination of pumps which are operably connected to an engine 130 which can preferably be operably connected to the first chassis 102 or optionally second chassis 104. The engine 130 can be a relatively low horsepower diesel unit, such as 166 horse power (124 KW) @3500 RPM FPT (Fiat Power Train) diesel engine.<br><br>**[0040]** Transmission and or tandem combination hydraulic pumps 132 and 134 can operably interconnect to the hydrau-lic ( and or other propel means) wheel motors 124 and 126 and engine 130 via hydraulic lines 136A and 136B and 138A and 138B, wherein lines 136A and 138A can preferably connect to flow divider 140 and 142 (and or combination of flow divider manifolds) to regulate hydraulic flow to the wheel motors 124 and 126 and lines 136B and 138B are return lines to the respective pumps 132 and 134.<br><br>**[0051]** The firefighting equipment 200 preferably includes cross over capabilities to perform hazardous material decon-tamination operations by merely the flip of an electronic switch and or a manual over-ride to the valve flow system. The fighting equipment 200 can be equipped with quick release pump systems that can provide various pressure and volume outputs to flow sufficient volumes |

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| | of water and or foam and or dry chemicals in a fire and or hazardous materials decontami-nation mission from a distance that can not endanger the operator of the vehicle 100 and enable one to quickly change from one flow rate and pressure to another as the mission dictates such as from fire to hazmat to weapons to DEW (Directed Energy Weapons) to crowd control in seconds. The fighting equipment 200 can include pump systems which have the capabilities to quickly change from flow rates and pressures of High Pressure/Low Volume, to Low Pressure/ High Volume, to Low Pressure/Low Volume, to High Pres-sure/High Volume in "joint" work together or independent pump systems and all pump systems can be draft capable, such as gross decontamination of men and equipment to include vehicles, downed aircraft, buildings, civilians, ect; in remote areas of the world during or after a chemical agent and or gas agent (Dirty Bomb), release by an opposing enemy or terrorist cell. Hose and attachment therewith can preferably be equipped to have quick release couplings. The fighting equipment 200 can be self powered (i.e., dual engines 202) or can be powered by the vehicle engine 130 through stacked hydrostatic PTO (Power Take Off) or hybrid electrical drive systems. Vehicle and secondary engines of the combustion type can be electrically started and all engine horse powers can be predetermined to be capable to give the necessary power to drive the intended function(s) of the engine. |
| A wireless remote control configured to enable an operator who is remote from the vehicle to: (1) control the ground engaging propulsion structure; (2) control a flow of liquid manure from the liquid pump; (3) control at least one of the speed and direction of the vehicle when the vehicle is ground engaging; and, (4) control at least one of the speed and direction of the vehicle when the vehicle is floating. | **[0018]** Another objective is to develop a small manned or unmanned or manned to unmanned by the methods of using various broadcast signals such as satellite, broadband, high band, Ethernet, Bluetooth and algorithms for robotic ground vehicle's.<br><br>**[0021]** Another objective is to develop a small manned or unmanned robotic ground vehicle.<br><br>**[0059]** This combination also has several important advan-tages, such as the ability to transport a pump or other device to direct the water, foam and dry chemicals at the fire, as well as decontamination solutions for decon missions. For example, the pump can force the water, foam and dry chemi-cal and decon solutions through the hose at a higher velocity, thus allowing the firefighters to attack the fire or decon objec-tive from a greater distance than if they were on foot. Further-more, while it is not practical for a firefighter or group of firefighters to carry a water cannon and then hold and operate it by hand, the present invention does permit the transporta-tion of the water cannon, thus enabling the firefighters to attack the fire or decon objective from an even greater dis-tance. The water cannon is as well capable to shoot streams of water (straight streams, fog, wide streams) of just water, foam, dry chemical or decon solutions in any combination and can be remotely controlled either wirelessly or wired in manned, unmanned and autonomous modes as well the water cannon can be operated manually in the case of a system failure.<br><br>**[0064]** Manual controls provide for operation of the vehicle 100. However, the operations of each unit described herein can be performed by remote control as part of processor 160 which is operably quick connectable to the vehicle 100 hav-ing suitable connections therewith for each aforesaid compo-nent as well as transceiver equipment associated therewith enabling the processor 160 to be reprogrammed on a need to need basis. This enables the vehicle 100 to be remotely con-trolled via line of sight, gps, or by air via aircraft such as the so-called "Preditor." Remote control mechanics, servos, hardware, wiring harnesses can be quick releasable |

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| | to facili-tate easy replacement of any faulty components in case of damage or failure. A manual over-ride can be incorporated should the vehicle 100 need to be taken out of autonomous, unmanned mode for whatever reason and vice versa.<br><br>**[0065]** For example, in an instance where as the operator could become incapacitated on a mission, the vehicle 100 via radio, satellite, cell, Modbus, serial communications, remote serial communication ports, digital or IR (infrared) signals can be placed into remote control operation to continue the mission as well as performance and other informational data can be transmitted and received by a second or more party remote from the vehicle 100. This can be accomplished through methods such as using the SAE (Society of Automotive Engineer's), J-1939 standard reader's protocol using the engine and transmission ECM (Engine Control Module) and ECU (Engine Control Unit) and transmission data reader's through the use of pressure regulators linked with On Board Diagnostics (OBD-2) 16 or more pin connector linked to various communication signals such as "Blue Tooth", communication transmissions to send all relevant and pertinent engine, transmission, weapons system data to and from the aircraft allowing the aircraft and the vehicle 100 to communicate with each other through vehicle 100's on-board computer software to convert any incoming wide spectrum of broadband signals, radio frequencies (UHF, VHF, Low Band, High Band, etc.) cell, satellite, digital or IR (Infra Red) signals into electrical impulses to engage servo's attached to vehicle 100 steering, braking, engine, transmission, weapons deployment and engagement systems, etc., allowing the aircraft to be the forward observers eye's (FO), for guidance to the vehicle 100. For instance, the aircraft informing the vehicle 100 that it's approaching a ravine and informing the vehicle 100 that it needs to down shift the transmission into a lower gear ratio for more power to negotiate itself at a slower speed to drive into the ravine and having the power to climb back out of the ravine. All pertinent data transmissions can be sent back and forth allowing for all systems monitoring such as vehicle speed, rpm, water temperature, oil pressure, gear transmission, electrical input and output, weapons diagnostics to include arming and disarming as well as including weapons selection if equipped with multiple weapons systems, water tank level, foam tank level, pump water pressure etc. |
| | |
| 2. The vehicle of claim 1, wherein the vehicle further comprises a conduit fluidly connected to the fluid pump. | **[0050]** The chassis 104 can include functional engines fire-fighting equipment 200 including a water tank, 201, dual engine pumps 202 and hoses with nozzles 204 all of which are operatively interconnected. Additionally, foam systems, dry chemical systems, split cell foam tanks, mechanical compo-nents, electrified water and or slippery slime tanks, micro-wave impulse equipment, water cannon, hazardous materials decontamination, weapons armaments, construction aid tools and packages can be provided.<br><br>**[0051]** The firefighting equipment 200 preferably includes cross over capabilities to perform hazardous material decon-tamination operations by merely the flip of an electronic switch and or a manual over-ride to the valve flow system. The fighting equipment 200 can be equipped with quick release pump systems that can provide various pressure and volume outputs to flow sufficient volumes of water and or foam and or dry chemicals in a fire and or hazardous materials decontami-nation mission from a distance that can not endanger the operator of the vehicle 100 and enable one to quickly change from one flow rate and pressure to another as the mission dictates such as from fire to hazmat to weapons to DEW (Directed Energy Weapons) to crowd control in seconds. The fighting |

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| | equipment 200 can include pump systems which have the capabilities to quickly change from flow rates and pressures of High Pressure/Low Volume, to Low Pressure/ High Volume, to Low Pressure/Low Volume, to High Pres-sure/High Volume in "joint" work together or independent pump systems and all pump systems can be draft capable, such as gross decontamination of men and equipment to include vehicles, downed aircraft, buildings, civilians, ect; in remote areas of the world during or after a chemical agent and or gas agent (Dirty Bomb), release by an opposing enemy or terrorist cell. Hose and attachment therewith can preferably be equipped to have quick release couplings. The fighting equipment 200 can be self powered (i.e., dual engines 202) or can be powered by the vehicle engine 130 through stacked hydrostatic PTO (Power Take Off) or hybrid electrical drive systems. Vehicle and secondary engines of the combustion type can be electrically started and all engine horse powers can be predetermined to be capable to give the necessary power to drive the intended function(s) of the engine.<br><br>**[0052]** The tank 201 can be used for fire-fighting and includes a sloshless baffle system. The baffle system includes a plurality of panels disposed transversely to one another using both horizontal and vertical plates of various thick-nesses depending on the size of the tank (for structural sta-bility) utilizing varying sized holes in each panel (e.g., hole sizes of less than about an inch can be used). The baffle system provides for relatively constant fluid level within the tank 201. The baffle system prevents uncontrolled upward, downward and side to side fluid movement in rough terrains, sudden stops and starts, and most importantly sudden or quick turns that suddenly transfers the fluids weight energy dangerously in different directions. This also provides the vehicle 100 better stabilization and control characteristics at higher speeds during tight or sharp maneuvering as well as on rough, steep or unleveled terrains. The tank 201 is equipped with pump 202 for providing various pressure and volume outputs to shoot sufficient volumes of water and/or foam and or/dry chemicals toward a fire from a distance that can not endanger the operator of vehicle 100. The user/operator can thereby quickly switch from one flow rate and/or pressure to another as needed. Hoses can preferably be provided with tank 201 and are of a quick connect end couplings as is known in the art.<br><br>**[0059]** This combination also has several important advantages, such as the ability to transport a pump or other device to direct the water, foam and dry chemicals at the fire, as well as decontamination solutions for decon missions. For example, the pump can force the water, foam and dry chemical and decon solutions through the hose at a higher velocity, thus allowing the firefighters to attack the fire or decon objective from a greater distance than if they were on foot. Further-more, while it is not practical for a firefighter or group of firefighters to carry a water cannon and then hold and operate it by hand, the present invention does permit the transporta-tion of the water cannon, thus enabling the firefighters to attack the fire or decon objective from an even greater distance. The water cannon is as well capable to shoot streams of water (straight streams, fog, wide streams) of just water, foam, dry chemical or decon solutions in any combination and can be remotely controlled either wirelessly or wired in manned, unmanned and autonomous modes as well the water cannon can be operated manually in the case of a system failure. |

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| 3. The vehicle of claim 2, wherein the conduit comprises an opening at an end thereof. | **[0050]** The chassis 104 can include functional engines fire-fighting equipment 200 including a water tank, 201, dual engine pumps 202 and hoses with nozzles 204 all of which are operatively interconnected. Additionally, foam systems, dry chemical systems, split cell foam tanks, mechanical compo-nents, electrified water and or slippery slime tanks, micro-wave impulse equipment, water cannon, hazardous materials decontamination, weapons armaments, construction aid tools and packages can be provided.<br><br>**[0052]** The tank 201 can be used for fire-fighting and includes a sloshless baffle system. The baffle system includes a plurality of panels disposed transversely to one another using both horizontal and vertical plates of various thick-nesses depending on the size of the tank (for structural sta-bility) utilizing varying sized holes in each panel (e.g., hole sizes of less than about an inch can be used). The baffle system provides for relatively constant fluid level within the tank 201. The baffle system prevents uncontrolled upward, downward and side to side fluid movement in rough terrains, sudden stops and starts, and most importantly sudden or quick turns that suddenly transfers the fluids weight energy dangerously in different directions. This also provides the vehicle 100 better stabilization and control characteristics at higher speeds during tight or sharp maneuvering as well as on rough, steep or unleveled terrains. The tank 201 is equipped with pump 202 for providing various pressure and volume outputs to shoot sufficient volumes of water and/or foam and or/dry chemicals toward a fire from a distance that can not endanger the operator of vehicle 100. The user/operator can thereby quickly switch from one flow rate and/or pressure to another as needed. Hoses can preferably be provided with tank 201 and are of a quick connect end couplings as is known in the art. |
| | |
| 4. The vehicle of claim 3, wherein the wireless remote control is configured to control an orientation of the opening. | **[0051]** The firefighting equipment 200 preferably includes cross over capabilities to perform hazardous material decon-tamination operations by merely the flip of an electronic switch and or a manual over-ride to the valve flow system. The fighting equipment 200 can be equipped with quick release pump systems that can provide various pressure and volume outputs to flow sufficient volumes of water and or foam and or dry chemicals in a fire and or hazardous materials decontami-nation mission from a distance that can not endanger the operator of the vehicle 100 and enable one to quickly change from one flow rate and pressure to another as the mission dictates such as from fire to hazmat to weapons to DEW (Directed Energy Weapons) to crowd control in seconds. The fighting equipment 200 can include pump systems which have the capabilities to quickly change from flow rates and pressures of High Pressure/Low Volume, to Low Pressure/ High Volume, to Low Pressure/Low Volume, to High Pres-sure/High Volume in "joint" work together or independent pump systems and all pump systems can be draft capable, such as gross decontamination of men and equipment to include vehicles, downed aircraft, buildings, civilians, ect; in remote areas of the world during or after a chemical agent and or gas agent (Dirty Bomb), release by an opposing enemy or terrorist cell. Hose and attachment therewith can preferably be equipped to have quick release couplings. The fighting equipment 200 can be self powered (i.e., dual engines 202) or can be powered by the vehicle engine 130 through stacked hydrostatic PTO (Power Take Off) or hybrid electrical drive systems. Vehicle and secondary engines of the combustion type can be electrically started and all engine horse powers can be predetermined to be capable to give the necessary power to drive the intended function(s) of the engine |

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| | **[0059]** This combination also has several important advan-tages, such as the ability to transport a pump or other device to direct the water, foam and dry chemicals at the fire, as well as decontamination solutions for decon missions. For example, the pump can force the water, foam and dry chemi-cal and decon solutions through the hose at a higher velocity, thus allowing the firefighters to attack the fire or decon objec-tive from a greater distance than if they were on foot. Further-more, while it is not practical for a firefighter or group of firefighters to carry a water cannon and then hold and operate it by hand, the present invention does permit the transporta-tion of the water cannon, thus enabling the firefighters to attack the fire or decon objective from an even greater dis-tance. The water cannon is as well capable to shoot streams of water (straight streams, fog, wide streams) of just water, foam, dry chemical or decon solutions in any combination and can be remotely controlled either wirelessly or wired in manned, unmanned and autonomous modes as well the water cannon can be operated manually in the case of a system failure. |
| | |
| 5. The vehicle of claim 4, wherein the vehicle further comprises a nozzle at the end of the conduit. | **[0050]** The chassis 104 can include functional engines fire-fighting equipment 200 including a water tank, 201, dual engine pumps 202 and hoses with nozzles 204 all of which are operatively interconnected. Additionally, foam systems, dry chemical systems, split cell foam tanks, mechanical compo-nents, electrified water and or slippery slime tanks, micro-wave impulse equipment, water cannon, hazardous materials decontamination, weapons armaments, construction aid tools and packages can be provided. |
| | |
| 6. The vehicle of claim 2, wherein the vehicle further comprises a nozzle at the end of the conduit. | **[0050]** The chassis 104 can include functional engines fire-fighting equipment 200 including a water tank, 201, dual engine pumps 202 and hoses with nozzles 204 all of which are operatively interconnected. Additionally, foam systems, dry chemical systems, split cell foam tanks, mechanical compo-nents, electrified water and or slippery slime tanks, micro-wave impulse equipment, water cannon, hazardous materials decontamination, weapons armaments, construction aid tools and packages can be provided. |
| | |
| 7. The vehicle of claim 1, wherein the at least one of speed and direction of the vehicle when the vehicle is floating is controlled by a fluid mover. | **[0049]** A protective cage 103 can be provided on the chassis 102 for the occupant and or occupants. Communications, special operations, laser, search, rescue, medical, surveillance, cargo, transport, construction, fuel tank, vehicle engine, transmission, propulsion pumps, wiring connectors, wire harnesses, instrument panels, access panels, computer, doors, windows, hatches, sensors, imaging equipment can preferably be operatively connected to the chassis 102 and or chassis 104.<br><br>**[0058]** The vehicle 100 is designed to be drivable on uneven ground, on mud, through deep water, or on other surfaces a regular automobile or truck cannot be driven on. To achieve this effect, the vehicle can be relatively lightweight, having eight, ten or twelve-wheel drive or more, which can prefer-ably be sealed against water intrusion to critical engine and transmission parts. Weight reduction can be achieved by using various polymers which also have ballistic proof capa-bility. |

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| | [0059] This combination also has several important advan-tages, such as the ability to transport a pump or other device to direct the water, foam and dry chemicals at the fire, as well as decontamination solutions for decon missions. For example, the pump can force the water, foam and dry chemi-cal and decon solutions through the hose at a higher velocity, thus allowing the firefighters to attack the fire or decon objec-tive from a greater distance than if they were on foot. Further-more, while it is not practical for a firefighter or group of firefighters to carry a water cannon and then hold and operate it by hand, the present invention does permit the transporta-tion of the water cannon, thus enabling the firefighters to attack the fire or decon objective from an even greater dis-tance. The water cannon is as well capable to shoot streams of water (straight streams, fog, wide streams) of just water, foam, dry chemical or decon solutions in any combination and can be remotely controlled either wirelessly or wired in manned, unmanned and autonomous modes as well the water cannon can be operated manually in the case of a system failure.<br><br>[0064] Manual controls provide for operation of the vehicle 100. However, the operations of each unit described herein can be performed by remote control as part of processor 160 which is operably quick connectable to the vehicle 100 hav-ing suitable connections therewith for each aforesaid compo-nent as well as transceiver equipment associated therewith enabling the processor 160 to be reprogrammed on a need to need basis. This enables the vehicle 100 to be remotely con-trolled via line of sight, gps, or by air via aircraft such as the so-called "Preditor." Remote control mechanics, servos, hardware, wiring harnesses can be quick releasable to facili-tate easy replacement of any faulty components in case of damage or failure. A manual over-ride can be incorporated should the vehicle 100 need to be taken out of autonomous, unmanned mode for whatever reason and vice versa.<br><br>[0079] The hull (bottom section) of the vehicle 100 can preferably be shaped in such a configuration as that of a boat in a slight curved V shape with angles from 1 degree to 95 degrees and may be greater that accomplish two separate tasks. (Task!) The hull of vehicle 100 can facilitate amphibious operations that accomplish three different sub tasks being (1) eliminating water drag on the vehicle as it moves through the water, (2) water build up distribution in front of and to the sides of the vehicle 100 (which slows the movement and turning capabilities of the vehicle 100), (3) significantly enhances both the movement directional speed i.e. forward or reverse and significantly enhances the turning capabilities left or right as well of vehicle 100. (Task 2) Upper body 105 and lower body 107 of vehicle 100 can facilitate land and sea borne operations in relationship to ballistic resistant proper-ties and Explosive Energy Dispersion, (EED), in relationship to IED's (Improvised Explosive Devices) and other explosive devices i.e. (land mines and or water mines), that accomplish two sub tasks. (Sub-Task 1) The hull uses angles of 1 degree to 95 degrees or greater significantly enhance ballistic pro-jectile defeat by creating a ricochet effect thereby increasing the effectiveness of the used method of armor. Using varying degrees of angles in different configurations using different thicknesses within the armors configuration can create a pocket and or channel the trajectory path of the munition into this pocket to catch or trap the munition or channel and deflect the munition into a different trajectory away from a crucial portion of the vehicle 100. (Sub-Task 2) The hull can use the same 1 degree to 95 degree angles or greater incorporated into configuration geometry into both the upper and lower body of vehicle 100 which accomplishes explosive blast energy dis-persion away from the vehicle 100. The lower body of vehicle 100 would also incorporate blast ducts using |

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| Claim | Carrier I (US 2012/0185129) |
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| | 1 degree to 95 degree angles in a shape configuration of duct channels formed within or incorporated onto the lower body of vehicle 100 that would give the energy and or pressure release of the blast a directional path to follow leading away from the vehicle 100 and critical components of the underbody and side components of the vehicle 100 such as wheel mounting hubs, tires and other critical components. |
| | |
| 12. The vehicle of claim 4, wherein the power source is connected to the hydraulic pump by a mechanical drive and connected to the fluid pump by the mechanical drive. | **[0026]** In another embodiment of the invention, the vehicle includes more than four wheels, such as six and preferably eight wheels but can contain an even greater number of wheels which are connected to the vehicle and powered by independent hydraulic or other propulsion power such as electric, chain, belt drive, wheel motors. The wheel motors likewise operably connect to an engine on the vehicle via a transmission and or hydraulic pump, which is operably inter-connected to the hydraulic or other propel drive means to the wheel motors and engine via hydraulic lines and preferably connects to a flow divider and or combination flow divider manifolds to regulate hydraulic flow to the wheel motors and other hydraulic components. Similarly, there can be a plural-ity of flow dividers and or combination of flow divider mani-folds to regulate and distribute flow in the hydraulic lines to each motor on an equalized basis. Isolation valves can be operably interposed between the wheel motors and aforesaid components. Additionally, sensors can be provided to detect when there is a pressure differential change in the connections and the system can preferably automatically and or manually actuate the appropriate isolation valves in a manner to main-tain flow equilibration in the system. Stability can be accom-plished when traveling over rough ground and includes a frame having a sealed hull to provide the vehicle with buoy-ancy. A platform exists on the frame above the hull which includes a plurality of open surfaces through which a quick release connector may be inserted to secure a functional unit or aid unit to the platform.<br><br>**[0039]** Each of the first and second chassis 102 and 104 include a plurality of wheels 120 and 122, respectively, which can each preferably be operably connected to a hydraulic or other propel means wheel motor 124 and 126, respectively. The hydraulic or other propel means wheel motors 124 and 126 can preferably be of a direct wheel mount type, such as the Bosch Rexroth MCRS-380 which are operably connected a transmission and or hydraulic pump or a combination of pumps which are operably connected to an engine 130 which can preferably be operably connected to the first chassis 102 or optionally second chassis 104. The engine 130 can be a relatively low horsepower diesel unit, such as 166 horse power (124 KW) @3500 RPM FPT (Fiat Power Train) diesel engine.<br><br>**[0050]** The chassis 104 can include functional engines fire-fighting equipment 200 including a water tank, 201, dual engine pumps 202 and hoses with nozzles 204 all of which are operatively interconnected. Additionally, foam systems, dry chemical systems, split cell foam tanks, mechanical compo-nents, electrified water and or slippery slime tanks, micro-wave impulse equipment, water cannon, hazardous materials decontamination, weapons armaments, construction aid tools and packages can be provided.<br><br>**[0051]** The firefighting equipment 200 preferably includes cross over capabilities to perform hazardous material decon-tamination operations by merely the flip of an electronic switch and or a manual over-ride to the valve flow system. The fighting equipment 200 |

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|---|---|
| | can be equipped with quick release pump systems that can provide various pressure and volume outputs to flow sufficient volumes of water and or foam and or dry chemicals in a fire and or hazardous materials decontami-nation mission from a distance that can not endanger the operator of the vehicle 100 and enable one to quickly change from one flow rate and pressure to another as the mission dictates such as from fire to hazmat to weapons to DEW (Directed Energy Weapons) to crowd control in seconds. The fighting equipment 200 can include pump systems which have the capabilities to quickly change from flow rates and pressures of High Pressure/Low Volume, to Low Pressure/ High Volume, to Low Pressure/Low Volume, to High Pres-sure/High Volume in "joint" work together or independent pump systems and all pump systems can be draft capable, such as gross decontamination of men and equipment to include vehicles, downed aircraft, buildings, civilians, ect; in remote areas of the world during or after a chemical agent and or gas agent (Dirty Bomb), release by an opposing enemy or terrorist cell. Hose and attachment therewith can preferably be equipped to have quick release couplings. The fighting equipment 200 can be self powered (i.e., dual engines 202) or can be powered by the vehicle engine 130 through stacked hydrostatic PTO (Power Take Off) or hybrid electrical drive systems. Vehicle and secondary engines of the combustion type can be electrically started and all engine horse powers can be predetermined to be capable to give the necessary power to drive the intended function(s) of the engine |
| | |
| 13. The vehicle of claim 12, wherein the wireless remote control is configured to operate the hydraulic motor to operate the ground engaging propulsion structure at variable speed. | **[0039]** Each of the first and second chassis 102 and 104 include a plurality of wheels 120 and 122, respectively, which can each preferably be operably connected to a hydraulic or other propel means wheel motor 124 and 126, respectively. The hydraulic or other propel means wheel motors 124 and 126 can preferably be of a direct wheel mount type, such as the Bosch Rexroth MCR5-380 which are operably connected a transmission and or hydraulic pump or a combination of pumps which are operably connected to an engine 130 which can preferably be operably connected to the first chassis 102 or optionally second chassis 104. The engine 130 can be a relatively low horsepower diesel unit, such as 166 horse power (124 KW) @3500 RPM FPT (Fiat Power Train) diesel engine.<br><br>**[0040]** Transmission and or tandem combination hydraulic pumps 132 and 134 can operably interconnect to the hydrau-lic ( and or other propel means) wheel motors 124 and 126 and engine 130 via hydraulic lines 136A and 136B and 138A and 138B, wherein lines 136A and 138A can preferably connect to flow divider 140 and 142 (and or combination of flow divider manifolds) to regulate hydraulic flow to the wheel motors 124 and 126 and lines 136B and 138B are return lines to the respective pumps 132 and 134.<br><br>**[0041]** There can be a plurality of flow dividers and or combination of flow divider manifolds 140 and 142 to regulate and distribute flow in the hydraulic lines 136A and 136B and 138A and 138B, respectively, to motors 124 and 126 on an equalized basis. Operably interposed between the flow dividers 140 and 142, pumps 132 and 134, and motors 124 and 126 are flushing valves 146 for flushing hydraulic fluid to aid in fluid cooling and excess fluid.<br><br>**[0042]** FIGS. 5-7 depict half of the hydraulic system and thus it is understood that components not mentioned here are likewise operatively disposed in the vehicle 100. Recirculation valves 150 can be operably interposed between the wheel |

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| | motors 124 and 126 and high speed shift valves 154 operably connect to one flow divider and or combination of flow divider manifolds 140. A second speed valve 156 and brake valve 157 can be operably interposed between pump 130 and one of each of the wheel motors 124 and 126.<br><br>**[0045]** Importantly, the ability to control the power system provides for counter rotation of wheels 120 and 122 (e.g. left) rotate and or drive in forward motion while wheels 120 and 122 (e.g., right) rotate and or drive in reverse motion or vice versa, skid steering where one side (e.g. left) of wheels 120 and 122 are precluded from moving and the other side (e.g., right) wheels 120 and 122 are under power of movement, as well as forward and reverse movement of wheels 120 and 122 and turn steer capabilities where as wheels 120 and 122 (e.g., left) rotate or drive forward at full power and wheels 120 and 122 (e.g., right) rotate or drive at a reduced power or vice versa which creates a slow, smooth gradual turning like that of an automobile. Preferably, a joy stick 164 can be operably connected to the control processor 160 and be equipped with contact switches such that actuation of the joy stick in a predetermined quadrant direction or part thereof will initiate one of the aforementioned operations of the control processor. For example, the forward movement of the stick 164 moves the vehicle 100 forward, backward movement moves vehicle 100 back, left or right movement produces a turn steer and or skid steer of one or the other side wheels 120 or 122 to effect a turn based on the position of the joy stick at the moment (e.g. from the point of neutral, half way through the axis of side travel of the joystick the vehicle will be in turn steer mode. As the operator or driver passes the half way axis point the vehicle 100 transitions into the skid steer mode then onto the counter-rotation mode), a diagonal movement produces a turn steer mode of the wheels disposed on opposite sides of the vehicle 100. The vehicle 100 includes more than four wheels, such as six and preferably eight wheels but could be of even a greater number of wheels which are connected to the vehicle and powered by independent hydraulic and or other propel means wheel motors.<br><br>**[0054]** It is contemplated that a direct drive system can be employed wherein one or more wheels is driven by a drive shaft with suitable yoke connections, a hydrostatic drive transmission or via a hydraulic system as is known in the art. One or more drive systems can be employed on the vehicle 100 providing the user with multiple drive mechanism options.<br><br>**[0056]** The aforesaid components making up the drive sys-tem can be controlled by a processor 160 which can respond from the joy stick 164 input. The drive system can be pro-grammed to be fully automatic through all speeds or manu-ally controlled. The drive system can also have program-mable down-shift inhibit points programmed into the processor 160 which would prevent the drive system from reacting to a shift or directional signal if the action would result in an engine over-speed and/or damage situation or to prevent accidental directional shuttle shifting at speeds which would cause a drive line package damage, premature counter rotation, skid steer movement or operator's discomfort, i.e., neck and back injuries, (whip lash). |

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| | **[0064]** Manual controls provide for operation of the vehicle 100. However, the operations of each unit described herein can be performed by remote control as part of processor 160 which is operably quick connectable to the vehicle 100 hav-ing suitable connections therewith for each aforesaid compo-nent as well as transceiver equipment associated therewith enabling the processor 160 to be reprogrammed on a need to need basis. This enables the vehicle 100 to be remotely con-trolled via line of sight, gps, or by air via aircraft such as the so-called "Preditor." Remote control mechanics, servos, hardware, wiring harnesses can be quick releasable to facili-tate easy replacement of any faulty components in case of damage or failure. A manual over-ride can be incorporated should the vehicle 100 need to be taken out of autonomous, unmanned mode for whatever reason and vice versa. |
| | |
| 14. The vehicle of claim 13, wherein the ground engaging propulsion structure comprises a set of wheels. | **[0024]** Accordingly, the present invention is an improve-ment on the prior invention and is directed to an all-terrain vehicle. One embodiment of the vehicle includes a first chas-sis and second chassis hingedly connected to the first chassis, each of the first and second chassis including a plurality of wheels which are operably connected to a hydraulic motor (or other propelling means, such as electric wheel). In this regard, the connection can be made for up and down movement (vertical) (oscillation) for unlevel terrain movement compen-sation and or cross hingedly connected for both up and down movement (vertical) (oscillation) as well as side to side move-ment (horizontal)(oscillation) for unlevel terrain movement compensation. The hydraulic motor is operably connected to an engine which is operably connected to the first chassis and can also be connected to the second chassis.<br><br>**[0026]** In another embodiment of the invention, the vehicle includes more than four wheels, such as six and preferably eight wheels but can contain an even greater number of wheels which are connected to the vehicle and powered by independent hydraulic or other propulsion power such as electric, chain, belt drive, wheel motors. The wheel motors likewise operably connect to an engine on the vehicle via a transmission and or hydraulic pump, which is operably inter-connected to the hydraulic or other propel drive means to the wheel motors and engine via hydraulic lines and preferably connects to a flow divider and or combination flow divider manifolds to regulate hydraulic flow to the wheel motors and other hydraulic components. Similarly, there can be a plural-ity of flow dividers and or combination of flow divider mani-folds to regulate and distribute flow in the hydraulic lines to each motor on an equalized basis. Isolation valves can be operably interposed between the wheel motors and aforesaid components. Additionally, sensors can be provided to detect when there is a pressure differential change in the connections and the system can preferably automatically and or manually actuate the appropriate isolation valves in a manner to main-tain flow equilibration in the system. Stability can be accom-plished when traveling over rough ground and includes a frame having a sealed hull to provide the vehicle with buoy-ancy. A platform exists on the frame above the hull which includes a plurality of open surfaces through which a quick release connector may be inserted to secure a functional unit or aid unit to the platform.<br><br>**[0039]** Each of the first and second chassis 102 and 104 include a plurality of wheels 120 and 122, respectively, which can each preferably be operably connected to a hydraulic or other propel means wheel motor 124 and 126, respectively. The hydraulic or other propel means wheel motors 124 and 126 can preferably be of a direct wheel mount type, such as the Bosch Rexroth MCR5-380 which |

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| | are operably connected a transmission and or hydraulic pump or a combination of pumps which are operably connected to an engine 130 which can preferably be operably connected to the first chassis 102 or optionally second chassis 104. The engine 130 can be a relatively low horsepower diesel unit, such as 166 horse power (124 KW) @3500 RPM FPT (Fiat Power Train) diesel engine.<br><br>**[0045]** Importantly, the ability to control the power system provides for counter rotation of wheels 120 and 122 (e.g. left) rotate and or drive in forward motion while wheels 120 and 122 (e.g., right) rotate and or drive in reverse motion or vice versa, skid steering where one side (e.g. left) of wheels 120 and 122 are precluded from moving and the other side (e.g., right) wheels 120 and 122 are under power of movement, as well as forward and reverse movement of wheels 120 and 122 and turn steer capabilities where as wheels 120 and 122 (e.g., left) rotate or drive forward at full power and wheels 120 and 122 (e.g., right) rotate or drive at a reduced power or vice versa which creates a slow, smooth gradual turning like that of an automobile. Preferably, a joy stick 164 can be operably connected to the control processor 160 and be equipped with contact switches such that actuation of the joy stick in a predetermined quadrant direction or part thereof will initiate one of the aforementioned operations of the control processor. For example, the forward movement of the stick 164 moves the vehicle 100 forward, backward movement moves vehicle 100 back, left or right movement produces a turn steer and or skid steer of one or the other side wheels 120 or 122 to effect a turn based on the position of the joy stick at the moment (e.g. from the point of neutral, half way through the axis of side travel of the joystick the vehicle will be in turn steer mode. As the operator or driver passes the half way axis point the vehicle 100 transitions into the skid steer mode then onto the counter-rotation mode), a diagonal movement produces a turn steer mode of the wheels disposed on opposite sides of the vehicle 100. The vehicle 100 includes more than four wheels, such as six and preferably eight wheels but could be of even a greater number of wheels which are connected to the vehicle and powered by independent hydraulic and or other propel means wheel motors.<br><br>**[0054]** It is contemplated that a direct drive system can be employed wherein one or more wheels is driven by a drive shaft with suitable yoke connections, a hydrostatic drive transmission or via a hydraulic system as is known in the art. One or more drive systems can be employed on the vehicle 100 providing the user with multiple drive mechanism options. |
| | |
| 15. The vehicle of claim 14, wherein the set of wheels comprises at least two powered wheels. | **[0024]** Accordingly, the present invention is an improve-ment on the prior invention and is directed to an all-terrain vehicle. One embodiment of the vehicle includes a first chas-sis and second chassis hingedly connected to the first chassis, each of the first and second chassis including a plurality of wheels which are operably connected to a hydraulic motor (or other propelling means, such as electric wheel). In this regard, the connection can be made for up and down movement (vertical) (oscillation) for unlevel terrain movement compen-sation and or cross hingedly connected for both up and down movement (vertical) (oscillation) as well as side to side move-ment (horizontal)(oscillation) for unlevel terrain movement compensation. The hydraulic motor is operably connected to an engine which is operably connected to the first chassis and can also be connected to the second chassis. |

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| Claim | Carrier I (US 2012/0185129) |
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| | **[0026]** In another embodiment of the invention, the vehicle includes more than four wheels, such as six and preferably eight wheels but can contain an even greater number of wheels which are connected to the vehicle and powered by independent hydraulic or other propulsion power such as electric, chain, belt drive, wheel motors. The wheel motors likewise operably connect to an engine on the vehicle via a transmission and or hydraulic pump, which is operably inter-connected to the hydraulic or other propel drive means to the wheel motors and engine via hydraulic lines and preferably connects to a flow divider and or combination flow divider manifolds to regulate hydraulic flow to the wheel motors and other hydraulic components. Similarly, there can be a plural-ity of flow dividers and or combination of flow divider mani-folds to regulate and distribute flow in the hydraulic lines to each motor on an equalized basis. Isolation valves can be operably interposed between the wheel motors and aforesaid components. Additionally, sensors can be provided to detect when there is a pressure differential change in the connections and the system can preferably automatically and or manually actuate the appropriate isolation valves in a manner to main-tain flow equilibration in the system. Stability can be accom-plished when traveling over rough ground and includes a frame having a sealed hull to provide the vehicle with buoy-ancy. A platform exists on the frame above the hull which includes a plurality of open surfaces through which a quick release connector may be inserted to secure a functional unit or aid unit to the platform. |
| | |
| 16. The vehicle of claim 14, wherein the set of wheels comprises four powered wheels, each wheel of the set of wheels is independently powered and is operable at variable speed. | **[0024]** Accordingly, the present invention is an improve-ment on the prior invention and is directed to an all-terrain vehicle. One embodiment of the vehicle includes a first chas-sis and second chassis hingedly connected to the first chassis, each of the first and second chassis including a plurality of wheels which are operably connected to a hydraulic motor (or other propelling means, such as electric wheel). In this regard, the connection can be made for up and down movement (vertical) (oscillation) for unlevel terrain movement compen-sation and or cross hingedly connected for both up and down movement (vertical) (oscillation) as well as side to side move-ment (horizontal)(oscillation) for unlevel terrain movement compensation. The hydraulic motor is operably connected to an engine which is operably connected to the first chassis and can also be connected to the second chassis.<br><br>**0025]** A transmission pump operably interconnects the hydraulic motors and engine via hydraulic lines and prefer-ably connects to a flow divider and or a combination of flow divider manifolds to regulate hydraulic flow to the wheel motors and other hydraulic components. There can be a plu-rality of flow dividers and or flow divider manifolds to regu-late and distribute flow in the hydraulic lines to each wheel motor on an equalized basis. Isolation valves can be operably interposed between the wheel motors and aforesaid compo-nents. These valves could either manually or automatically be sensing pressure changes and isolate a damaged wheel motor from the rest of the hydraulic system preventing loss of power and hydraulic fluid from the rest of the hydraulic system. Additionally, sensors can be provided to detect when there is a pressure differential change in the connections and the system can preferably automatically as well as manually actuate the appropriate isolation valves in a manner to main-tain flow equilibration in the system. Thus, if there is a leak in one wheel motor or other hydraulic component, this can be stopped and hydraulic fluid redirected to the remaining wheel motors and other hydraulic components thereby providing drive and PTO (Power Take Off) for the remaining wheel motors and other hydraulic components. The vehicle thus enables a series of backup drive mechanisms. A central con-trol processor |

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| | can be provided on the vehicle and is operably connected to the sensors and Isolation and speed shift valves and power system, such as that provided by the engine or separate battery, to control operation of each of the aforemen-tioned movable components. Importantly, this provides for counter rotation of wheels where one side of wheels turn in a forward motion while at the exact same time the other side of wheels tum in a reverse motion and vice versa depending on which direction the operator decides to execute the counter rotation e.g. (left or right, in forward or reverse), skid steering where one side of wheels are precluded from moving and the other side wheels are under power of movement tum steer like an automobile where one side receives less power than the other at the wheel motors thereby creating a smooth left or right turn, as well as forward and reverse movement of wheels. Preferably, a joy stick can be operably connected to the control processor and be equipped with contact switches such that actuation of the joy stick in a predetermined quad-rant direction or part thereof will initiate one of the aforementioned operations of the control processor thereof will initiate one of the aforementioned operations of the control processor.<br><br>**[0026]** In another embodiment of the invention, the vehicle includes more than four wheels, such as six and preferably eight wheels but can contain an even greater number of wheels which are connected to the vehicle and powered by independent hydraulic or other propulsion power such as electric, chain, belt drive, wheel motors. The wheel motors likewise operably connect to an engine on the vehicle via a transmission and or hydraulic pump, which is operably inter-connected to the hydraulic or other propel drive means to the wheel motors and engine via hydraulic lines and preferably connects to a flow divider and or combination flow divider manifolds to regulate hydraulic flow to the wheel motors and other hydraulic components. Similarly, there can be a plural-ity of flow dividers and or combination of flow divider mani-folds to regulate and distribute flow in the hydraulic lines to each motor on an equalized basis. Isolation valves can be operably interposed between the wheel motors and aforesaid components. Additionally, sensors can be provided to detect when there is a pressure differential change in the connections and the system can preferably automatically and or manually actuate the appropriate isolation valves in a manner to main-tain flow equilibration in the system. Stability can be accom-plished when traveling over rough ground and includes a frame having a sealed hull to provide the vehicle with buoy-ancy. A platform exists on the frame above the hull which includes a plurality of open surfaces through which a quick release connector may be inserted to secure a functional unit or aid unit to the platform.<br><br>**[0039]** Each of the first and second chassis 102 and 104 include a plurality of wheels 120 and 122, respectively, which can each preferably be operably connected to a hydraulic or other propel means wheel motor 124 and 126, respectively. The hydraulic or other propel means wheel motors 124 and 126 can preferably be of a direct wheel mount type, such as the Bosch Rexroth MCR5-380 which are operably connected a transmission and or hydraulic pump or a combination of pumps which are operably connected to an engine 130 which can preferably be operably connected to the first chassis 102 or optionally second chassis 104. The engine 130 can be a relatively low horsepower diesel unit, such as 166 horse power (124 KW) @3500 RPM FPT (Fiat Power Train) diesel engine. |

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| Claim | Carrier I (US 2012/0185129) |
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| | **[0040]** Transmission and or tandem combination hydraulic pumps 132 and 134 can operably interconnect to the hydrau-lic ( and or other propel means) wheel motors 124 and 126 and engine 130 via hydraulic lines 136A and 136B and 138A and 138B, wherein lines 136A and 138A can preferably connect to flow divider 140 and 142 (and or combination of flow divider manifolds) to regulate hydraulic flow to the wheel motors 124 and 126 and lines 136B and 138B are return lines to the respective pumps 132 and 134.<br><br>**[0041]** There can be a plurality of flow dividers and or combination of flow divider manifolds 140 and 142 to regulate and distribute flow in the hydraulic lines 136A and 136B and 138A and 138B, respectively, to motors 124 and 126 on an equalized basis. Operably interposed between the flow dividers 140 and 142, pumps 132 and 134, and motors 124 and 126 are flushing valves 146 for flushing hydraulic fluid to aid in fluid cooling and excess fluid.<br><br>**[0042]** FIGS. 5-7 depict half of the hydraulic system and thus it is understood that components not mentioned here are likewise operatively disposed in the vehicle 100. Recirculation valves 150 can be operably interposed between the wheel motors 124 and 126 and high speed shift valves 154 operably connect to one flow divider and or combination of flow divider manifolds 140. A second speed valve 156 and brake valve 157 can be operably interposed between pump 130 and one of each of the wheel motors 124 and 126.<br><br>**[0045]** Importantly, the ability to control the power system provides for counter rotation of wheels 120 and 122 (e.g. left) rotate and or drive in forward motion while wheels 120 and 122 (e.g., right) rotate and or drive in reverse motion or vice versa, skid steering where one side (e.g. left) of wheels 120 and 122 are precluded from moving and the other side (e.g., right) wheels 120 and 122 are under power of movement, as well as forward and reverse movement of wheels 120 and 122 and turn steer capabilities where as wheels 120 and 122 (e.g., left) rotate or drive forward at full power and wheels 120 and 122 (e.g., right) rotate or drive at a reduced power or vice versa which creates a slow, smooth gradual turning like that of an automobile. Preferably, a joy stick 164 can be operably connected to the control processor 160 and be equipped with contact switches such that actuation of the joy stick in a predetermined quadrant direction or part thereof will initiate one of the aforementioned operations of the control processor. For example, the forward movement of the stick 164 moves the vehicle 100 forward, backward movement moves vehicle 100 back, left or right movement produces a turn steer and or skid steer of one or the other side wheels 120 or 122 to effect a turn based on the position of the joy stick at the moment (e.g. from the point of neutral, half way through the axis of side travel of the joystick the vehicle will be in turn steer mode. As the operator or driver passes the half way axis point the vehicle 100 transitions into the skid steer mode then onto the counter-rotation mode), a diagonal movement produces a turn steer mode of the wheels disposed on opposite sides of the vehicle 100. The vehicle 100 includes more than four wheels, such as six and preferably eight wheels but could be of even a greater number of wheels which are connected to the vehicle and powered by independent hydraulic and or other propel means wheel motors. |

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| Claim | Carrier I (US 2012/0185129) |
|---|---|
| | [0054] It is contemplated that a direct drive system can be employed wherein one or more wheels is driven by a drive shaft with suitable yoke connections, a hydrostatic drive transmission or via a hydraulic system as is known in the art. One or more drive systems can be employed on the vehicle 100 providing the user with multiple drive mechanism options. |
| | |
| 17. The vehicle of claim 16, wherein the wheels are operable at variable speed by the hydraulic motor. | [0025] A transmission pump operably interconnects the hydraulic motors and engine via hydraulic lines and prefer-ably connects to a flow divider and or a combination of flow divider manifolds to regulate hydraulic flow to the wheel motors and other hydraulic components. There can be a plu-rality of flow dividers and or flow divider manifolds to regu-late and distribute flow in the hydraulic lines to each wheel motor on an equalized basis. Isolation valves can be operably interposed between the wheel motors and aforesaid compo-nents. These valves could either manually or automatically be sensing pressure changes and isolate a damaged wheel motor from the rest of the hydraulic system preventing loss of power and hydraulic fluid from the rest of the hydraulic system. Additionally, sensors can be provided to detect when there is a pressure differential change in the connections and the system can preferably automatically as well as manually actuate the appropriate isolation valves in a manner to main-tain flow equilibration in the system. Thus, if there is a leak in one wheel motor or other hydraulic component, this can be stopped and hydraulic fluid redirected to the remaining wheel motors and other hydraulic components thereby providing drive and PTO (Power Take Off) for the remaining wheel motors and other hydraulic components. The vehicle thus enables a series of backup drive mechanisms. A central con-trol processor can be provided on the vehicle and is operably connected to the sensors and Isolation and speed shift valves and power system, such as that provided by the engine or separate battery, to control operation of each of the aforemen-tioned movable components. Importantly, this provides for counter rotation of wheels where one side of wheels turn in a forward motion while at the exact same time the other side of wheels tum in a reverse motion and vice versa depending on which direction the operator decides to execute the counter rotation e.g. (left or right, in forward or reverse), skid steering where one side of wheels are precluded from moving and the other side wheels are under power of movement tum steer like an automobile where one side receives less power than the other at the wheel motors thereby creating a smooth left or right turn, as well as forward and reverse movement of wheels. Preferably, a joy stick can be operably connected to the control processor and be equipped with contact switches such that actuation of the joy stick in a predetermined quad-rant direction or part thereof will initiate one of the aforementioned operations of the control processor thereof will initiate one of the aforementioned operations of the control processor.<br><br>[0026] In another embodiment of the invention, the vehicle includes more than four wheels, such as six and preferably eight wheels but can contain an even greater number of wheels which are connected to the vehicle and powered by independent hydraulic or other propulsion power such as electric, chain, belt drive, wheel motors. The wheel motors likewise operably connect to an engine on the vehicle via a transmission and or hydraulic pump, which is operably inter-connected to the hydraulic or other propel drive means to the wheel motors and engine via hydraulic lines and preferably connects to a flow divider and or combination flow divider manifolds to regulate hydraulic flow to the wheel motors and other hydraulic components. Similarly, there can be a plural-ity of flow dividers and or combination of flow divider mani-folds to regulate and distribute flow in the hydraulic lines to each motor on an equalized |

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| Claim | Carrier I (US 2012/0185129) |
|---|---|
| | basis. Isolation valves can be operably interposed between the wheel motors and aforesaid components. Additionally, sensors can be provided to detect when there is a pressure differential change in the connections and the system can preferably automatically and or manually actuate the appropriate isolation valves in a manner to main-tain flow equilibration in the system. Stability can be accom-plished when traveling over rough ground and includes a frame having a sealed hull to provide the vehicle with buoy-ancy. A platform exists on the frame above the hull which includes a plurality of open surfaces through which a quick release connector may be inserted to secure a functional unit or aid unit to the platform.<br><br>**[0039]** Each of the first and second chassis 102 and 104 include a plurality of wheels 120 and 122, respectively, which can each preferably be operably connected to a hydraulic or other propel means wheel motor 124 and 126, respectively. The hydraulic or other propel means wheel motors 124 and 126 can preferably be of a direct wheel mount type, such as the Bosch Rexroth MCR5-380 which are operably connected a transmission and or hydraulic pump or a combination of pumps which are operably connected to an engine 130 which can preferably be operably connected to the first chassis 102 or optionally second chassis 104. The engine 130 can be a relatively low horsepower diesel unit, such as 166 horse power (124 KW) @3500 RPM FPT (Fiat Power Train) diesel engine.<br><br>**[0040]** Transmission and or tandem combination hydraulic pumps 132 and 134 can operably interconnect to the hydrau-lic ( and or other propel means) wheel motors 124 and 126 and engine 130 via hydraulic lines 136A and 136B and 138A and 138B, wherein lines 136A and 138A can preferably connect to flow divider 140 and 142 (and or combination of flow divider manifolds) to regulate hydraulic flow to the wheel motors 124 and 126 and lines 136B and 138B are return lines to the respective pumps 132 and 134.<br><br>**[0041]** There can be a plurality of flow dividers and or combination of flow divider manifolds 140 and 142 to regulate and distribute flow in the hydraulic lines 136A and 136B and 138A and 138B, respectively, to motors 124 and 126 on an equalized basis. Operably interposed between the flow dividers 140 and 142, pumps 132 and 134, and motors 124 and 126 are flushing valves 146 for flushing hydraulic fluid to aid in fluid cooling and excess fluid.<br><br>**[0042]** FIGS. 5-7 depict half of the hydraulic system and thus it is understood that components not mentioned here are likewise operatively disposed in the vehicle 100. Recirculation valves 150 can be operably interposed between the wheel motors 124 and 126 and high speed shift valves 154 operably connect to one flow divider and or combination of flow divider manifolds 140. A second speed valve 156 and brake valve 157 can be operably interposed between pump 130 and one of each of the wheel motors 124 and 126.<br><br>**[0045]** Importantly, the ability to control the power system provides for counter rotation of wheels 120 and 122 (e.g. left) rotate and or drive in forward motion while wheels 120 and 122 (e.g., right) rotate and or drive in reverse motion or vice versa, skid steering where one side (e.g. left) of wheels 120 and 122 are precluded from moving and the other side (e.g., right) wheels 120 and 122 are |

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| Claim | Carrier I (US 2012/0185129) |
|---|---|
| | under power of movement, as well as forward and reverse movement of wheels 120 and 122 and turn steer capabilities where as wheels 120 and 122 (e.g., left) rotate or drive forward at full power and wheels 120 and 122 (e.g., right) rotate or drive at a reduced power or vice versa which creates a slow, smooth gradual turning like that of an automobile. Preferably, a joy stick 164 can be operably connected to the control processor 160 and be equipped with contact switches such that actuation of the joy stick in a predetermined quadrant direction or part thereof will initiate one of the aforementioned operations of the control processor. For example, the forward movement of the stick 164 moves the vehicle 100 forward, backward movement moves vehicle 100 back, left or right movement produces a turn steer and or skid steer of one or the other side wheels 120 or 122 to effect a turn based on the position of the joy stick at the moment (e.g. from the point of neutral, half way through the axis of side travel of the joystick the vehicle will be in turn steer mode. As the operator or driver passes the half way axis point the vehicle 100 transitions into the skid steer mode then onto the counter-rotation mode), a diagonal movement produces a turn steer mode of the wheels disposed on opposite sides of the vehicle 100. The vehicle 100 includes more than four wheels, such as six and preferably eight wheels but could be of even a greater number of wheels which are connected to the vehicle and powered by independent hydraulic and or other propel means wheel motors.<br><br>**[0054]** It is contemplated that a direct drive system can be employed wherein one or more wheels is driven by a drive shaft with suitable yoke connections, a hydrostatic drive transmission or via a hydraulic system as is known in the art. One or more drive systems can be employed on the vehicle 100 providing the user with multiple drive mechanism options. |
| | |
| 18. The vehicle of claim 17, wherein the vehicle further comprises a nozzle at the end of the conduit. | **[0050]** The chassis 104 can include functional engines fire-fighting equipment 200 including a water tank, 201, dual engine pumps 202 and hoses with nozzles 204 all of which are operatively interconnected. Additionally, foam systems, dry chemical systems, split cell foam tanks, mechanical compo-nents, electrified water and or slippery slime tanks, micro-wave impulse equipment, water cannon, hazardous materials decontamination, weapons armaments, construction aid tools and packages can be provided. |
| | |
| 19. The vehicle of claim 17, wherein the at least one of speed and direction of the vehicle when the vehicle is floating is controlled by a fluid mover. | **[0049]** A protective cage 103 can be provided on the chassis 102 for the occupant and or occupants. Communications, special operations, laser, search, rescue, medical, surveillance, cargo, transport, construction, fuel tank, vehicle engine, transmission, propulsion pumps, wiring connectors, wire harnesses, instrument panels, access panels, computer, doors, windows, hatches, sensors, imaging equipment can preferably be operatively connected to the chassis 102 and or chassis 104.<br><br>**[0058]** The vehicle 100 is designed to be drivable on uneven ground, on mud, through deep water, or on other surfaces a regular automobile or truck cannot be driven on. To achieve this effect, the vehicle can be relatively lightweight, having eight, ten or twelve-wheel drive or more, which can prefer-ably be sealed against water intrusion to critical engine and transmission parts. Weight reduction can be achieved by using various polymers which also have ballistic proof capa-bility. |

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| Claim | Carrier I (US 2012/0185129) |
|---|---|
| | **[0059]** This combination also has several important advan-tages, such as the ability to transport a pump or other device to direct the water, foam and dry chemicals at the fire, as well as decontamination solutions for decon missions. For example, the pump can force the water, foam and dry chemi-cal and decon solutions through the hose at a higher velocity, thus allowing the firefighters to attack the fire or decon objec-tive from a greater distance than if they were on foot. Further-more, while it is not practical for a firefighter or group of firefighters to carry a water cannon and then hold and operate it by hand, the present invention does permit the transporta-tion of the water cannon, thus enabling the firefighters to attack the fire or decon objective from an even greater dis-tance. The water cannon is as well capable to shoot streams of water (straight streams, fog, wide streams) of just water, foam, dry chemical or decon solutions in any combination and can be remotely controlled either wirelessly or wired in manned, unmanned and autonomous modes as well the water cannon can be operated manually in the case of a system failure.<br><br>**[0064]** Manual controls provide for operation of the vehicle 100. However, the operations of each unit described herein can be performed by remote control as part of processor 160 which is operably quick connectable to the vehicle 100 hav-ing suitable connections therewith for each aforesaid compo-nent as well as transceiver equipment associated therewith enabling the processor 160 to be reprogrammed on a need to need basis. This enables the vehicle 100 to be remotely con-trolled via line of sight, gps, or by air via aircraft such as the so-called "Preditor." Remote control mechanics, servos, hardware, wiring harnesses can be quick releasable to facili-tate easy replacement of any faulty components in case of damage or failure. A manual over-ride can be incorporated should the vehicle 100 need to be taken out of autonomous, unmanned mode for whatever reason and vice versa.<br><br>**[0079]** The hull (bottom section) of the vehicle 100 can preferably be shaped in such a configuration as that of a boat in a slight curved V shape with angles from 1 degree to 95 degrees and may be greater that accomplish two separate tasks. (Task!) The hull of vehicle 100 can facilitate amphibious operations that accomplish three different sub tasks being (1) eliminating water drag on the vehicle as it moves through the water, (2) water build up distribution in front of and to the sides of the vehicle 100 (which slows the movement and turning capabilities of the vehicle 100), (3) significantly enhances both the movement directional speed i.e. forward or reverse and significantly enhances the turning capabilities left or right as well of vehicle 100. (Task 2) Upper body 105 and lower body 107 of vehicle 100 can facilitate land and sea borne operations in relationship to ballistic resistant proper-ties and Explosive Energy Dispersion, (EED), in relationship to IED's (Improvised Explosive Devices) and other explosive devices i.e. (land mines and or water mines), that accomplish two sub tasks. (Sub-Task 1) The hull uses angles of 1 degree to 95 degrees or greater significantly enhance ballistic pro-jectile defeat by creating a ricochet effect thereby increasing the effectiveness of the used method of armor. Using varying degrees of angles in different configurations using different thicknesses within the armors configuration can create a pocket and or channel the trajectory path of the munition into this pocket to catch or trap the munition or channel and deflect the munition into a different trajectory away from a crucial portion of the vehicle 100. (Sub-Task 2) The hull can use the same 1 degree to 95 degree angles or greater incorporated into configuration geometry into both the upper and lower body of vehicle 100 which accomplishes |

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| Claim | Carrier I (US 2012/0185129) |
|---|---|
| | explosive blast energy dis-persion away from the vehicle 100. The lower body of vehicle 100 would also incorporate blast ducts using 1 degree to 95 degree angles in a shape configuration of duct channels formed within or incorporated onto the lower body of vehicle 100 that would give the energy and or pressure release of the blast a directional path to follow leading away from the vehicle 100 and critical components of the underbody and side components of the vehicle 100 such as wheel mounting hubs, tires and other critical components. |

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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | |
|---|---|
| In re Patent of: | : |
| Ian Nuhn | : |
| Patent No. 11,358,425 | : |
| Issued June 14, 2022 | : |
| For AMPHIBIOUS PUMPING VEHICLE | : |

## CERTIFICATE OF SERVICE

The undersigned certifies that on August 31, 2022, service of a true and complete copy of this REQUEST FOR *EX PARTE* REEXAMINATION with associated exhibits was served in its entirety via United Postal Service on BRUNET & CO. LTD. at the following addresses:

BRUNET & CO. LTD.
401 Bay St.
Suite 1600
Toronto, ON M5H 2Y4
CANADA

and with sufficient postage affixed, and with delivery confirmation requested.

Respectfully submitted,

MERCHANT & GOULD P.C.
P.O. Box 2903
Minneapolis, Minnesota 55402-0903
612.332.5300

Dated: August 31, 2022

/Robert A. Kalinsky/
Robert A. Kalinsky
Reg. No. 50,471



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PTO/SB/57 (01-18)
Approved for use through 11/30/2021. OMB 0651-0064
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

(Also referred to as FORM PTO-1465)

# REQUEST FOR *EX PARTE* REEXAMINATION TRANSMITTAL FORM

Address to:
**Mail Stop *Ex Parte* Reexam**
**Commissioner for Patents**
**P.O. Box 1450**
**Alexandria, VA 22313-1450**

**Attorney Docket No.:** 19061.0001USR2

**Date:** August 31, 2022

1. ☒ This is a request for *ex parte* reexamination pursuant to 37 CFR 1.510 of patent number 11,358,425 issued June 14, 2022. The request is made by:
   ☐ patent owner. ☒ third party requester.

2. ☒ The name and address of the person requesting reexamination is:
   Bazooka-Farmstar, LLC
   800 E 7th St
   Washington, IA 52353

3. Requester ☒ asserts small entity status (37 CFR 1.27) or ☐ certifies micro entity status (37 CFR 1.29). Only a patent owner requester can certify micro entity status. Form PTO/SB/15A or B must be attached to certify micro entity status.

4. This request is accompanied by payment of the reexamination fee as set forth in:
   ☒ 37 CFR 1.20(c)(2); **or**
   ☐ 37 CFR 1.20(c)(1). **In checking this box for payment of the fee set forth in 37 CFR 1.20(c)(1), requester asserts that this request has forty (40) or fewer pages and complies with all other requirements of 37 CFR 1.20(c)(1).**

   Payment of the reexamination fee is made by the method set forth below.
   a. ☐ A check in the amount of $_____ is enclosed to cover the reexamination fee;
   b. ☐ The Director is hereby authorized to charge the reexamination fee to Deposit Account No. _____;
   c. ☐ Payment by credit card. Form PTO-2038 is attached; **or**
   d. ☒ Payment made via EFS-Web.

   ☒ In addition, the Director is hereby authorized to charge any fee deficiencies to Deposit Account No. 13-2725.

5. ☒ Any refund should be made by ☐ check or ☒ credit to Deposit Account No. 13-2725. 37 CFR 1.26(c). If payment is made by credit card, refund must be to credit card account.

6. ☒ A copy of the patent to be reexamined having a double column format on one side of a separate paper is enclosed. 37 CFR 1.510(b)(4).

7. ☐ CD-ROM or CD-R in duplicate, Computer Program (Appendix) or large table
   ☐ Landscape Table on CD



This collection of information is required by 37 CFR 1.510. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) a request for reexamination. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Mail Stop *Ex Parte* Reexam, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*

8. ☐ Nucleotide and/or Amino Acid Sequence Submission
*If applicable, items a. – c. are required.*
   a. ☐ Computer Readable Form (CRF)
   b. Specification Sequence Listing on:
      i. ☐ CD-ROM (2 copies) or CD-R (2 copies) **or**
      ii. ☐ paper
   c. ☐ Statements verifying identity of above copies.

9. ☐ A copy of any disclaimer, certificate of correction or reexamination certificate issued in the patent is included.

10. ■ Reexamination of claim(s) 1-21 is requested.

11. ■ A copy of every patent or printed publication relied upon is submitted herewith including a listing thereof on Form PTO/SB/08, PTO-1449, or equivalent.

12. ☐ An English language translation of all necessary and pertinent non-English language patents and/or printed publications is attached.

13. ■ The attached detailed request includes at least the following items:
   a. A statement identifying each substantial new question of patentability based on prior patents and printed publications. 37 CFR 1.510(b)(1).
   b. An identification of every claim for which reexamination is requested, and a detailed explanation of the pertinency and manner of applying the cited art to every claim for which reexamination is requested. 37 CFR1.510(b)(2).

14. ☐ A proposed amendment is included (only where the patent owner is the requester). 37 CFR 1.510(e).

15. ■ It is certified that the statutory estoppel provisions of 35 U.S.C. 315(e)(1) or 35 U.S.C. 325(e)(1) do not prohibit requester from filing this *ex parte* reexamination request. 37 CFR 1.510(b)(6).

16. Service
   a. ■ It is certified that a copy of this request (if filed by other than the patent owner) has been served in its entirety on the patent owner as provided in 37 CFR 1.33(c).

      The name and address of the party served are:

      BRUNET & CO. LTD.

      401 Bay St., Suite 1600

      Toronto, ON M5H 2Y4 CANADA

      Date of Service: August 31, 2022

   **OR**

   b. ☐ A duplicate copy is enclosed since service on patent owner was not possible. An explanation of the efforts made to serve patent owner **is attached**. See MPEP 2220.

17. Correspondence Address: Direct all communication about the reexamination to:

☒ The address associated with Customer Number: 23552

**OR**

☐ Firm or Individual Name _____
(at the address identified below)

Address

| City | State | Zip |
|---|---|---|
| | | |

Country

| Telephone | Email |
|---|---|
| | |

18. ☒ The patent is currently the subject of the following concurrent proceeding(s):

a. ☐ Copending reissue Application No. _____

b. ☐ Copending reexamination Control No. _____

c. ☐ Copending Interference No. _____

d. ☒ Copending litigation styled:

Nuhn Industries Ltd. v. Bazooka Farmstar, LLC, United States District Court for the Southern District of Iowa, Civil Action No. 3:22-cv-00044-SMA-HCA

**WARNING : Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

/Robert A. Kalinsky/ — Authorized Signature

August 31, 2022 — Date

Robert A. Kalinsky — Typed/Printed Name

50,471 — Registration No.

☐ For Patent Owner Requester ☒ For Third Party Requester

# Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

# EXHIBIT O

| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| An amphibious vehicle comprising: | | **[0043]** Referring to FIG. 1, an illustrative embodiment of a vehicle 10 is shown. As detailed further herein, vehicle 10 may be a tracked ATV that includes ground engaging members, illustratively a left side track member 12 and a right side track member 14, a powertrain assembly 500 (FIG. 13), a frame assembly 30, a body or tub 40 (FIG. 4), a roll cage assembly 50, and a suspension assembly 70 (FIG. 4). Vehicle 10 may be configured for military applications and is configured to travel through various terrains or surfaces. More particularly, vehicle 10 is configured for both land an amphibious operation. Additionally, vehicle 10 may be operated by remote control. In one embodiment, vehicle 10 may be configured to travel at speeds of approximately 50 mph during land operation. |
| A floatable vehicle body | **Abstract:** A floating manure agitator that floats on the surface of a manure lagoon and that may be remotely controlled to agitate manure supernatant into a slurry with sludge settling on the bottom of the lagoon. The agitator is provided with a plurality of fluid outputs, the direction of which may be controlled to motivate and steer the agitator. The outputs are angled to develop vortices of supernatant into the sludge to further mix the materials into a slurry.<br><br>**[0001]** The present invention relates in general to a manure agitator and, more particularly, to a floating manure agitator for use in association with a manure lagoon.<br><br>**[0006]** It is also known in the art to provide a large vehicle that may be lowered into the lagoon. The vehicle may equipped with a fluid intake, a pump and a fluid output to draw supernatant into the pump and force the supernatant at high speed downward | **[0043]** Referring to FIG. 1, an illustrative embodiment of a vehicle 10 is shown. As detailed further herein, vehicle 10 may be a tracked ATV that includes ground engaging mem-bers, illustratively a left side track member 12 and a right side track member 14, a powertrain assembly 500 (FIG. 13), a frame assembly 30, a body or tub 40 (FIG. 4), a roll cage assembly 50, and a suspension assembly 70 (FIG. 4). Vehicle 10 may be configured for military applications and is configured to travel through various terrains or surfaces. More par-ticularly, vehicle 10 is configured for both land and amphibi-ous operation. Additionally, vehicle 10 may be operated by remote control. In one embodiment, vehicle 10 may be con-figured to travel at speeds of approximately 50 mph during land operation. |

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| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| | toward the sludge. The vehicle is typically moved with cables by operators on the shore.<br><br>**[0008]** It would, therefore, be desirable to provide a vehicle which floats on the manure pond and which is maneuverable. It would also be desirable to provide the vehicle with multiple outlet nozzles to direct the fluid downward into the lagoon a sufficient distance to agitate the solids in the bottom of the lagoon into suspension and create vortices within the lagoon to assist in carrying solids within the sludge into suspension in the supernatant. It would additionally be desirable to direct the nozzles to create vortices that mix the solids of the sludge into suspension with the supernatant, while minimizing the amount of unpleasant smelling hydrogen sulfide rising to the surface and escaping into the air.<br><br>**[0011]** In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore.<br><br>**[0022]** A floating fluid agitator is shown generally as (10) in FIG. 1. A vessel (12) is provided having a frame (14) | **[0051]** Longitudinal frame members 32, 33 and cross frame members 34 may be comprised of a metallic or polymeric material. Frame assembly 30 of FIGS. 7A-7C may be com-prised of an aluminum material, for example 6061-T6 Alu-minum. Similarly, tub 40 may be comprised of an aluminum material, for example 5052-H32 Aluminum. Alternatively, at least a portion of frame assembly 30 and/or tub 40 may include ultra-high molecular weight polyethylene. Addition-ally, frame assembly 30 and/or tub 40 may include a marine-grade pourable urethane coating and/or foam material inserts in order to fill volume voids and resist water ingestion during amphibious operation. As such, frame assembly 30 and tub 40 are configured to minimize water accumulation within vehicle 10. Flotation devices, such as inflatable units, may also be included and secured to vehicle 10 to further increase the buoyancy of vehicle 10 during amphibious operation. In one embodiment, vehicle 10 is configured to float at approxi-mately 1,600 kg without any urethane materials, however, urethane materials may increase the buoyancy of vehicle 10 during amphibious operation. |

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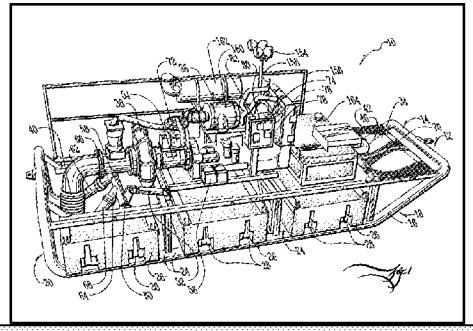
| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| | preferably constructed of welded tubular steel pipes (16). The vessel (12) may alternatively be constructed of any suitable material or may be constructed with a more standard hull, such as those known in the art. The frame (14) is constructed with an angled bow (18) and a vertical stern (20). The angled bow (18) facilitates the launch and retrieval of the agitator (10) from a manure lagoon (22). (FIGS. 1-2). The frame (14) defines a plurality of receiver slots (24) into which are provided modular dock sections (26), such as those known in the art. In the preferred embodiment, the dock sections (26) are 1000 series dock components manufactured by Connect-A-Dock, Inc. of Atlantic, Iowa.<br><br>**Figure 1:**<br><br>  | |
| Ground engaging propulsion structure comprising a plurality of ground engaging elements powered by a hydraulic motor; | | **[003]** Generally, all-terrain vehicles ("ATVs") and utility vehicles ("UVs") are used to carry one or more passengers over a variety of terrain. More particularly, some ATVs and UVs may include side-by-side seating, in which a passenger may be seated next to the driver at the front of the vehicle. Side-by-side vehicles may also include a rear seating area to accommodate additional passengers in the vehicle. Additionally, ATVs and UVs may provide a cargo |

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| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| | | area in the front and/or the rear of the vehicle in order to carry cargo. ATVs and UVs include ground-engaging members, which may be tires, tracks, or any other device for moving the vehicle across the ground.<br><br>**[0044]** As shown in FIG. 1, frame assembly 30 is supported on track members 12, 14. In one embodiment, track members 12, 14 may be comprised of a polymeric material (e.g., rubber) and may be approximately 12 inches in width (approximately 0.3 m). Frame assembly 30 also may support a plurality of body panels, for example a hood 16, a front fender 17, side fenders 18, and a rear fender 19. Front fender 17 and rear fender 19 are provided to protect components of vehicle 10 from dirt, mud, debris, and/or damage. Additionally, frame assembly 30 supports an operator area 20, which includes an operator seat 22, a passenger seat 24, a dash board assembly 25 (FIG. 6), and operator controls, as detailed further herein. Operator seat 22 and passenger seat 24 may be in a side-by-side arrangement and may include a seat back and a seat bottom. In the illustrative embodiment of vehicle 10 of FIG. 1, operator seat 22 is adjacent to and is separate from passenger seat 24. Alternatively, as shown in FIG. 4, operator seat 22 may be coupled to passenger seat 24 such that the seat bottoms are configured as a bench seat and the seat backs are configured as a single back rest.<br><br>**[0062]** Referring now to FIGS. 8, 9A, and 9B, suspension assembly 70 includes a plurality of lower guide or carrier rollers 72, a plurality of upper carrier |

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| | | rollers 73, drive units 590, 592, at least one idler wheel 79, and a plurality of load wheels 75. Carrier rollers 72 and 73, drive units 590, 592, idler wheel 79, and/or load wheels 75 may be comprised of metallic and/or polymeric materials. For example, as shown in FIGS. 9A and 9B, at least one load wheel 75 is configured as a non-pneumatic tire while carrier rollers 72, 73 and idler wheel 79 are configured as spoked wheels. In one embodi-ment, these spoked wheels are made of a polymer. Non-pneumatic tires may be comprised of a polymeric material and may be used to increase the compliance of suspension assembly 70 and track members 12, 14 during operation of vehicle 10.<br><br>**[0063]** Carrier rollers 72, 73, drive units 590, 592, and load wheels 75 are in contact with track members 12, 14 and are supported on side walls 48 of tub 40. In one embodiment, idler wheels 79 are connected to suspension members. Drive units 590, 592 may be supported by front axle assembly 532. Drive units 590, 592 are profiled to engage track members 12, 14, as detailed further herein. Upper carrier rollers 73 may be fixed to side walls 48 of tub 40. Upper carrier rollers 73 and idler wheel 79 are configured to maintain the tension in track members 12, 14. In one embodiment, for example on vehicle 10" of FIG. 3, at least one of upper carrier rollers 73 may be partially covered with a shroud 122. Shroud 122 may be integrally formed with side fender 18" or may be coupled thereto and/or to side body panel 27" with conventional fas-teners. |

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|---|---|---|
| | | **[0064]** Lower carrier rollers 72 and load wheels 75 may be operably coupled to side walls 48 of tub 40 with a plurality of shafts 76 and a plurality of control arms 78. As shown in FIGS. 4, 6, 8, 9A, and 9B, shafts 76 are coupled to side walls 48 with conventional fasteners (e.g., welds, rivets, bolts, adhesive) and an upper end of control arms 78 may be pivot-ally coupled to shafts 76. Lower ends of control arms 78 are operably coupled to lower carrier rollers 72 and load wheels 75. Load wheels 75 include a front load wheel 75a and a rear load wheel 75b and are configured to support the majority of the load of vehicle 10. Lower carrier rollers 72 are configured to support a portion of the load of vehicle 10 and also are configured to guide track members 12, 14 to prevent derail-ment. For example, load wheels 75 may support approxi-mately 75% of the load of vehicle 10 while lower carrier rollers 72 may support approximately 25% of the load of vehicle 10.<br><br>**[0083]** A hydraulic pump assembly 518 is also coupled to engine 502 and is driven by the crankshaft of engine 502. As described herein, hydraulic pump assembly 518 is operative to drive hydraulic motor 552 of steering and drive assembly 508 to facilitate zero-speed turning and low-speed turning of vehicle 10. In one embodiment, hydraulic pump assembly 518 includes a dual hydraulic pump in a dual stage configu-ration, i.e., a pair of hydraulic pumps coupled in a series relationship (see FIG. 18, for example). Hydraulic lines are routed from hydraulic pump assembly 518 to hydraulic motor 552 of steering and drive assembly 508. In one embodiment, |

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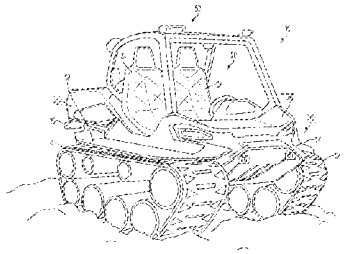
| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| | | hydraulic pump assembly 518 drives other hydraulic components of vehicle 10.<br><br>**[0090]** In one embodiment, to keep a constant velocity of vehicle 10 during a turning operation, the outer side drive axle 534 (relative to the turning direction) is faster than a neutral vehicle (i.e., the requested speed of the vehicle 10), and the inner side drive axle 534 is driven the same amount slower than the neutral vehicle speed. In the illustrated embodiment, intermediate shaft 572 of steering gear assembly 562 is operative to invert the rotational direction of the ring gear 568 of planetary gear assembly 564 relative to the rotational direction of ring gear 568 of planetary gear assembly 566. As such, the steering input provided with hydraulic motor 552 causes one drive axle 534 to drive faster and one drive axle 534 to drive slower relative to the neutral vehicle speed to provide the turning effect.<br><br>**Figure 1**<br>  <br>FIG. 1 |
| a fluid pump for pumping liquid manure; | **Abstract:** A floating manure agitator that floats on the surface of a manure lagoon and that may be remotely controlled to agitate manure supernatant into a slurry with sludge settling on the bottom of the lagoon. The agitator is provided with a plurality | **[0059]** The inverted "U" shape of bottom wall 45 is designed to direct any water in tub 40 toward perimeter 47 of bottom wall 45. As shown in FIG. 19, vehicle 10 may include a plurality of pumps, for |

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|---|---|---|
| | of fluid outputs, the direction of which may be controlled to motivate and steer the agitator. The outputs are angled to develop vortices of supernatant into the sludge to further mix the materials into a slurry.<br><br>**[0001]** The present invention relates in general to a manure agitator and, more particular, a to a floating manure agitator for use in association with a manure lagoon.<br><br>**[0006]** It is also known in the art to provide a large vehicle that may be lowered into the lagoon. The vehicle may equipped with a fluid intake, a pump and a fluid output to draw supernatant into the pump and force the supernatant at high speed downward toward the sludge. The vehicle is typically moved with cables by operators on the shore.<br><br>**[0026]** The slurry pump (38) is coupled to a liquid manure intake, such as a slurry intake, which is a downwardly directed intake pipe (40) in the preferred embodiment and is capable of handling manure crust, supernatant, sludge and the combined slurry. (FIGS. 1 and 4). If desired, the intake pipe (40) may be extensible to adjust the depth of the intake pipe (40). The intake pipe (40) is constructed to extend about twenty-four inches below the surface of the lagoon (22), but may be extended or retracted to any desired depth, including the entire depth of the lagoon (22).<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe ( 42) is a first slurry output ( 44). (FIG. 5). The first slurry output ( 44) is an angled pipe ( 46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe ( 46) is a tapered liquid manure nozzle ( 48) to increase the velocity of slurry (50) passing through the nozzle ( 48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles ( 48) may be | example bilge pumps 630, positioned around perimeter 47 of tub 40 in order to evacuate any water from tub 40. In one embodiment, vehicle 10 may include four pumps 630 coupled to bottom wall 45 at perimeter 47 (i.e., adjacent side walls 48) of tub 40. Pumps 630 may be configured for automatic operation upon the detection of water in tub 40 and/or may be manually operated. Vehicle 10 also may be configured to support a jet pump and/or propeller member to assist with amphibious operation, as detailed further herein.<br><br>**[0079]** As illustrated in FIG. 14, gearbox 510 drives an attachment shaft 511 for transferring engine torque to an attachment or implement (e.g., a work tool) attached to vehicle 10. Attachment shaft 511 illustratively extends outwardly from a backside of gearbox 510 opposite drive shaft 506 and towards the back of vehicle 10 (e.g., through an aperture of the tub) for attaching the external implement. In one embodiment, attachment shaft 511 provides a power take-off for driving the implement with engine 502. In one embodiment, gearbox 510 selectively engages attachment shaft 511 based on an operator input. For example, the shift lever may be actuated to engage attachment shaft 511 to power the implement coupled to vehicle 10. In one embodiment, a clutch assembly is selectively engaged by the operator to engage attachment shaft 511 via gearbox 510. The clutch assembly may be hydraulically or electronically operated. In one embodiment, attachment shaft 511 is used to drive a jet pump and/or propeller member to assist in propelling vehicle in water during amphibious operation. |

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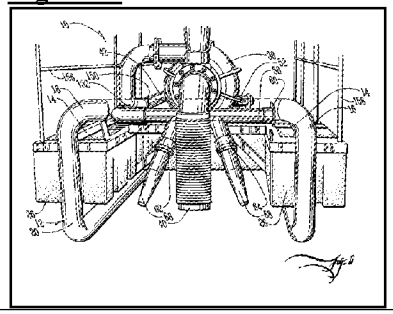
| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| | coupled to the angled pipe ( 46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output ( 44). Coupled between the angled pipe ( 46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**Figure 6:**<br>  | |
| A power source connected to a hydraulic pump, the power source configured to provide power to both the ground engaging propulsion structure and the fluid pump; and, | **[0011]** In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore. | **[0043]** Referring to FIG. 1, an illustrative embodiment of a vehicle 10 is shown. As detailed further herein, vehicle 10 may be a tracked ATV that includes ground engaging members, illustratively a left side track member 12 and a right side track member 14, a powertrain assembly 500 (FIG. 13), a frame assembly 30, a body or tub 40 (FIG. 4), a roll cage assembly 50, and a suspension assembly 70 (FIG. 4). Vehicle 10 may be configured for military applications and is configured to travel through various terrains or surfaces. More particularly, vehicle 10 is configured for both land an amphibious operation. Additionally, vehicle 10 may be operated by remote control. In one embodiment, vehicle 10 may be configured to travel at speeds of approximately 50 mph during land operation. |

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|---|---|---|
| | [0024] The vessel (12) is provided with a deck (34) and a power source (36). (FIG.1). While the power source (36) may be any suitable power source, in the preferred embodiment the power source (36) is a John Deere Tier 3 diesel engine. Depending on the desired size and efficiency of the agitator (10), the power source (36) is preferably between twenty and two-thousand horsepower, more preferably between fifty and five hundred horsepower, and most preferably between one hundred fifty and two hundred fifty horsepower.<br><br>[0025] Coupled to the power source (36) is a liquid manure pump such as a slurry pump (38). In the preferred embodi-ment, the slurry pump (38) is a Cornell Redi-Prime centrifu-gal pump capable of handling both solid and liquid material. The slurry pump (38) is preferably designed to move between one thousand and twenty-four thousand liters of material per minute, more preferably between eight thousand and twenty thousand liters of material per minute, and most preferably about sixteen thousand liters of material per minute. | [0083] A hydraulic pump assembly 518 is also coupled to engine 502 and is driven by the crankshaft of engine 502. As described herein, hydraulic pump assembly 518 is operative to drive hydraulic motor 552 of steering and drive assembly 508 to facilitate zero-speed turning and low-speed turning of vehicle 10. In one embodiment, hydraulic pump assembly 518 includes a dual hydraulic pump in a dual stage configu-ration, i.e., a pair of hydraulic pumps coupled in a series relationship (see FIG. 18, for example). Hydraulic lines are routed from hydraulic pump assembly 518 to hydraulic motor 552 of steering and drive assembly 508. In one embodiment, hydraulic pump assembly 518 drives other hydraulic components of vehicle 10. |
| A wireless remote control configured to enable an operator who is remote from the vehicle to: (1) control the ground engaging propulsion structure; (2) control a flow of liquid manure from the liquid pump; (3) control at least one of the speed and direction of the vehicle when the vehicle is ground | **Abstract:** A floating manure agitator that floats on the surface of a manure lagoon and that may be remotely controlled to agitate manure supernatant into a slurry with sludge settling on the bottom of the lagoon. The agitator is provided with a plurality of fluid outputs, the direction of which may be controlled to motivate and steer the agitator. The outputs are angled to develop vortices of supernatant into the sludge to further mix the materials into a slurry.<br><br>[0009] It would further be desirable to provide a floating vehicle for the mixing of sludge solids into suspension with the supernatant that may be quickly and readily transported to a manure lagoon, launched into the lagoon, used to suspend sludge solids into suspension with the supernatant, and removed from the lagoon onto a trailer. It would also be desirable to provide a | [0043] Referring to FIG. 1, an illustrative embodiment of a vehicle 10 is shown. As detailed further herein, vehicle 10 may be a tracked ATV that includes ground engaging members, illustratively a left side track member 12 and a right side track member 14, a powertrain assembly 500 (FIG. 13), a frame assembly 30, a body or tub 40 (FIG. 4), a roll cage assembly 50, and a suspension assembly 70 (FIG. 4). Vehicle 10 may be configured for military applications and is configured to travel through various terrains or surfaces. More particularly, vehicle 10 is configured for both land and amphibious operation. Additionally, vehicle 10 may be operated by remote control. In one embodiment, vehicle 10 may be configured to travel |

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| engaging; and, (4) control at least one of the speed and direction of the vehicle when the vehicle is floating. | floating vehicle configured to the stan-dard, height, weight and width restrictions associated with highway travel. Additionally, it would be desirable to provide a floating manure agitation vehicle that may be remotely controlled and guided to specific portions of the lagoon to move solids of the sludge into suspension with the superna-tant as desired.<br><br>**[0011]** In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore.<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe ( 42) is a first slurry output ( 44). (FIG. 5). The first slurry output ( 44) is an angled pipe ( 46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe ( 46) is a tapered liquid manure nozzle ( 48) to increase the velocity of slurry (50) passing through the nozzle ( 48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles ( 48) may be coupled to the angled pipe ( 46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output ( 44). Coupled between the angled pipe ( 46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder | at speeds of approximately 50 mph during land operation.<br><br>**[0121]** In one embodiment, vehicle 10 is adapted to be remotely controlled. For example, a remote control electronic device may be used to control vehicle 10 wirelessly without an operator being positioned in the vehicle 10. In one embodiment, vehicle 10 is operative to drive autonomously without human input. |

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|---|---|---|
| | (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**[0035]** Once the agitator (10) is floating in the lagoon (22), the remote control system (84) is used to activate the power source (36) to cause the slurry pump (38) to draw supernatant (128) into the intake pipe (40) and out the outputs (44), (62) and (64). The remote control system (84) is used to direct the pivot pipe (58) to angle the slurry outputs (62) and (64) aft to drive the agitator (10) forward. The remote control system (84) then actuates the control panel (7 4) to direct the hydrau-lic cylinder (52) to angle the first slurry output (44) to turn the agitator (10) port or starboard as desired. The remote control system (84) is thereafter used to direct the volume of super-natant (128) drawn into the intake pipe (40) and the direction at which the supernatant (128) is expelled from the slurry outputs (44), (62) and (64). By manipulating the direction of the slurry outputs (44), (62) and (64) with the remote control system (84), a user may direct the agitator (10) to any desired portion of the lagoon.<br><br>**[0037]** The remote control system (84) may be used to cause the slurry pump (38) to expel slurry (50) more slowly from the slurry outputs (44), (62) and (64) as the agitator (10) is near the shore (142) of the lagoon (22) so as not to penetrate the lining (144) of the lagoon (22) thereby allowing the slurry (50) to escape. As the agitator (10) moves towards the center of the lagoon (22) which may range from five to forty feet deep, or more, the remote control system (84) can be used to increase the speed at which the supernatant (128) is passed from the slurry outputs (44), (62) and (64) to adequately mix the sludge (130) at the deepest portions of the lagoon (22). The remote control system (84) is used to direct the agitator (10) to all desired portions of the lagoon until the crust (126) and supernatant (128) is adequately mixed with the sludge (130). | |

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| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| 2. The vehicle of claim 1, wherein the vehicle further comprises a conduit fluidly connected to the fluid pump. | **[0011]** In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore.<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**[0035]** Once the agitator (10) is floating in the lagoon (22), the remote control system (84) is used to activate the power source (36) to cause the slurry pump (38) to draw supernatant (128) into | |

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|---|---|---|
| | the intake pipe (40) and out the outputs (44), (62) and (64). The remote control system (84) is used to direct the pivot pipe (58) to angle the slurry outputs (62) and (64) aft to drive the agitator (10) forward. The remote control system (84) then actuates the control panel (7 4) to direct the hydrau-lic cylinder (52) to angle the first slurry output (44) to turn the agitator (10) port or starboard as desired. The remote control system (84) is thereafter used to direct the volume of super-natant (128) drawn into the intake pipe (40) and the direction at which the supernatant (128) is expelled from the slurry outputs (44), (62) and (64). By manipulating the direction of the slurry outputs (44), (62) and (64) with the remote control system (84), a user may direct the agitator (10) to any desired portion of the lagoon. | |
| | | |
| 3. The vehicle of claim 2, wherein the conduit comprises an opening at an end thereof. | **[0027]** Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5). | |
| | | |
| 4. The vehicle of claim 3, wherein the wireless remote control is configured to control an | **[0027]** Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different | |

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|---|---|---|
| orientation of the opening. | sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**[0033]** If desired, the remote control system (84) may be provided with a first gate close button (114) that closes a valve (115) on the transport pipe (42) positioned between the fluid intake pipe (40) and forward nozzle (48). A gate open button (116) is also provided to open the valve (150). Similarly, a close gate button (118) and open gate button (120) are pro-vided to open and close a valve (152) provided between the fluid intake pipe (40) and the nozzles (66) and (68). The gate buttons (114), (116), (118) and (120) allow a user to selec-tively supply fluid through one, two or three of the nozzles (48), (66) and (68) as is desired to appropriately agitate the fluid (128) within which the agitator (10) is floating. The remote control system (84) is also provided with a button (122) to actuate lights (154) provided on the agitator (10) if it is desired to use the agitator (10) in circumstances where additional lighting is desired. The remote control system (84) may be configured to receive feedback from the control panel (74), such as system status, latitude, longitude and height coordinates.<br><br>**[0035]** Once the agitator (10) is floating in the lagoon (22), the remote control system (84) is used to activate the power source (36) to cause the slurry pump (38) to draw supernatant (128) into the intake pipe (40) and out the outputs (44), (62) and (64). The remote control system (84) is used to direct the pivot pipe (58) to angle the slurry outputs (62) and (64) aft to drive the agitator (10) forward. The remote control system (84) then actuates the | |

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| | control panel (7 4) to direct the hydrau-lic cylinder (52) to angle the first slurry output ( 44) to turn the agitator (10) port or starboard as desired. The remote control system (84) is thereafter used to direct the volume of super-natant (128) drawn into the intake pipe (40) and the direction at which the supernatant (128) is expelled from the slurry outputs (44), (62) and (64). By manipulating the direction of the slurry outputs (44), (62) and (64) with the remote control system (84), a user may direct the agitator (10) to any desired portion of the lagoon.<br><br>**[0037]** The remote control system (84) may be used to cause the slurry pump (38) to expel slurry (50) more slowly from the slurry outputs (44), (62) and (64) as the agitator (10) is near the shore (142) of the lagoon (22) so as not to penetrate the lining (144) of the lagoon (22) thereby allowing the slurry (50) to escape. As the agitator (10) moves towards the center of the lagoon (22) which may range from five to forty feet deep, or more, the remote control system (84) can be used to increase the speed at which the supernatant (128) is passed from the slurry outputs (44), (62) and (64) to adequately mix the sludge (130) at the deepest portions of the lagoon (22). The remote control system (84) is used to direct the agitator (10) to all desired portions of the lagoon until the crust (126) and supernatant (128) is adequately mixed with the sludge (130).<br><br>**Figure 7:** | |

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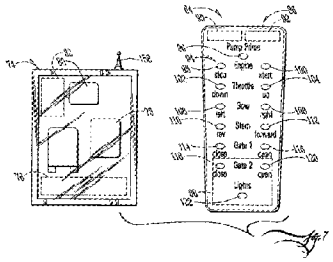
| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| |  | |
| | | |
| 5. The vehicle of claim 4, wherein the vehicle further comprises a nozzle at the end of the conduit. | **[0008]** It would, therefore, be desirable to provide a vehicle which floats on the manure pond and which is maneuverable. It would also be desirable to provide the vehicle with multiple outlet nozzles to direct the fluid downward into the lagoon a sufficient distance to agitate the solids in the bottom of the lagoon into suspension and create vortices within the lagoon to assist in carrying solids within the sludge into suspension in the supernatant. It would additionally be desirable to direct the nozzles to create vortices that mix the solids of the sludge into suspension with the supernatant, while minimizing the amount of unpleasant smelling hydrogen sulfide rising to the surface and escaping into the air.<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled | |

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| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| | to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**[0029]** Releasably coupled to the second slurry output (62) and third slurry output (64) are a pair of nozzles (66) and (68) pivotably coupled to the vessel (12). The second slurry output (62) and third slurry output (64) are oriented and configured to direct the slurry (50) as desired and to increase the velocity with which the slurry (50) exits the nozzles (66) and (68). The second slurry output (62) is preferably directed between five and eighty degrees port, more preferably directed between ten and sixty degrees port and, most preferably, between fifteen and forty-five degrees port. The third slurry output (64) is preferably directed between five and eighty degrees star-board, more preferably between ten and sixty degrees star-board and, most preferably, between fifteen and forty-five degrees starboard. The intake pipe (40) is preferably posi-tioned between the first slurry output (44) and the second slurry output (62).<br><br>**[0033]** If desired, the remote control system (84) may be provided with a first gate close button (114) that closes a valve (115) on the transport pipe (42) positioned between the fluid intake pipe (40) and forward nozzle (48). A gate open button (116) is also provided to open the valve (150). Similarly, a close gate button (118) and open gate button (120) are pro-vided to open and close a valve (152) provided between the fluid intake pipe (40) and the nozzles (66) and (68). The gate buttons (114), (116), (118) and (120) allow a user to selec-tively supply fluid through one, two or three of the nozzles (48), (66) and (68) as is desired to appropriately agitate the fluid (128) within which the agitator (10) is floating. The remote control system (84) is also provided with a button (122) to actuate lights (154) provided on the agitator (10) if it is desired to use the agitator (10) in circumstances where additional lighting is desired. The remote | |

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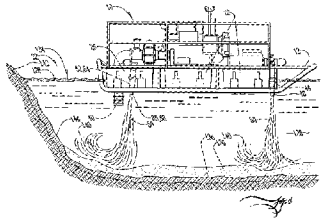
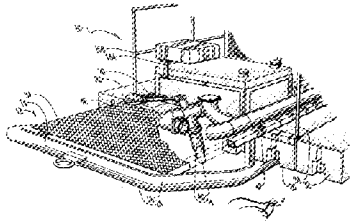
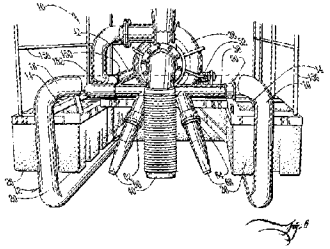
| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| | control system (84) may be configured to receive feedback from the control panel (74), such as system status, latitude, longitude and height coordinates.<br><br>**Figure 4:**<br>  <br>**Figure 5:**<br>  <br>**Figure 6:**<br>  | |
| | | |
| 6. The vehicle of claim 2, wherein the | **[0008]** It would, therefore, be desirable to provide a vehicle which floats on the manure pond and which is maneuverable. It | |



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| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| vehicle further comprises a nozzle at the end of the conduit. | would also be desirable to provide the vehicle with multiple outlet nozzles to direct the fluid downward into the lagoon a sufficient distance to agitate the solids in the bottom of the lagoon into suspension and create vortices within the lagoon to assist in carrying solids within the sludge into suspension in the supernatant. It would additionally be desirable to direct the nozzles to create vortices that mix the solids of the sludge into suspension with the supernatant, while minimizing the amount of unpleasant smelling hydrogen sulfide rising to the surface and escaping into the air.<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**[0029]** Releasably coupled to the second slurry output (62) and third slurry output (64) are a pair of nozzles (66) and (68) pivotably coupled to the vessel (12). The second slurry output (62) and third slurry output (64) are oriented and configured to direct the slurry (50) as desired and to increase the velocity with which the slurry (50) exits the nozzles (66) and (68). The second slurry output (62) is preferably directed between five and eighty degrees port, more preferably directed between ten and sixty degrees port and, most preferably, between fifteen and forty-five | |

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| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| | degrees port. The third slurry output (64) is preferably directed between five and eighty degrees star-board, more preferably between ten and sixty degrees star-board and, most preferably, between fifteen and forty-five degrees starboard. The intake pipe (40) is preferably posi-tioned between the first slurry output (44) and the second slurry output (62).<br><br>**[0033]** If desired, the remote control system (84) may be provided with a first gate close button (114) that closes a valve (115) on the transport pipe (42) positioned between the fluid intake pipe ( 40) and forward nozzle ( 48). A gate open button (116) is also provided to open the valve (150). Similarly, a close gate button (118) and open gate button (120) are pro-vided to open and close a valve (152) provided between the fluid intake pipe (40) and the nozzles (66) and (68). The gate buttons (114), (116), (118) and (120) allow a user to selec-tively supply fluid through one, two or three of the nozzles (48), (66) and (68) as is desired to appropriately agitate the fluid (128) within which the agitator (10) is floating. The remote control system (84) is also provided with a button(122) to actuate lights (154) provided on the agitator (10) if it is desired to use the agitator (10) in circumstances where additional lighting is desired. The remote control system (84) may be configured to receive feedback from the control panel (74), such as system status, latitude, longitude and height coordinates.<br><br>**Figure 4:** | |

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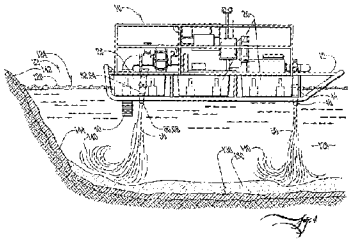
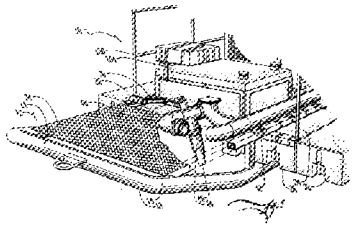
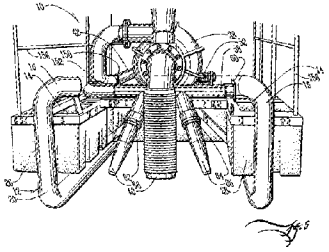
| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| |  <br>**Figure 5:**<br>  <br>**Figure 6:**<br>  | |
| 7. The vehicle of claim 1, wherein the at least one of speed and direction of the vehicle when the vehicle is floating is | **Abstract:** A floating manure agitator that floats on the surface of a manure lagoon and that may be remotely controlled to agitate manure supernatant into a slurry with sludge settling on the bottom of the lagoon. The agitator is provided with a plurality of fluid outputs, the direction of which may be controlled to motivate and steer the agitator. The outputs are angled to develop | **[0059]** The inverted "U" shape of bottom wall 45 is designed to direct any water in tub 40 toward perimeter 47 of bottom wall 45. As shown in FIG. 19, vehicle 10 may include a plurality of pumps, for example bilge pumps 630, positioned around perimeter 47 of tub 40 in order to evacuate any water |

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| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| 65 controlled by a fluid mover. | vortices of supernatant into the sludge to further mix the materials into a slurry<br><br>**[0011]** In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore.<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5). | from tub 40. In one embodiment, vehicle 10 may include four pumps 630 coupled to bottom wall 45 at perimeter 47 (i.e., adjacent side walls 48) of tub 40. Pumps 630 may be configured for automatic operation upon the detection of water in tub 40 and/or may be manually operated. Vehicle 10 also may be configured to support a jet pump and/or propeller member to assist with amphibious operation, as detailed further herein.<br><br>**[0079]** As illustrated in FIG. 14, gearbox 510 drives an attachment shaft 511 for transferring engine torque to an attachment or implement (e.g., a work tool) attached to vehicle 10. Attachment shaft 511 illustratively extends outwardly from a backside of gearbox 510 opposite drive shaft 506 and towards the back of vehicle 10 (e.g., through an aperture of the tub) for attaching the external implement. In one embodiment, attachment shaft 511 provides a power take-off for driving the implement with engine 502. In one embodiment, gearbox 510 selectively engages attachment shaft 511 based on an operator input. For example, the shift lever may be actuated to engage attachment shaft 511 to power the implement coupled to vehicle 10. In one embodiment, a clutch assembly is selectively engaged by the operator to engage attachment shaft 511 via gearbox 510. The clutch assembly may be hydraulically or electronically operated. In one embodiment, attachment shaft 511 is used to drive a jet pump and/or propeller member to assist in propelling vehicle in water during amphibious operation. |

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| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| | [0029] Releasably coupled to the second slurry output (62) and third slurry output (64) are a pair of nozzles (66) and (68) pivotably coupled to the vessel (12). The second slurry output (62) and third slurry output (64) are oriented and configured to direct the slurry (50) as desired and to increase the velocity with which the slurry (50) exits the nozzles (66) and (68). The second slurry output (62) is preferably directed between five and eighty degrees port, more preferably directed between ten and sixty degrees port and, most preferably, between fifteen and forty-five degrees port. The third slurry output (64) is preferably directed between five and eighty degrees star-board, more preferably between ten and sixty degrees star-board and, most preferably, between fifteen and forty-five degrees starboard. The intake pipe (40) is preferably posi-tioned between the first slurry output (44) and the second slurry output (62).<br><br>[0032] The remote control system (64) also includes an engine stop button (98), start button (100), a throttle down button (102) and throttle up button (104). To steer the agitator (10) the remote control system (84) is provided with a bow left button (106) and bow right button (108). The bow left button (106) causes the steering control hydraulic cylinder (52) to extend, thereby directing the nozzle (48) to starboard and driving the agitator (10) port. The remote control system (84) is also provided with a bow right button (108) to retract the hydraulic cylinder (52) and steer the agitator (10) star-board. The remote control system (84) is provided with a reverse button (110) which causes the hydraulic cylinder (70) to extend, thereby forcing the pivot pipe (58) to direct the slurry outputs (62) and (64) toward the bow (18) of the agi-tator (10), thereby driving the vessel (12) rearward. Similarly, a forward button (112) causes the hydraulic cylinder (70) to retract and drive the agitator (10) forward. | |

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| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| | [0035] Once the agitator (10) is floating in the lagoon (22), the remote control system (84) is used to activate the power source (36) to cause the slurry pump (38) to draw supernatant (128) into the intake pipe (40) and out the outputs (44), (62) and (64). The remote control system (84) is used to direct the pivot pipe (58) to angle the slurry outputs (62) and (64) aft to drive the agitator (10) forward. The remote control system (84) then actuates the control panel (74) to direct the hydrau-lic cylinder (52) to angle the first slurry output (44) to turn the agitator (10) port or starboard as desired. The remote control system (84) is thereafter used to direct the volume of super-natant (128) drawn into the intake pipe (40) and the direction at which the supernatant (128) is expelled from the slurry outputs (44), (62) and (64). By manipulating the direction of the slurry outputs (44), (62) and (64) with the remote control system (84), a user may direct the agitator (10) to any desired portion of the lagoon. | |
| | | |
| **8.** The vehicle of claim **1,** further comprising a plurality of fluid nozzles fluidly connected to the fluid pump. | [0008] It would, therefore, be desirable to provide a vehicle which floats on the manure pond and which is maneuverable. It would also be desirable to provide the vehicle with multiple outlet nozzles to direct the fluid downward into the lagoon a sufficient distance to agitate the solids in the bottom of the lagoon into suspension and create vortices within the lagoon to assist in carrying solids within the sludge into suspension in the supernatant. It would additionally be desirable to direct the nozzles to create vortices that mix the solids of the sludge into suspension with the supernatant, while minimizing the amount of unpleasant smelling hydrogen sulfide rising to the surface and escaping into the air.<br><br>[0027] Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe (46) is a tapered | |

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| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| | liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5).<br><br>**[0029]** Releasably coupled to the second slurry output (62) and third slurry output (64) are a pair of nozzles (66) and (68) pivotably coupled to the vessel (12). The second slurry output (62) and third slurry output (64) are oriented and configured to direct the slurry (50) as desired and to increase the velocity with which the slurry (50) exits the nozzles (66) and (68). The second slurry output (62) is preferably directed between five and eighty degrees port, more preferably directed between ten and sixty degrees port and, most preferably, between fifteen and forty-five degrees port. The third slurry output (64) is preferably directed between five and eighty degrees star-board, more preferably between ten and sixty degrees star-board and, most preferably, between fifteen and forty-five degrees starboard. The intake pipe (40) is preferably posi-tioned between the first slurry output (44) and the second slurry output (62).<br><br>**Figure 4:** | |

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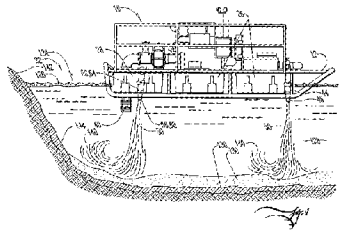
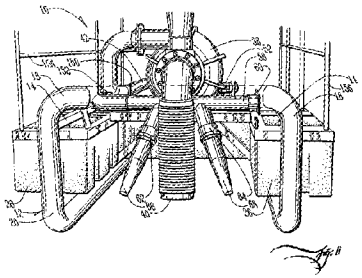
| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| |  <br>**Figure 6:**<br>  <br>**Claim 14:**<br>A liquid manure agitator comprising:<br>(a) a floating vessel;<br>(b) a power source provided on the vessel;<br>(c) a liquid manure pump coupled to the power source;<br>(d) a liquid manure intake coupled to the liquid manure pump;<br>(e) a first liquid manure nozzle coupled to the liquid manure pump;<br>(f) a second liquid manure nozzle coupled to the liquid manure pump; and<br>(g) a steering control coupled to the first liquid manure nozzle. | |

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| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| | **Claim 20:**<br>A liquid manure agitator comprising:<br>(a) a frame;<br>(b) a floatation device coupled to the frame;<br>(c) a power source coupled to the frame;<br>(d) a liquid manure pump coupled to the power source;<br>(e) a liquid manure intake coupled to the liquid manure pump;<br>(f) a first liquid manure nozzle coupled to the liquid manure pump and positioned stern of the liquid manure intake;<br>(g) a steering control coupled to the first liquid manure nozzle;<br>(h) a second liquid manure nozzle coupled to the liquid manure pump and positioned aft of the first liquid manure nozzle wherein the second manure nozzle is directed port;<br>(i) a third liquid manure nozzle coupled to the liquid manure pump and positioned aft of the first liquid manure nozzle wherein the third manure nozzle is directed starboard; and<br>(j) a wireless remote control coupled to the steering control. | |
| | | |
| 9. The vehicle of claim 8, wherein the wireless remote control is configured to control the plurality of fluid nozzles to control the at least one of speed and direction of the vehicle when the vehicle is floating. | **Abstract:** A floating manure agitator that floats on the surface of a manure lagoon and that may be remotely controlled to agitate manure supernatant into a slurry with sludge settling on the bottom of the lagoon. The agitator is provided with a plurality of fluid outputs, the direction of which may be controlled to motivate and steer the agitator. The outputs are angled to develop vortices of supernatant into the sludge to further mix the materials into a slurry. | |

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| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| | [0011] In the preferred embodiment of this invention, a floating manure agitator is provided with a floating vessel and a power source. A slurry pump is coupled to the power source. A slurry intake and three slurry outputs are also coupled to the slurry pump. Two of the slurry outputs are directed outward from the floating vessel. The slurry intake is provided between the two rearward slurry outputs. An additional slurry output is provided closer to the bow of the floating vessel and is provided with a steering control to direct the slurry output to control the direction of the floating vessel. The two aft slurry outputs may be rotated more rearward to increase the speed of the floating vessel or rotated more stern to slow or reverse the speed of the floating vessel, or move downward to direct more of the supernatant into the sludge. A remote control device may be coupled to the slurry control to allow the floating vehicle to be steered from the shore.<br><br>[0032] The remote control system (64) also includes an engine stop button (98), start button (100), a throttle down button (102) and throttle up button (104). To steer the agitator (10) the remote control system (84) is provided with a bow left button (106) and bow right button (108). The bow left button (106) causes the steering control hydraulic cylinder (52) to extend, thereby directing the nozzle (48) to starboard and driving the agitator (10) port. The remote control system (84) is also provided with a bow right button (108) to retract the hydraulic cylinder (52) and steer the agitator (10) star-board. The remote control system (84) is provided with a reverse button (110) which causes the hydraulic cylinder (70) to extend, thereby forcing the pivot pipe (58) to direct the slurry outputs (62) and (64) toward the bow (18) of the agi-tator (10), thereby driving the vessel (12) rearward. Similarly, a forward button (112) causes the hydraulic cylinder (70) to retract and drive the agitator (10) forward. | |

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| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| | [0033] If desired, the remote control system (84) may be provided with a first gate close button (114) that closes a valve (115) on the transport pipe (42) positioned between the fluid intake pipe (40) and forward nozzle (48). A gate open button (116) is also provided to open the valve (150). Similarly, a close gate button (118) and open gate button (120) are provided to open and close a valve (152) provided between the fluid intake pipe (40) and forward nozzle (48). A gate open button (116) is also provided to open the valve (150). Similarly, a close gate button (118) and open gate button (120) are provided to open and close a valve (152) provided between the fluid intake pipe (40) and the nozzles (66) and (68). The gate buttons (114), (116), (118), and (120) allow a user to selectively supply fluid through one, two or three of the nozzles (48), (66) and (68) as is desired to appropriately agitate the fluid (128) within which the agitator (10) is floating. The remote control system (84) is also provided with a button (122) to actuate lights (154) provided on the agitator (10) if it is desired to use the agitator (10) in circumstances where additional lighting is desired. The remote control system (84) may be configured to receive feedback from the control panel (74), such as system status, latitude, longitude and height coordinates.<br><br>[0035] Once the agitator (10) is floating in the lagoon (22), the remote control system (84) is used to activate the power source (36) to cause the slurry pump (38) to draw supernatant (128) into the intake pipe (40) and out the outputs (44), (62) and (64). The remote control system (84) is used to direct the pivot pipe (58) to angle the slurry outputs (62) and (64) aft to drive the agitator (10) forward. The remote control system (84) then actuates the control panel (7 4) to direct the hydrau-lic cylinder (52) to angle the first slurry output (44) to turn the agitator (10) port or starboard as desired. The remote control system (84) is thereafter used to direct the volume of super-natant (128) drawn into the | |

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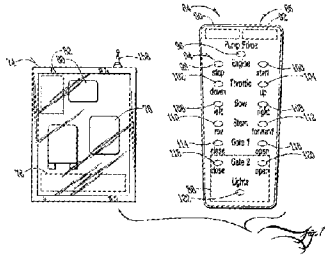
| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| | intake pipe (40) and the direction at which the supernatant (128) is expelled from the slurry outputs (44), (62) and (64). By manipulating the direction of the slurry outputs (44), (62) and (64) with the remote control system (84), a user may direct the agitator (10) to any desired portion of the lagoon.<br><br>**[0037]** The remote control system (84) may be used to cause the slurry pump (38) to expel slurry (50) more slowly from the slurry outputs (44), (62) and (64) as the agitator (10) is near the shore (142) of the lagoon (22) so as not to penetrate the lining (144) of the lagoon (22) thereby allowing the slurry (50) to escape. As the agitator (10) moves towards the center of the lagoon (22) which may range from five to forty feet deep, or more, the remote control system (84) can be used to increase the speed at which the supernatant (128) is passed from the slurry outputs (44), (62) and (64) to adequately mix the sludge (130) at the deepest portions of the lagoon (22). The remote control system (84) is used to direct the agitator (10) to all desired portions of the lagoon until the crust (126) and supernatant (128) is adequately mixed with the sludge (130).<br><br>**Figure 7:**<br><br>  <br><br>**Claim 2:** | |

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| Claim | Puck (2014/0112093) | Bennett (2014/0288763) |
|---|---|---|
| | The floating slurry agitator of claim 1, further comprising a wireless remote control coupled to the steering control.<br><br>**Claim 15:**<br>The liquid manure agitator of claim 14, further comprising a wireless remote control coupled to the steering control. | |
| | | |
| 10. The vehicle of claim 4, further comprising a plurality of fluid nozzles fluidly connected to the fluid pump. | **[0008]** It would, therefore, be desirable to provide a vehicle which floats on the manure pond and which is maneuverable. It would also be desirable to provide the vehicle with multiple outlet nozzles to direct the fluid downward into the lagoon a sufficient distance to agitate the solids in the bottom of the lagoon into suspension and create vortices within the lagoon to assist in carrying solids within the sludge into suspension in the supernatant. It would additionally be desirable to direct the nozzles to create vortices that mix the solids of the sludge into suspension with the supernatant, while minimizing the amount of unpleasant smelling hydrogen sulfide rising to the surface and escaping into the air.<br><br>**[0027]** Coupled to the slurry pump (38) by a transport pipe (42) is a first slurry output (44). (FIG. 5). The first slurry output (44) is an angled pipe (46) pivotably coupled to the transport pipe (42). Releasably coupled to the angled pipe (46) is a tapered liquid manure nozzle (48) to increase the velocity of slurry (50) passing through the nozzle (48). (FIGS. 4-5). If desired, different sizes and configurations of nozzles (48) may be coupled to the angled pipe (46) to adjust the direction and velocity of slurry (50) exiting through the first slurry output (44). Coupled between the angled pipe (46) and the frame (14) is a steering control hydraulic cylinder (52). The hydraulic cylinder (52) is coupled to a hydraulic pump (54) that, in turn, is coupled to a 12-volt battery (56). (FIGS. 1 and 5). | |

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