United States Patent

[11] 3,584,592

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[54] YACHTCAR
15 Claims, 13 Drawing Figs.

[52] **U.S. Cl.** **115/1**
[51] **Int. Cl.** **B63f 3/00**
[50] **Field of Search** 115/1

[56] **References Cited**

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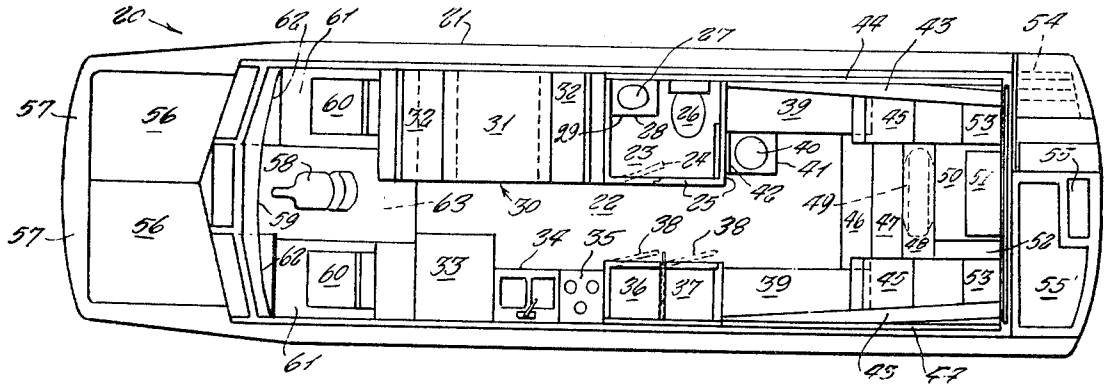
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Primary Examiner—Andrew H. Farrell

ABSTRACT: An amphibious vehicle for movement upon land or upon a water surface, the device including a hull supported upon a plurality of wheels, the hull carrying a pair of propeller assemblies at its lower rear, the hull containing two motors for selectively driving the propeller assemblies or the wheels, and the wheels and propellers being selectively retractable into the hull when not in use.



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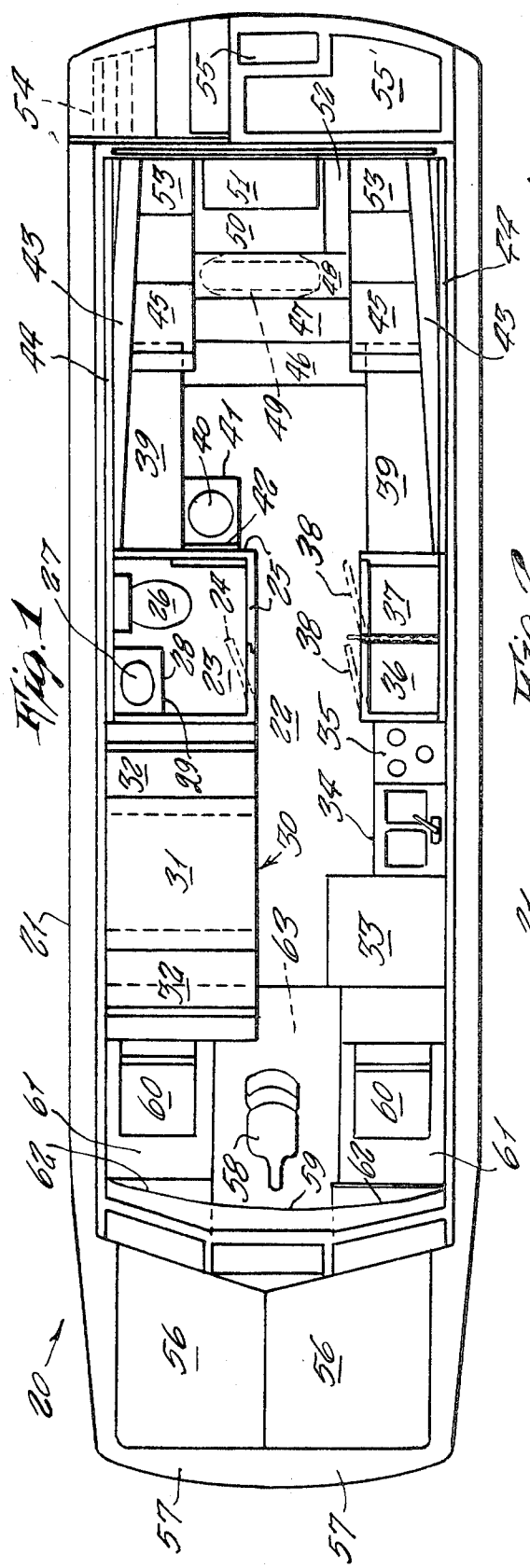


Fig. 1

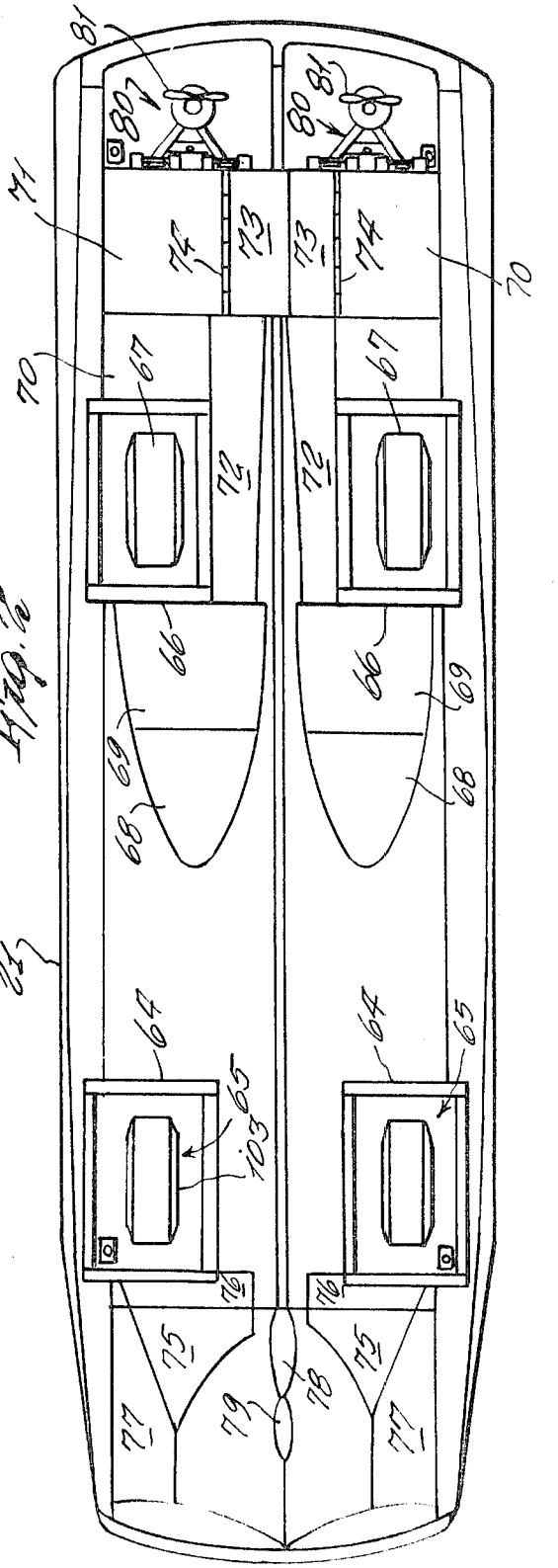
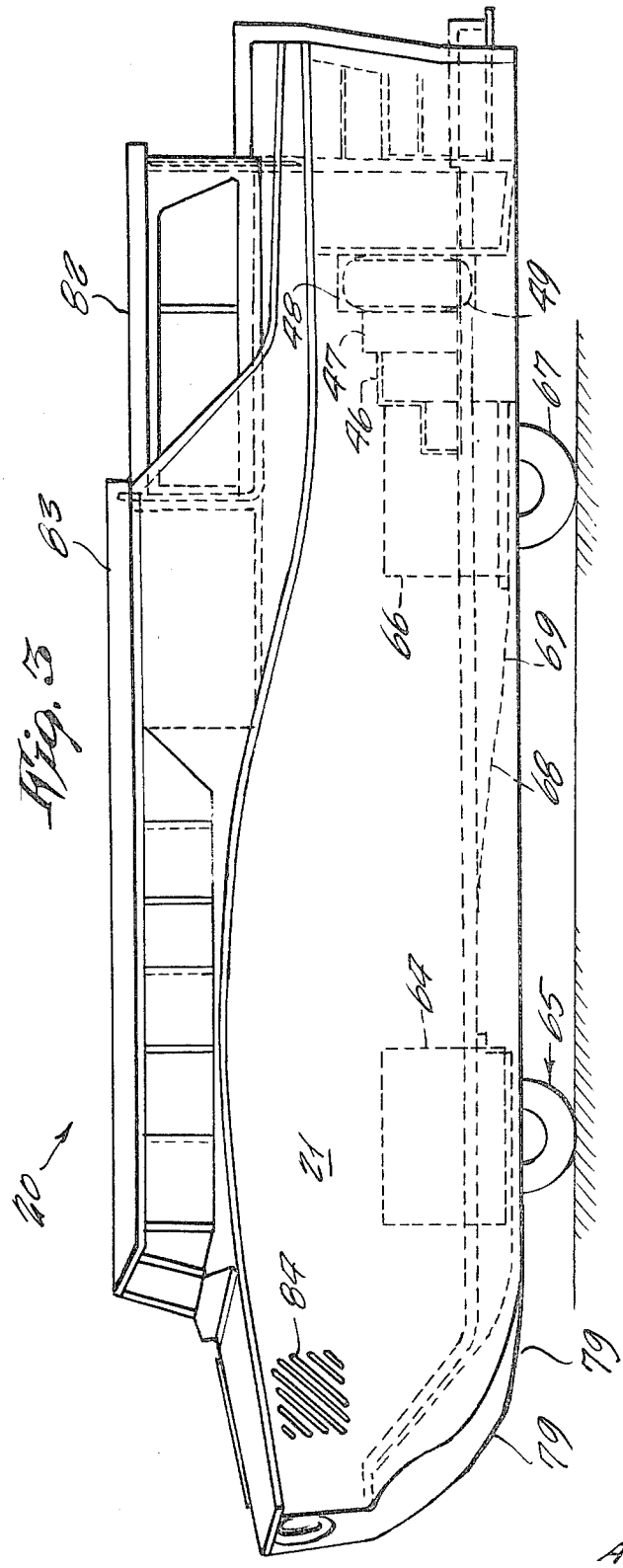
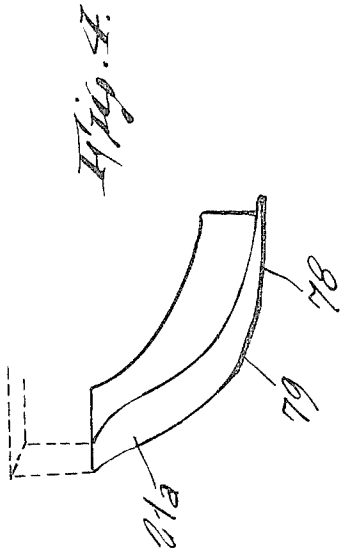


Fig. 2

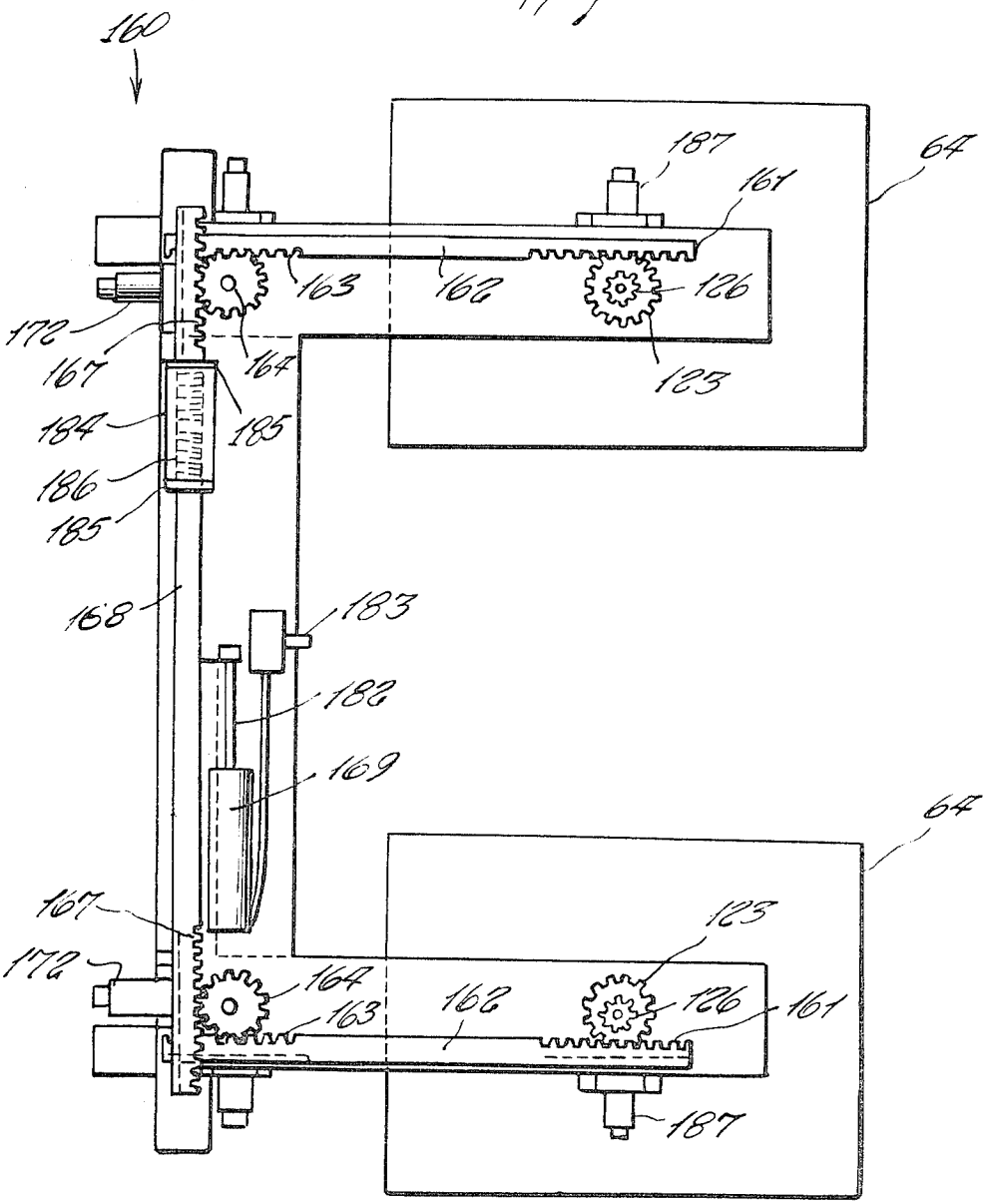
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Fig. 5



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Fig. 7

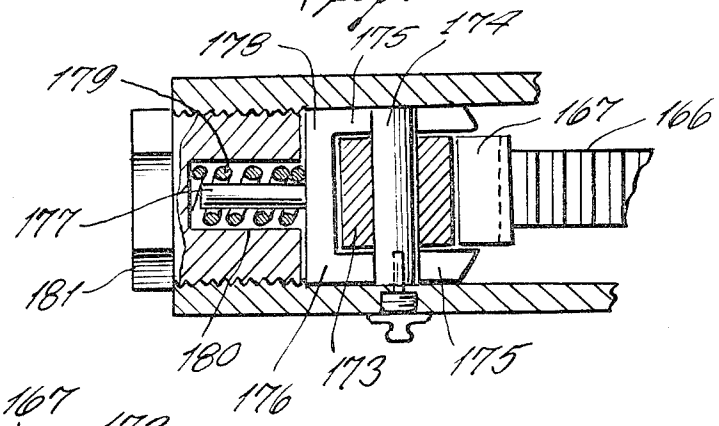
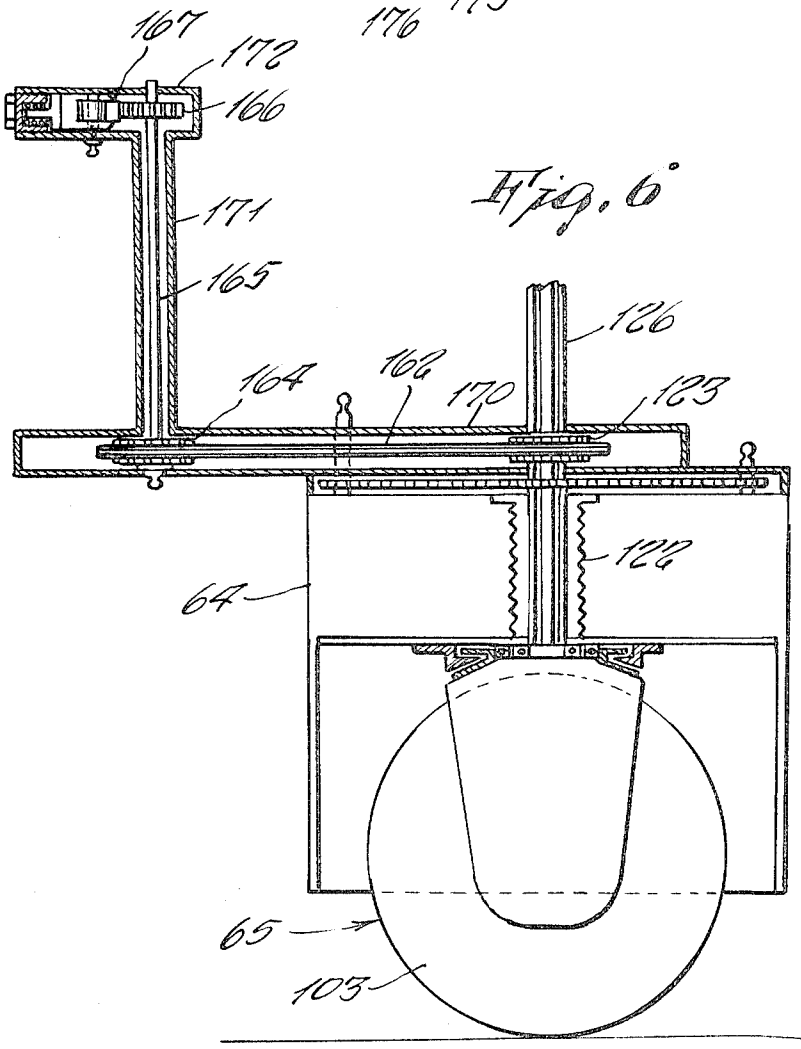


Fig. 6



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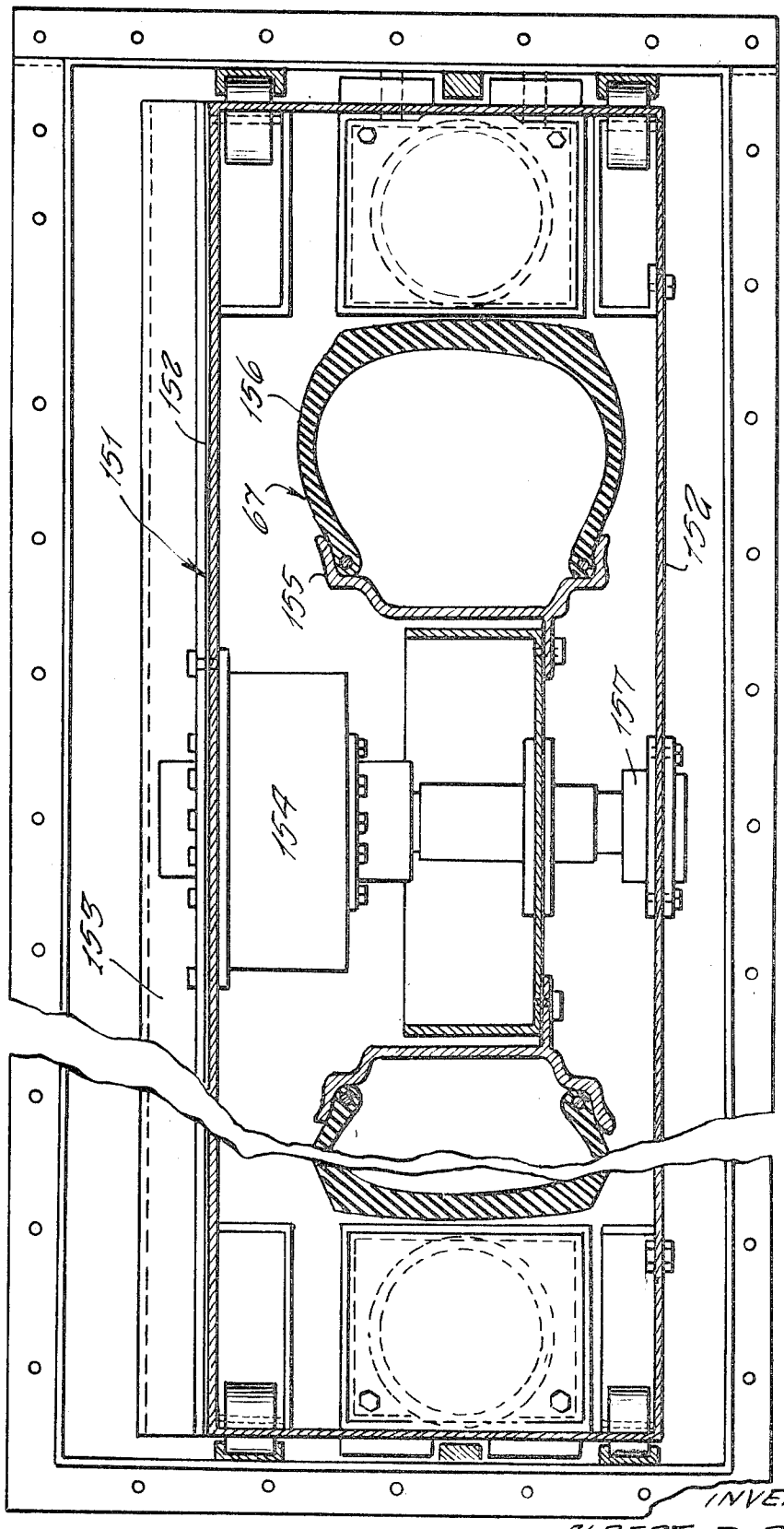


Fig. 8

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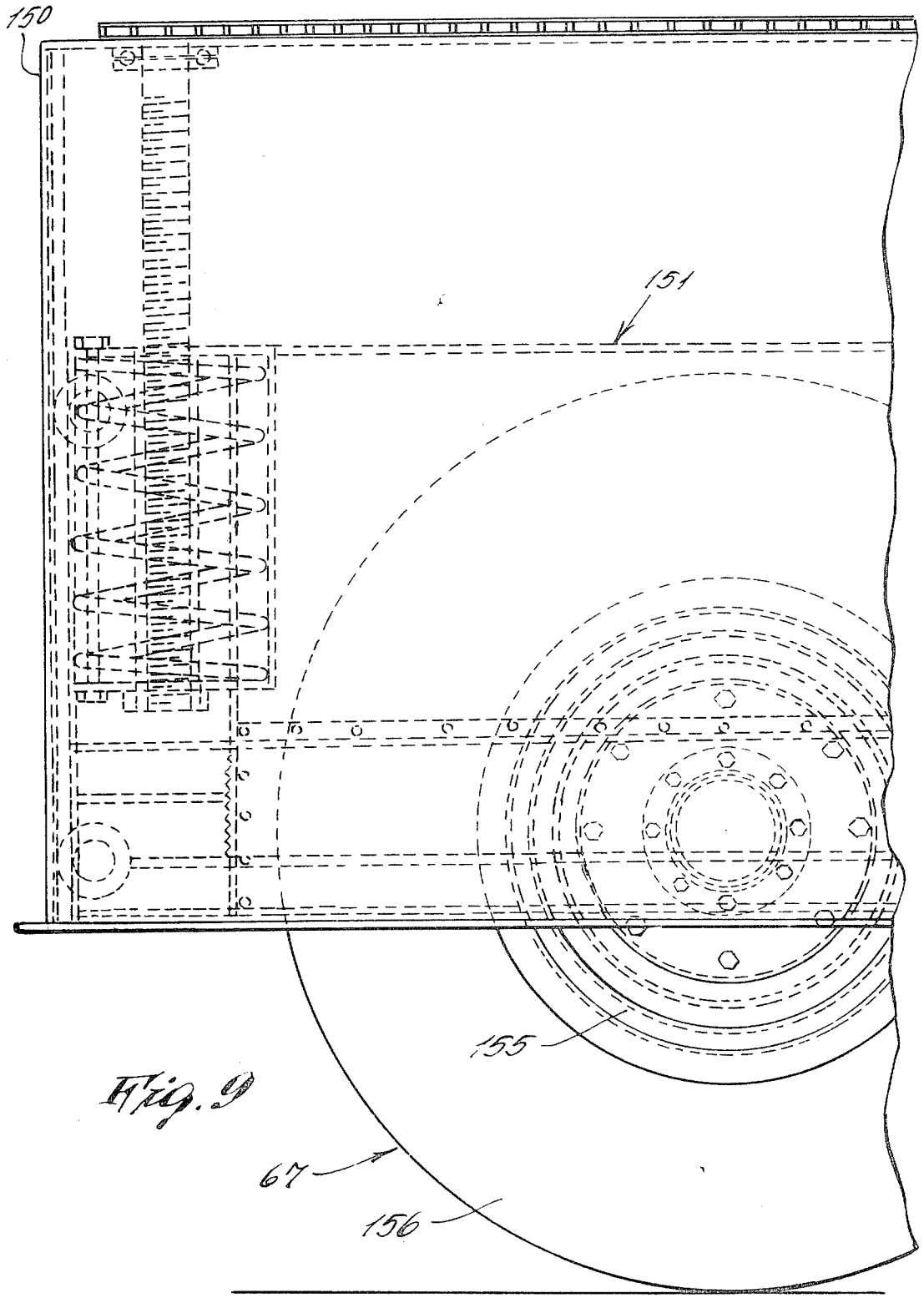


Fig. 9

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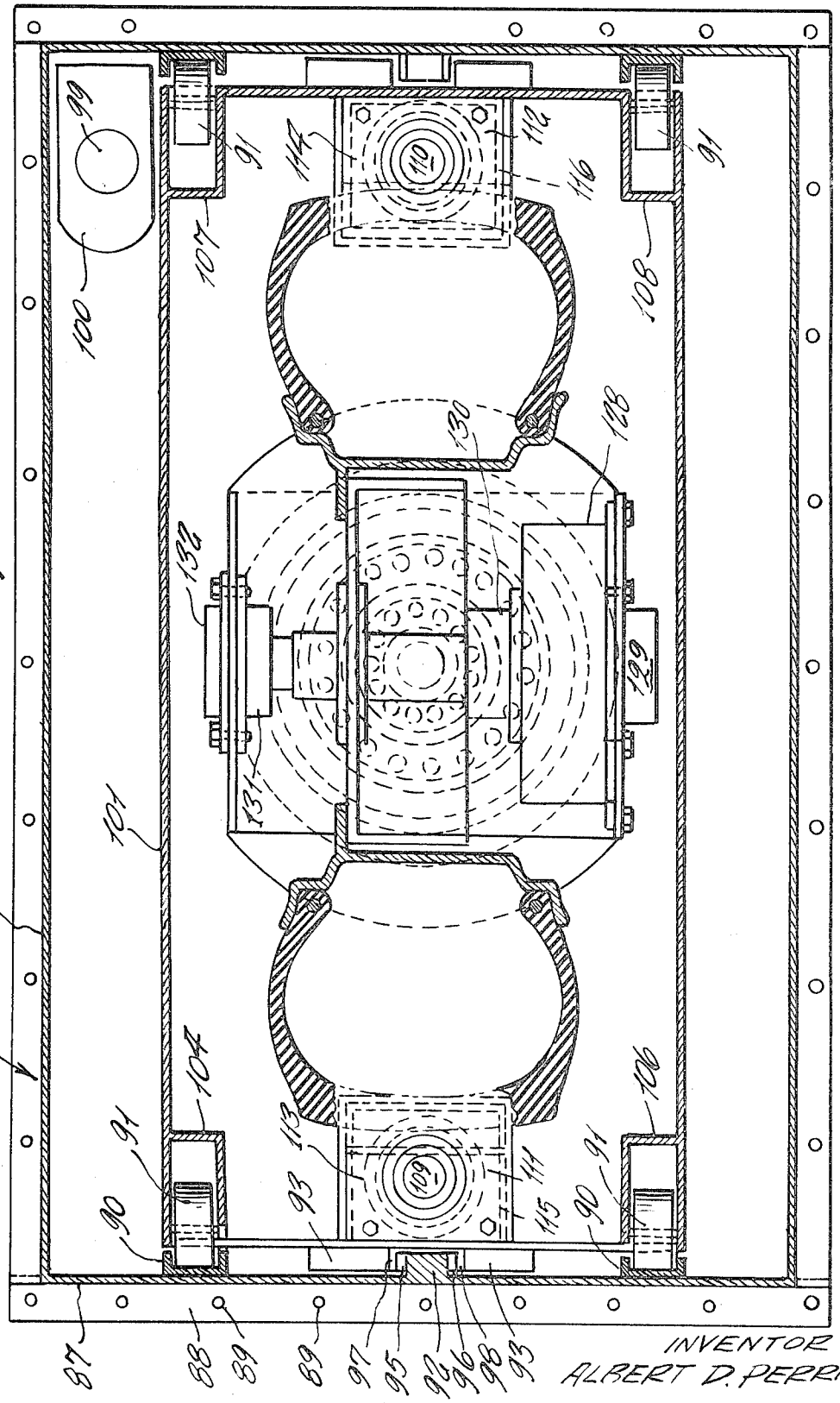


Fig. 10

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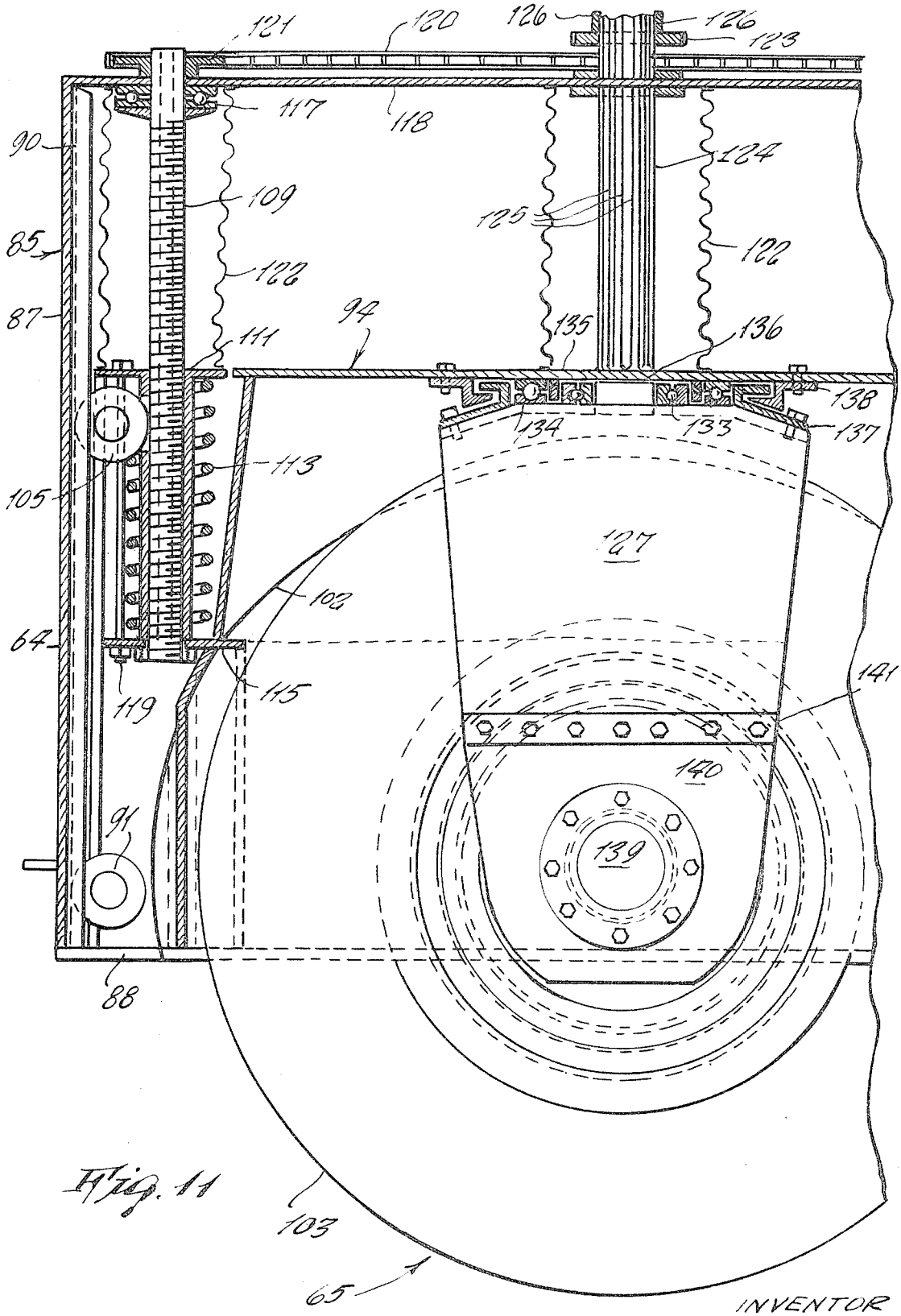


Fig. 11

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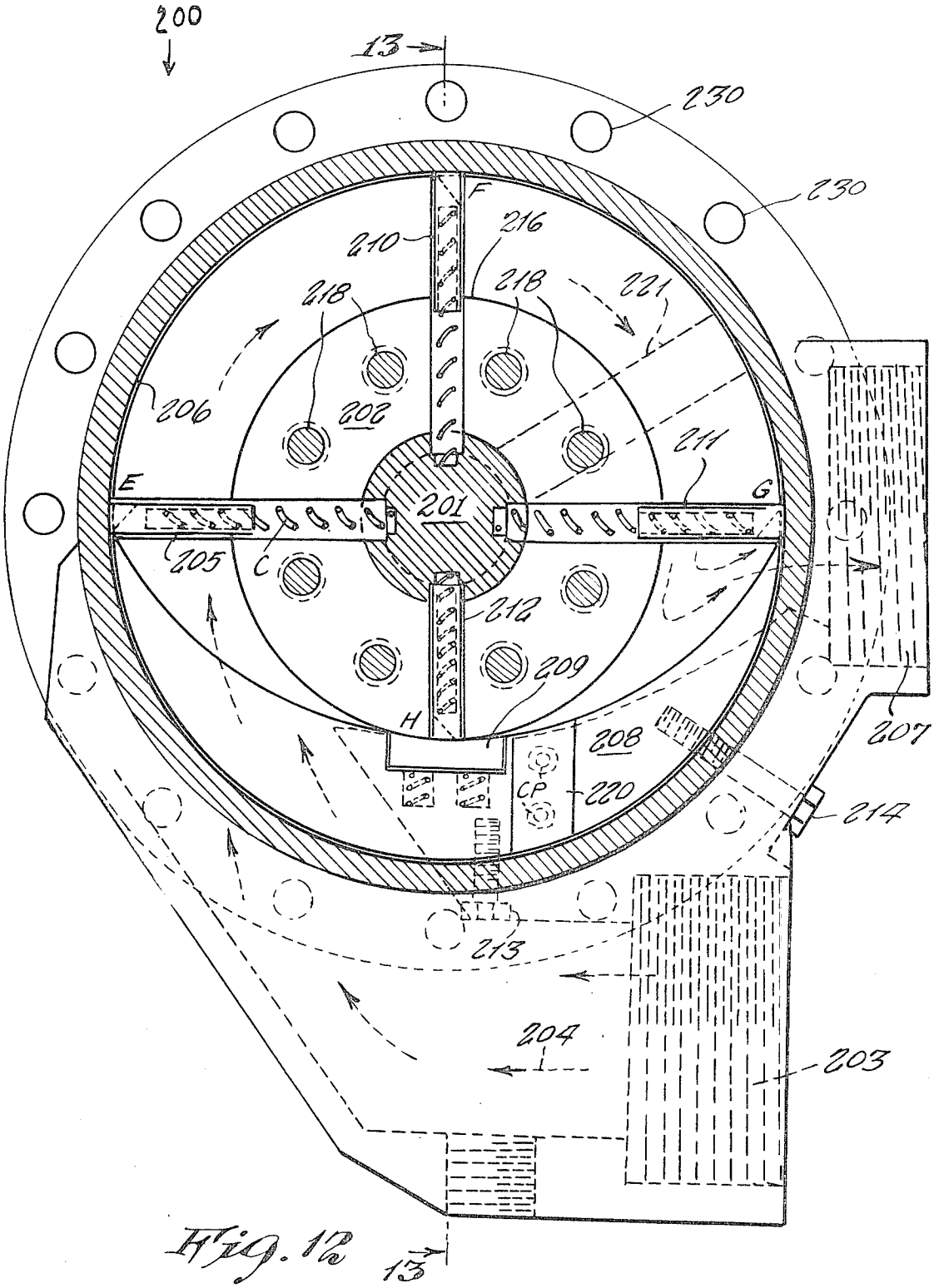
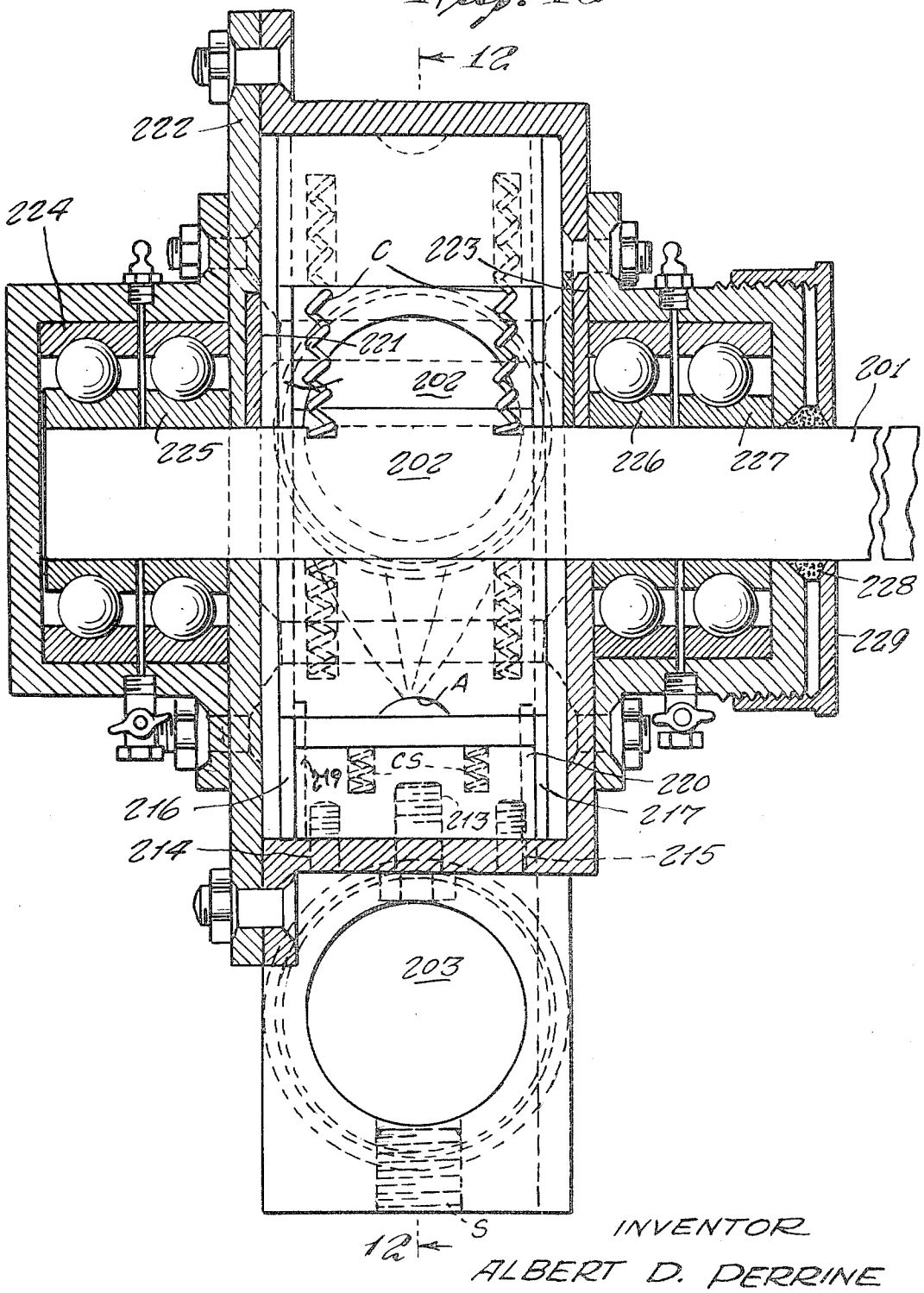


Fig. 12

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Fig. 13



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YACHTCAR

This invention relates generally to amphibious vehicles. More specifically, it relates to vehicles adaptable for travelling upon the surface of a body of water, as well as upon the highways of the land.

A principle object of the present invention is to provide an amphibious vehicle for travel on the water or upon highways, and which includes convenient accommodations for from six to nine passengers to travel and live thereupon.

Another object of the present invention is to provide a yachtcar wherein the wheels retract when the vehicle is water borne and a pair of propellers are lowered for driving the vehicle upon the water, and wherein the vehicle skims along the surface by means of surface-riding hydroplanes.

Yet another object of the present invention is to provide a yachtcar wherein the propeller wheels are lowered downwardly from the hull for purpose of travel upon a highway.

Yet a further object is to provide a yachtcar wherein air is piped to the wheel housing so to eliminate vacuum thereby providing a faster travel.

Yet another object is to provide a yachtcar serving as a camper or houseboat upon the water with the wheel housings and the concave surfaces between the hydroplanes acting as suction buckets when airflow is cut off to them, thereby depressing roll when anchored or when moving at reduced speed in rough seas.

Yet another object is to provide a yachtcar having a rear section of the top thereof telescoping into a forward section and passing above clothing chests and a shower stall so as to leave an open cockpit for fishing and closing tightly for storm condition or for highway travel.

Yet another object is to provide a yachtcar having a gull wing, and a false front end which can be replaced quickly when it is damaged by a highway front end collision or by it being driven aground while in the water.

Yet another object is to provide a yachtcar in which all four wheels have positive traction by means of special designed hydraulic motors built into the hub of each wheel, and wherein the same type of hydraulic motor is connected to each of the two propellers so that the same hydraulic power, in the form of oil pumped from the front internal combustion power source proceeds through pipes and flexible hoses to the wheel driving motors and which can be switched to the propellers by the simple act of turning valve.

Yet another object is to provide a yachtcar having a hinged, disappearing stairway so to allow easy entrance to the vehicle while upon land, and to allow easy entrance for scuba divers boarding the craft in the water and who carry a bulky gear.

Yet another object of the present invention is to provide a yachtcar which can serve as a comfortable home and which has the graceful lines of a fish on the side, the mouth of a fish at the radiator grill, and the dorsal fin of a sail fish above the center of the catwalk.

Yet a further object of the present invention is to provide a yachtcar which includes built in hydraulic jacks or screw jacks so to level and steady the vehicle when used as a camper.

Yet another object is to provide a yachtcar which does not use any conventional gear train nor a gearshift for highway travel, but which uses a bypass valve between a pressure side existing from a pump and the suction side entering the pump, and opening this bypass valve by degrees affecting a gearshift, and wherein the larger the volume of oil pumped back to the suction side through the bypass valve, the slower the wheel r.p.m. compared to the internal combustion motor r.p.m.

Other objects of the present invention are to provide a yachtcar which is simple in design, inexpensive to manufacture, rugged in construction, easy to use and efficient in operation.

These and other objects will be readily evident upon a study of the following specifications and the accompanying drawings wherein:

FIG. 1 is a floor plan view of the present invention;

FIG. 2 is a bottom plan view thereof;

FIG. 3 is a side elevation view thereof;

FIG. 4 is a side elevation view of the removable bow;

FIG. 5 is a plan view of the steering mechanism;

FIG. 6 is a side elevation view thereof;

FIG. 7 is an enlarged view of a detail illustrated in FIG. 6;

FIG. 8 is a bottom plan view of a wheel and left rear wheel housing assembly;

FIG. 9 is a fragmentary side elevation view thereof;

FIG. 10 is right front wheel housing shown viewed from the bottom;

FIG. 11 is a fragmentary side elevation view thereof;

FIG. 12 is a cross-sectional view taken along the line 12–12 of FIG. 13, showing the dual purpose hydraulic motor and hydraulic pump, and

FIG. 13 is a cross-sectional view taken along the lines 13–13 of FIG. 12.

Referring now to the drawings in detail, and more specifically to FIGS. 1 through 4 at the present time, the reference numeral 20 represents a yachtcar, according to the present invention wherein there is a hull 21 of a boatlike configuration and which includes a removable bow 21*a* upon the front end of the vehicle.

The hull 21 has an interior that is divided into living quarters for passengers so as to provide convenience for six to nine persons. As shown in FIG. 1, the interior is shown to include a main cabin 22 having a washroom 23 adjacent to one side thereof and accessible thereinto by means of a door 24 in a wall 25. Within the washroom there is a chlorinated sanitary toilet 26, a sink 27 above a storage cabinet 28, and a shower 29. Adjacent to the washroom 23, there is a dinette area 30 which includes a dinette table 31 and dinette seats 32. Storage space is provided underneath the seats 32, and the dinette table may form a bed while giving additional sleeping quarters.

A storage space is provided under the base of the dinette. Upon the opposite side of the cabin 22, there is a refrigerator 33, a kitchen sink 34, a stove 35, and a pair of clothing lockers 36 and 37. Each of the clothing lockers are accessible by means of doors 38. On each side of the main cabin there is a rear wheel hosing 39 with a storage space upon the top of the housing. A sink 40 in the main cabin is mounted upon a base 41 providing storage there below, the sink being adjacent a mirror 42 upon the wall 25. On each side of the main cabin, a single bed 43 is stored against the wall 44. Adjacent to each bed 43 there is a fighting chair 45, a storage space below each chair, and a gasoline tank located below the storage space. Several steps 46, 47 and 48 are located at the rear of the main cabin, the step 48 enclosing a spare tire 49 in a space there below. A fishing well cover 50 is located rearward of the step 48, and a hinged step 51 is located rearward of the fishing well cover. Adjacent to the steps there is a storage 52 for fishing tackle, and adjacent to each side of the steps there is a sloping footrest 53. At the rear of the hull, there is a hinged step unit 54, an anchor storage 55 and a dry ice fish storage box 55.

At the forward end of the yachtcar hull, space is provided for a port and a starboard motor and pump assembly 56, each of which has a radiator 57 in front thereof. An operator's seat 58 is centrally located at the front of the hull, the operator's seat being of bucket-type, rotary sit-stand design, a projection holding the operator when standing at the seat. A foot space 59 is provided for the operator's feet when seated. Side seats 60 are located adjacent each side of the operator's seat, each side seat 60 having a stand space 61 and a foot space 62.

Beneath the floor upon which the operator's seat is located, a water storage tank 63 is located.

Upon the underside of the hull, as shown in FIG. 2, there are a pair of front wheel housings 64, each of which contains a front wheel 65. Likewise, there are a pair of rear wheel housings 66, each of which has a rear wheel 67 therein. Hydroplanes 68, 69, 70 and 71, are located forward and aft of the rear wheel housing, and hydroplanes 72 are located between the housings 66. Hinged doors 73 mounted upon hinges 74 provide access to a fishing well and service as the hydroplanes surfaces when closed. Hydroplanes surfaces 75,

76, 77, 78 and 79, are located below the forward end of the hull, as shown in FIG. 2.

A pair of propeller assemblies 80 are located near the rear end of the hull, each propeller assembly having a propeller 81 for driving the hull through the water.

Referring now to FIG. 3, a rear section 82 is telescopically slidable forwardly into the front section 83 so to form an open cockpit for purposes of fishing at the rear. Shipped water outlets 84 are provided upon opposite sides of the hull so to allow discharge of water taken aboard during rough seas.

Referring now to the front wheel housings of the yachtcar, of FIGS. 10 and 11 the right front wheel housing, has the same base, the same construction and operating features as the left front wheel housing. The front wheel housings comprises a rectangular steel box, identified with the reference numerals 85 and shown in greater detail in FIGS. 10 and 11. The box is open at the bottom and closed at the top. The box is likewise closed by sidewalls 86 and end walls 87.

The box extends upwardly into the yachtcar body or hull with the open side downward. A flange 88 is welded around the opening and provided with bolt openings 89 so to attach the housing by means of bolts to the hull framework and cross member floor supports of the yachtcar body in a manner which would remain permanently tight and rigid against all thrust from any direction or twisting force exerted upon the box by highway operation and yet remain leakproof around the flange base while the yachtcar is in the water. On walls 87 are channels 90, welded, or otherwise suitably attached in a vertical direction so to serve as a reinforcement and as a track within which wheels 91 may roll. Another channel 92 likewise welded or otherwise suitably attached in a vertical direction on the box, serves as a reinforcement and also as a track for wheels 93. A like construction is shown at the opposite end of the box, the wheels thus serving to carry an assembly 94 vertically along the tracks. To silence the wheel operation along the channels, strips of rubber 95 and 96 are cemented to the channels and over these are laid flat strips of steel 97 and 98, the steel strips being one-quarter inch thick and attached by means of bolts which pass through the rubber into the channel 92. Wheels 93 travel up and down on the flat steel strips with the layer of rubber under the wheels. While the opposite end of the box is of a like construction, there is one exception thereto. This comprises a hydraulic jack or screwjack 99 with footplate 100 being built into the forward outer corner of the outer box, and for the purpose of raising the yachtcar when changing a tire, greasing or to level and steady the camper when camping upon land. The front right wheel housing also has this type of jack built into the forward outer corner.

An inner box 101 of the wheel housing comprises a rectangular steel box likewise open at the bottom and closed at the top, both sides and both ends, except that an arc 102 is cut out of each side so to allow the yachtcar wheel 103 to rotate or turn in order to steer the car. In the vertical corners of the box 101, are welded L-shaped angles so to form four small boxes as follows:

A box 104 encloses wheel 91 in the left or outer rear corner of the box 101; the box 104 being closed at the top and bottom and containing the wheel 91 at the bottom and a wheel 105 at the top. The box 104 adds strength to the box 101 and keeps mud and snow away from the wheels contained therein. Ports are cut through the rear wall at two points on the box 104 just large enough so to allow the wheels to pass through and operate against the track as the box 101 springs up and down in highway travel. Another box 106 in the right rear corner of the box 101 performs the same functions and contains the same kind of wheels described above. The wheels of this box and the above described box absorb rearward thrust when breaking to slow highway speed or when backing the yachtcar. Similar boxes are located at the front end of the box 101, as indicated by the reference numerals 107 and 108. These boxes, however, absorb the forward thrust of highway travel. The wheels in each of the small boxes are essentially a closed bearing containing a pressure grease nipple and held in place by a bolt passing through the wall of the small box. Threaded bars 109 and 110 extend through receptacles 111 and 112 which extend downward in the center of coil springs 111 and 114; the receptacles 113' and 112 pass without touching, through plates 115 and 116 which support the bases of the springs. Receptacles 111 and 112 have a flange at the top against which the top of the springs transfer the weight of the yachtcar. The weight or load in turn is transferred upward by the bars 109 and 110 to bearings 117 which are supported by the top wall 118 of the outer box 64. Actually, the load is carried by the top of the box which is held securely by the side walls extending down to the flange 88 that is bolted to the framework and the floor supports of the yachtcar. The rigidity of the box and the large size of the base area at the flange make this a very rigid wheel support mechanism without use of a long horizontal axle. Consequently, this yachtcar will travel with equal facility on land or water due to the wheels being retracted upwardly into the boxes while in the water.

Also, the boxes form suction buckets when air pipes to them are closed off so to prevent roll of the yachtcar while moving in heavy seas or while anchored. While operating on the highway, the box 101 can move upward 4 inches and down 2 inches from standing load level position, against the base of the springs. A fixed limit to the downward travel is provided by two long bolts lying close to each spring. These bolts also hold the top end of the shock absorber. These bolts can be seen in FIG. 11 and are identified with the reference numeral 119. When the yachtcar enters the water, wheels 103 are raised 12 inches by means of simultaneous clockwise rotation of the threaded bars 109 and 110 which pick up threaded receptacles 111 and 112. The top of each bar terminate in a sprocket wheel. A chain of the type used on motorcycles connects the sprocket wheels as is indicated by the reference numeral 120 passed around sprocket wheels 121. A small electric battery powered motor, (Not shown in the drawing), or other power source, runs he chain so to turn the bars 109 and 110. Reversing the electric motor or power source, reverses the rotation of the bars and lowers the wheel 103. The bars 109 and 110 rotate easily with the weight of the car upon them due to bearings 117 at the top and due to an opening being drilled down the center of each bar which intercepts horizontal openings drilled at intervals along the bar so that grease may be forced down the center opening from the top and to pass outward through the horizontal openings and keeping the threads lubricated. The rectangular boxes welded to the end walls of the box 101 support the plates 115 and 116 upon which the springs 113 and 114 are supported. These boxes extend downward to the bottom of the box 101 so to protect the bottom of the bars 109 and 110 from water of highway slush. The sections of bars 109 and 110 appearing between the top of the box 101 and the top of the box 64 when wheel 103 is in a down or driving position, are protected from mud, snow, dust and water by a flexible bellows 122 which collapses when the wheel is raised.

The yachtcar is steered by means of a spur gear wheel 123, which remains in one horizontal plane. A vertical axle 124 having V-configurated grooves out parallel to its central axis, is provided, the grooves being indicated with reference numeral 125, and the axle being slidable upwardly and downwardly through the spur gear wheel 123 see FIG. 11. The grooves 125 are engaged by corresponding teeth within the spur gear wheel 123 which is equipped with a pressure grease nipple for lubrication purposes.

The spur gear has an upward projection 126 in the form of a series of fingers with the underside of each carrying a tooth which fits into a V-shaped groove within the vertical axle 124. The fingers encircle the vertical axle and are spring tempered so that they exert a constant pressure against the vertical axle so to nullify wear and keep the gearing tight. There are also gear teeth within the gear wheel so to absorb heavy twisting action in any horizontal direction. The purpose of the springy fingers is to prevent any looseness developing from wear due to steering. The steering is carried forward to the other parts

of the steering mechanism by a rack gear formed on each end of a shaft and held positively against the spur gear **123** by means of a rack gear tightener as shown in FIG. **7**. The forward end of the rod and rack gear connect with another spur gear under the dashboard. The shaft of this spur gear rises vertically into the dashboard and connects by spur gear to the shaft from the power steering cylinder in the dash. The rack gear is also pressed against the spur gear by spring pressure so that no looseness could develop in the steering. This is true of all rack and spur gear connections.

The vertical axle **124** is shown in a cutoff position at its upper end. Actually, it extends 14 inches above the spur gear so to allow lowering of the wheel **103** down out of the housing sufficiently so to change tires without permitting the axle to slip out of the splined opening through the sprocket gear **123**. The vertical axle **124** is welded to a yoke **127** at the plane where they meet. The yoke has two arms and connects at the lower extremities of the arms to a short axle on which there is carried the wheel **103**, the driving motor **128**, bearing **129**, bearing **130**, bearing **131** and brakedrum **132**. The flexible hose and its attachments which carry oil under pressure to the driving motor **128** are not shown in FIG. **10** but are shown upon the driving motor figures. The flat top section of yoke **127** furnish a nesting place for two bearings **133** and **134**. The bearing **133** rests on the yoke next to the vertical axle **124** and does not touch the top section of the box **101**. The bearing **133** takes all horizontal thrust from the vertical axle **124** and transfers that thrust to the circular ring **135** which is welded to the top of the box **101**. Thus the thrust is passed on to the outer box **64**. The bearing **134** lies outside of bearing **133** and carries the weight of the yachtcar. Both bearings receive grease which is forced down the orifice in the center of the vertical axle **124** and out through horizontal openings represented by reference numeral **136**. Grease travels across the top of the bearing **133** and into it, and on and downward at the angle through openings drilled in the ring **135** and outwardly through safety rings **137** and **138** which maintain a small clearance at all times when loaded. Thus the movement of the grease down and outward blocks abrasives and water away from the bearing and carries adhering debris outward and away. Greasing of these bearings, spur gear **123**, the teeth and axle splines that slide by them, and all the screw bars is made easy, and can be done frequently from within the yachtcar through nipples covered by screwcaps. Safety rings **137** and **138** hook over each other but do not touch each other in highway operation. Their purpose is to lift the wheel **103** and the vertical axle when the screw bars **109** and **110** lift up the box **101**, ad to keep the dirt out of the bearings.

Their design also strengthens both the yoke **127** and the top of the box **101**. Thus, additionally, in case of a broken vertical axle safety ring **137** and **138** would still hold the wheel and offer enough resistance to rotary movement so to allow the car to be brought to a safe stop. The rings also protect the bearings from highway splash and from water splash when the yachtcar is water borne.

Changing the front tires involves the same operation for each; see FIGS. **10** and **11**. The steps for changing the left font tire are as follows:

The hydraulic jack **99** raises the yachtcar 14 inches. Counterclockwise rotation of the threaded bars **109** and **110** lowers the box **101** and the wheel **103** 12 inches, at which point it should touch the ground, since it has two inches of downward movement when not loaded. The cap **139** which fits over the cover of the bearing cover **131** and is held in place by bolts through the flange **132** and yoke tip **140** by screwing into the flange of bearing cover **131**, is removed by removing the bolts. Next, the bolts which secure the reinforcement **141** and yoke tip **140** are removed and the yoke tip **140** is then set aside. Next the wheel nuts are removed so to release the wheel and tire. Replacement is accomplished by a reverse order of the above operation.

Referring now to the rear wheel housing assemblies **66**, and which are structurally identified by the left rear wheel housing assembly, illustrated in FIGS. **8** and **9**, there is shown a structure which includes an outer box **150** that is constructed in the same manner and operates in the same manner as the outer box for the front wheel housing. It includes the same general components as above described, and will accordingly not be necessary here to duplicate the details thereof. The rear wheel housing assembly also includes an inner box **151** that is constructed in the same manner as the inner box for the front wheel housing and has the same operating feature and equipment except for the following exceptions:

The sides **152** of the inner box are not provided with the cutout of arcuate configuration as is provided in the front wheel housing inner box. Additionally, the inner box **151** does not have the vertical axle and yoke with its bearings and steering gear such as is contained in the front wheel housing inner box. The reason for this is that the rear wheels are not used for steering purposes. The rear wheel housing inner box has a U-shaped reinforcement bar **153** which, however, is not contained in the front wheel housing. The rear wheel housing additionally does not contain the hydraulic jack **99** provided in the front wheel housing for tire changing and leveling when camping upon land area. The hydraulic jacks for lifting and leveling the rear of the yachtcar are contained at the extreme rear on each side, port and starboard, within the same two compartments which house the propellers and the propeller motors.

In the rear wheel housing, the driving motor **154**, the wheel assembly **67** comprised of wheel **155** and tire **156**, bearings and brakedrum are carried by the short horizontal axle located between the walls **152** of the box **151**, and by means of bolts shown through the walls of the box **151** near the axle, the driving motor **154** and the bearing cover **157** being attached to the walls of the box **151**.

The process of changing tires for the rear is, however, the same as for the front tires, except that a rectangular section of the inner box is removed to permit access to the wheel nuts.

Referring now to the steering mechanism **160**, illustrated in FIGS. **5** through **7**, there is shown in FIG. **5** a top plan view of the front wheel housing assemblies **64** from each of which there extends the extension **126** carrying the spur gear **123** which engages a toothed rack **161** upon a rod **162**. The opposite end of the rod **162** is provided with a toothed rack **163** engaging a spur gear **164** mounted upon a shaft **165** having at its upper end a spur gear **166** secured thereto that engages a rack gear **167** on the end of a rod **168** that connects the two front wheels by extending transversly across the yachtcar in a horizontal plane, and which also connects to the power steering cylinder **169** in the dash, and which further carries threaded collar and lock for aligning the front wheels. As shown in FIG. **6**, it is to be noted that the rod and its associate toothed racks **161** and **163** are enclosed within a dust cover and grease retainer housing **170**, while the vertical shaft **165** is enclosed within a shaft housing **171**, and the spur gear **166** is enclosed within a housing **172**. The rack gear **167** is slidable transversely adjacent a wheel **173** near each end of the rack rod **168**, the wheel being pivotable about a shaft **174** mounted within opposite legs **175** of a generally U-shaped yoke **176**, the yoke having a pin **177** centrally secured to an intermediate leg **178** of the yoke, the pin being inserted into a compression coil spring **179** contained within recess **180** of a threaded nut **181** threadingly secured to one end of the housing **172**, one end of the compression coil spring **179** bearing against the bottom of the recess **180** and the opposite end of the compression coil spring bearing against the intermediate leg **178** of the yoke, thereby urging the wheel into contact engagement with the rod **168**. It is to be noted that each of the opposite legs **175** of the yoke **176** extend beyond the cylindrical side of the wheel **17** so as to form shoulders between which the slidable rack gear rod **168** is guided. This structure is clearly illustrated in FIG. **7** of the drawing.

FIG. **5** further illustrates a power steering rod **182** extending from a conventional power steering cylinder **169**, and a conventional power steering wheel shaft **183** associated with the

power steering cylinder. The rod 168 is further shown to include an adjustment 184 for the purpose of aligning the wheels 65, the adjustment having a lock nut 185 at each opposite end thereof secured to threaded portions 186 of the rod 168, and an associate extension thereof carrying the rack gear 167.

It is to be further noted that a rack gear tightener 187 is provided for each of the rods 162. This structure is of the type as is illustrated in FIG. 7 for the purpose of tightening the wheel 173 against the rod 168. Thus the slidable rods 162 and 168 are at all times held against engaging teeth of associate spur gears.

Referring now to a dual purpose hydraulic motor and hydraulic pump assembly 200, illustrated in FIGS. 12 and 13 the assembly essentially includes a center rotor motor or a pump that consists of a rotating axle 201 having an enlarged section of the axle having four slots which are machined there within so as to house four sliding vanes 205, 210, 211, and 212 respectively in rotation as each vane passes from an outlet port 203 to an inlet port 204. Two circular plates are riveted at 218 to the enlarged section of the axle, the plates 216, 217 having four slots machined into each so to match the four slots in the axle.

The plates 216, 217 and axle 201 together with the vanes 205, 210, 211 and 212 constitute a center rotor. The slots in the plates act as a guide for the sliding vanes and furnish a shoulder against which oil pressure forces the vane to a perfect seal on each side. The outer edge of the slots in the axle form a shoulder against which the bottom of the vane forms a perfect seal. Two coil springs C incorporated in two openings drilled in each vane push against the axle and force the vane outward along the slot so to make a perfect seal against the outer circular motor housing. Extra openings may be drilled into the vanes so to remove weight therefrom. Spring pressure and centrifugal force move the vanes outward the maximum distance as each reaches the inlet port. Oil pressure forces the motor to rotate by pushing against the vanes.

The plates which are riveted to the enlarged section of the axle pass on each side of a block 208 at the bottom of the motor. The block is bolted to the outer motor housing. The block fills all space between the plates up to the enlarged section of the axle. The block contains three spring loaded seals to compensate for wear of the plates and axle and effectively to seal off the pressure side from the outlet side. The pipes or flexible hose carrying oil to the motor and away from it connects to a steel block drilled and threaded at two points so to accept the male projection of each pipe or hose. This block is welded to the outside surface of the circular motor housing. Reversing the flow of oil reverses the rotation of the motor.

When this motor is used as a high pressure hydraulic pump, the power source such as an internal combustion motor or electric motor, is connected to the axle. Rotation either clockwise or counterclockwise will produce a high pressure pumping action. The axle is reversible within the motor housing so that the axle extension can be brought out of either side of the motor housing and thus be made suitable for operation with either clockwise rotating power sources or counterclockwise rotating power sources.

In operative use, the operation of the dual purpose hydraulic motor and hydraulic pump is as follows in the successive steps indicated:

Oil is carried under pressure by pipe or flexible hose from a motor driven pump 56 entering opening 203, the oil following the direction as indicated by the arrows 204 shown in FIG. 12. The vane 205 is forced outward at position E so to form a tight seal against the circular wall 206 by spring pressure and centrifugal force. The moving oil pushed against the vane 205 thus produces a tight seal on the sides and at the bottom of the vane as it is pressed against the shoulders of the slot within which it slides. Since the oil cannot pass the vane, the axle is forced to rotate as the vane is carried clockwise by oil pressure through the position F to position G. Pressure is released on vane as it passes the oil outlet 207 and contacts the block 208 at position G. The block 208 and the trapped oil force the vane 205 to slide toward the axle by way of the slot within which it operates until the vane 205 has reached the seal 209 at position H. After passing the seal 209, the vane 205 is gradually forced outward by the two coil springs C located in it and behind it until it again contacts the wall 206 at position E and starts its next subsequent cycle of operation.

The vanes 210, 211, and 212 go through the same cycle of operation as described above for the vane 205.

During about one-fifth of each revolution, two vanes are acting as seals ahead of the oil. Each vane is self compensating for wear. The slots are cut one-sixteenth inch wider than the thickness of the vane so that no vacuum can develop at the base of the vane and no oil can be trapped at the base of the vane.

Looseness of the vane in the slot is an aid to trouble free operation. Pressure against the vane will make it seal perfectly regardless of whether the pressure comes from a clockwise direction or a counterclockwise direction.

The block 208 separates the pressure side from the outlet side, and forces the vanes back into the enlarged section of the axle as they move downward from position G and controls the outward movement of each vane after it passes seal 209 at position H. The oil entrance drilled through block 208 as indicated by the oil flow arrows, is not as wide as the block 208 so that a one-quarter inch wide shoulder is provided at each side thus limiting the outward movement of the vane. The block 208 is bolted to the circular motor housing 206 by means of bolts 213, 214 and 215. Bolt 213 location is made possible by a screw plug P located therebelow which provides an opening for drilling the opening, threading the same and installing of the bolt 213. The block 208 has a depression cut in it below the position G as shown by the dotted line so to allow trapped oil to escape around the end of the vane to the outlet 207, in clockwise rotation, and to prevent a vacuum from forming behind the vanes in counterclockwise rotation. Each vane has an arc A cut in the leading edge of the outer end to one-quarter inch of depth and one-half inch width so to match the depression below the position G. The purpose of the arc cut is to allow the escaping trapped oil to exert rearward thrust on the vane to reduce wear upon the block.

The seal 209 is held in firm contact with the enlarged section of the axle by coil springs CS to compensate for wear on the axle and to give a positive seal against oil passage.

The slots holding and guiding the vanes are milled into plates 216 and 217. These plates are riveted by steel rivets 218 to the enlarged section of the axle. Plates 216 and 217 pass on opposite sides of the block 208. The four slots milled in the plates 216 and 217 match four slots milled into the enlarged axle section so to allow the vanes to slide back into the enlarged axle section while crossing the block 208 and the seal 209. Seals 219 and 220 lie in slots milled for them upon opposite sides of the block 208 near the seal 209. Seals 219 and 220 are forced outward by coil spring pressure CP to contact plates 216 and 217 and form a positive seal and compensate for wear of the plates 216 and 217. A flat seal 221 lies in a slot milled in plate 222 and presses against the outer wall of plate 216 by means of a flat spring to compensate for wear of plate 216 and to prevent oil from escaping between the plates from the pressure side to the outlet. A similar flat seal 223 lies in a slot in the motor housing 206 on the opposite side of the motor to perform the same operation as the seal 221. The axle 201 is carried by four bearings 224, 225, 226 and 227 which are grease packed and equipped with grease nipples and outlet flow valve opening manually to allow old or diluted grease to be forced out by a new grease.

Grease is prevented from escaping around the axle 201 by sealing ring 228 and by a cap 229 which can be tightened by screw threads around the bearing cover so to adjust for wear of the sealing ring 228. The cap 229 incorporates a locking device to prevent backward movement which would loosen the seal.

The body of the motor is bolted together by sixteen bolts 230. Bearing covers are bolted to the body of the motor.

All bolt heads are countersunk and welded to the countersunk opening. All nuts are rounded on the pressure side to fit a countersunk opening so that no slippage of any bolted part can occur. Bolt openings for the bearing covers are equilateral and all moving parts of the motor are equilateral so that the axle and bearings can be turned around and can be brought out of either side of the motor. Reversing the flow of oil reverses the motor.

Thus there has been provided a yachtcar having retracting wheels. The yachtcar retracts the wheels vertically in the water to decrease resistance and includes means (not shown) to lower the propellers and their driving hydraulic motors vertically on tracks by control screw bars (not shown). The propellers can kick backward when they strike an underwater object and return automatically to the former position.

When reversing one or both propellers a lock (not shown) is automatically applied to the shaft housing just above the propeller to prevent kicking backward. The lock automatically disengages when the propeller is again shifted to forward.

Due to the propeller being lowered into operating position by screw bars, the depth to which propellers are lowered can be varied accordingly to the speed of travel desired and according to the depth of the water. Shallow water operation and trolling are done most efficiently when the propeller works close to the surface. High speed requires considerable water above the propeller to prevent cavitation, hammering and booming on the hull and vibration.

The thrust of two propellers is straight backwards on a line parallel to the keels. This is more efficient than thrust which is angled downward.

The yachtcar has two propellers **81** operated by oil pumped from the two internal combustion motor-and-pump assemblies **56** for safety and seaworthiness, if a propeller or an internal combustion motor breaks down, there is still one motor and one propeller in operative condition so as to bring the craft into a harbor.

The yachtcar exerts positive traction with all four wheels. One internal combustion motor may pump oil to power the two hydraulic motors of the two front wheels. The other internal combustion motor may pump oil to power the two rear wheel. Bypass valves may be opened from either the front wheels or the rear wheels so that travel is possible at a slower rate of speed with one motor shut off.

By using the cross hatch emergency valve on the two propellers, one motor may be used to turn both propellers when trolling and thus allow the motor to work at about 1000 r.p.m. while the propellers move slowly, thereby prolonging motor life.

The yachtcar has independent springing on all four wheels. The movement allowable from loaded position is 4 inches up and 2 inches downward. The 2 inches down travel limit checks sway on curves by stopping spring expansion at that point. Also the down travel limits reduce the amount of necessary wheel rise in water and prevent the front wheel and vertical axle from dropping out when in the water. Two bolts are provided for this at each spring or four bolts per wheel housing for safety and to prevent binding of the inner box if one bolt becomes broken.

The same internal combustion motors which pump the oil to drive the wheels also pump the oil to drive the propellers. By turning a valve, the power is switched from one to the other.

It shall be further noted that the yachtcar hydraulic motor pump works on an entirely new and different principle as compared to conventional rotary pumps on the market. In the yachtcar, the motor eliminates the problems of eccentric rotor motors. The yachtcar motor uses a center rotor which results in a constant angle of curvature of the outer housing. The eccentric rotor motors have a constantly changing angle of curvature of the outer housing. This constantly changing angle makes effective sealing at the ends of the vane impossible especially at high pressures. In the present invention, the motor pump gives perfect sealing at the ends of the vane even at high pressure since the ends of the vanes can be made to fit perfectly the constant angle of curvature of the outer housing.

This motor guarantees a constant cross sectional area of the expansion chamber from the inlet pot to the outlet port. Accordingly, the area of vanes against which the pressure thrusts is constant through approximately 145° of arc. This allows the use of only four vanes which counter balance each other and furnish double sealing by two vanes during 90° of the power stroke. In other words, the first 90° of the power stroke is always sealed by two vanes.

The eccentric rotor of present rotary motors requires the expansion chamber to be crescent shaped so that the cross sectional area of it vane against which pressure of greatest extension of the vane. If taking for example, the yachtcar motor with a total vane area of 2 inches when fully extended and working on a vane outer tip radius of 4 inches as compared to an eccentric rotor motor having an extended vane area of 2 inches and working on an outer vane tip radius of 4 inches, at equal pressure for both motors, the yachtcar motor will deliver twice the power even if the fact that the vane of the eccentric rotor cannot be adequately sealed was ignored. Pumping capacity efficiency would vary in the same degree.

In the yachtcar motor, the vane is not loaded while it is being extended, and it is fully extended by the time t reaches the inlet port. The vane remains fully extended until it reaches the inlet port. The vane remains fully extended until it reaches the outlet port and the pressure or load is removed. Then the vane is shoved back into the slot provided for it.

The eccentric rotor forces the vane to move outward and inward while loaded, thus binding in the slots and setting up high resistance to movement. Such vanes, when extended have only a short base to hold them. Attempts have been tried by others to overcome this serious weakness by extensions of fingers like character on the bottom of the vanes which interconnect with fingers on the vane on the opposite side of the motor. This only partly solves the problem and adds two new ones, on of which is increased cost of vanes and the other being the bypassing of gas or liquid from the pressure side of the suction side alongside the vanes.

The present motor uses a means entirely unique and original to separate the pressure side from the suction side and to control the movement outward and inward of the vanes. The new moon shaped block is securely bolted to the bottom of the motor and fills completely the space between the moving sidewalls or circular plates and the center rotor, thus separating the pressure side from the suction side. The block forces the vanes back into the slots of the center rotor at the end of the power stroke and limits and regulates the outward movement of the vanes after the bottom center is passed by the vanes. The block carries three spring loaded seals to compensate for wear of the center rotor and of the inner edge of the rotating plates. Two flat spring loaded seals in the outer motor housing compensate for wear of the outer surfaces of the plates. This construction likewise is not present in any eccentric rotor motor.

Regarding the protection of blocks, the present invention motor has a vane that is planed flat and comprises a piece of steel with openings drilled from the bottom side to within one-half inch of the outer edge so to lighten the same in weight. The leading edge of the outer end of the vane considered from the standard point of its most frequent direction of rotation has a small angled new moon cut into it. The purpose of this cut is to kick the vane toward the rotor center after it passes the outlet port and eliminate or at least greatly reduce hammering of the vane on the block as it first makes contact. In operative use, considerable gas or liquid is trapped ahead of the vane after it passes the outlet port. A small arc or trough is cut in the center of the block to allow the trapped gas or liquid to escape by means of the trough. The escaping of the liquid or gas out of the trough past the end of the vane produces thrust against the angled base of the cut in the vane, thus forcing it back to prevent hammering on the block. This will work best at high speed and that is when it is most particularly needed.

A light coil spring pressure is used to push the vanes outward for starting speeds. After the centrifugal force begins to exceed the weight of the vane with increasing r.p.m., the

spring pressure is not necessary, the springs being only needed for slow speeds.

While various changes may be made in the detailed construction, it is understood that such changes will be within the spirit and scope of the present invention as is defined by the appended claims:

I claim:

1. In an amphibious vehicle, the combination of a hull including a pair of power motors,

said hull including four wheel assemblies for travel on the land,

a pair of propeller assemblies on said hull for optional travel over a body of water,

means mounting said wheel assemblies for vertical adjustment between an operative and inoperative position,

said wheel assemblies each including hydraulic motors in wheel hubs thereof,

said power motors including internal combustion motors and hydraulic pumps for supplying hydraulic pressure to said hydraulic motors in the hubs of said wheel assemblies,

each of said wheel assemblies including an outer box connected to said hull and an inner box vertically slidable in said outer box, each of the inner boxes having a wheel journaled therein, one pair of wheels comprising front steering wheels and the other pair of wheels comprising rear wheels.

2. The combination as set forth in claim 1 wherein said power motors comprise dual purpose hydraulic motors and hydraulic pumps, each said hydraulic motor comprising a circular center rotor oil powered motor which fits into each wheel of said vehicle, said hydraulic motor reversing with the reversal of oil flow and operating with equal power and speed in reverse or forward, said oil powered center rotor motor having spring loaded seals which compensate automatically for wear of moving parts and which keep the motor highly efficient, and said oil powered center rotor motor having four sliding vanes which are automatically sealed against leakage of oil around them on both sides and at the bottom by the pressure against them and which are sealed at the top or outer circumference by spring pressures.

3. The combination as set forth in claim 2 wherein said oil powered center rotor motor has four sliding vanes which seal against oil passage in a clockwise rotation and in a counterclockwise rotation, said oil powered center rotor motor containing a block in the lower portion which fills the space between the circular plates up to an axle, the block carrying three seals to compensate for wear of the inner surfaces of said plates and said axle, said block separating the pressure side from the outlet side, and controls inward and outward movement of said vanes.

4. The combination as set forth in claim 2 wherein said oil powered center rotor motor becomes a high pressure oil pump operative in either clockwise or counterclockwise direction when said axle is connected directly to the power output shaft of an input motor, thus producing a pumping force for propelling oil through pipes or hoses to said driving motors in said wheel hubs.

5. The combination as set forth in claim 1 wherein said outer box of said wheel housing contains a flange around the outside of a lower edge thereof which bolts in a watertight manner to a lower frame and floor support of said housecar, the upper part of said outer box extending upward into said housecar, said inner box containing a base for two coil springs and openings at the top of said inner box through which said springs can transfer thrust against the top of said outer box thus carrying the weight of said housecar, said inner box containing small wheels which extend through the end walls of said inner box to engage suitable vertical tracks on the end walls of said outer box to guide the up and down movement of said inner box and to absorb thrust from all sides, said inner box carrying said wheel and a hydraulic driving motor on a short axle between and attached to the side walls of said inner box thus giving even support to each of the two sides of said wheel.

6. The combination as set forth in claim 5 wherein said inner box of each said wheel housing is vertically movable by two threaded bars each of which has a sprocket secured thereto engaged by a sprocket chain powered by a motor, each said threaded bar threadingly engaging a threaded receptacle forming a part of said inner box, whereby each said wheel may be lifted up into said box when the vehicle is in the water.

7. The combination as set forth in claim 6 wherein said wheel housing has adjustable means for a road clearance from a few inches up to 18 inches.

8. The combination as set forth in claim 7 wherein vertically extending boxes are formed at each corner of the said inner box, said vertical boxes being comprised of opposing channels within which guide wheels travel protected from roadway dirt, said guide wheels absorbing thrust.

9. The combination as set forth in claim 8 wherein flexible, collapsible bellows enclose that portion of said threaded bars extending above said inner box, said bellows enclosing thrust bearings at the upper ends of said bars to prevent road dirt gaining access thereto and to a chain drive traveling around gears at the upper ends of said threaded bars.

10. The combination as set forth in claim 9 wherein another flexible, collapsible bellows encloses a central vertical grooved shaft extending upwardly above said inner box, said bellows protecting said grooved shaft from roadway dirt, said grooved shaft vertically slidably engaging a spur gear wheel which is a part of a steering mechanism.

11. The combination as set forth in claim 10 wherein said steering mechanism is contained within the vehicle protected from roadway dirt or slush.

12. The combination as set forth in claim 11 wherein dual shock absorbers in each said wheel housing are of a type to compensate for variable load weight, said housing including means for limiting the down travel of said wheels to eliminate need of antisway bars, and a down travel limiting device stopping the expansion of springs on a rising side when said vehicle leans while traveling on a curve.

13. The combination as set forth in claim 1 wherein said vehicle has surface riding hydroplanes which allow it to skim the water surface for increased travel speed and lower fuel consumption.

14. The combination as set forth in claim 1 wherein a steering mechanism is fully contained within said hull body protected from roadway dirt and water.

15. The combination as set forth in claim 14 wherein said steering mechanism is carried forward from the top of a vertical steering axle by means of a series of spur gears and rack gears working in grease to connect with a power steering cylinder.