United States Patent [19]

Buddrus

[11] **3,915,111**

[45] **Oct. 28, 1975**

[54] **HYDRAULIC MARINE PROPULSION AND GUIDANCE SYSTEM**

[75] Inventor: **Curt Buddrus,** Muskogee, Okla.

[73] Assignee: **Curt Buddrus,** Muskogee, Okla.

[22] Filed: **Oct. 4, 1974**

[21] Appl. No.: **512,074**

[52] **U.S. Cl.** ..... **115/34 A;** 115/35; 115/41 HT

[51] **Int. Cl.**[2] **B63H 5/12;** B63H 25/42

[58] **Field of Search** ..... 115/34 A, 34 R, 35, 41, 115/41 HT

[56] **References Cited**

UNITED STATES PATENTS

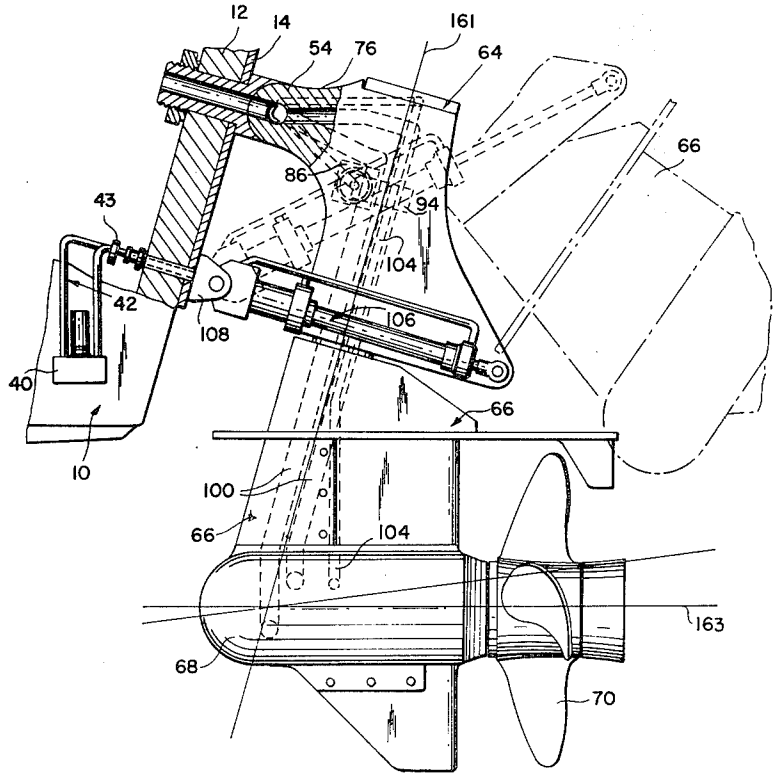
3,139,062	6/1963	Keefe	115/34 A
3,587,511	6/1971	Buddrus	115/34 A
3,596,626	8/1971	Buddrus	115/34 A
3,599,595	8/1971	James	115/34 A
3,847,107	11/1974	Buddrus	115/35

Primary Examiner—Trygve M. Blix
Assistant Examiner—Stuart M. Goldstein
Attorney, Agent, or Firm—Staas & Halsey

[57] **ABSTRACT**

The present invention relates to a hydraulic propulsion and guidance system for a marine vessel. There is provided within the vessel a main system for generating fluid pressure to be transmitted to the fluid motor, a helm pressure generating unit for transmitting fluid pressure to the steering mechanism, and a further fluid pump for operating the trim and lift cylinder. A stationary, manifold hinge shaft is mounted to the transom with first rigid hinge sections so as to extend in a generally horizontal postion outside the vessel. Second hinge sections are mounted for oscillation about the manifold hinge shaft. The outdrive unit consists of an upper section and a lower section, the former mounted to oscillate about the manifold hinge shaft while the latter includes a fluid motor and a steering shaft formed as an integral part thereof and mounted to oscillate with respect to the upper section for steering. A first hydraulic system is mounted within the upper section of the outdrive for turning the steering shaft of the lower section while a second hydraulic system mounted to the transom of the vessel is connected to the upper section of the outdrive so as to rotate same in a vertical plane about the manifold hinge shaft for trim and lift. First fluid conduit structure is provided operatively connecting the main fluid pressure generating system and the fluid motor, including portions thereof passing through and forming a part of the manifold hinge shaft, first hinge sections and the lower section of the outdrive including the steering shaft thereof. There is further provided second fluid conduit structure operatively connecting the helm pressure generating unit and the first hydraulic system, including portions thereof passing through and forming a part of the manifold hinge shaft and the first and second hinge sections. The first hydraulic system includes a piston provided with a rack meshing with a corresponding pinion gear formed along the periphery of the steering shaft of the lower section of the outdrive such that as the helm pressure generating unit is operated the first hydraulic system rotates the steering shaft and the lower section of the outdrive unit. The second hydraulic system consists of a two-cylinder tandem arrangement operated by the fluid pump for preforming the trim and lift functions.

19 Claims, 8 Drawing Figures



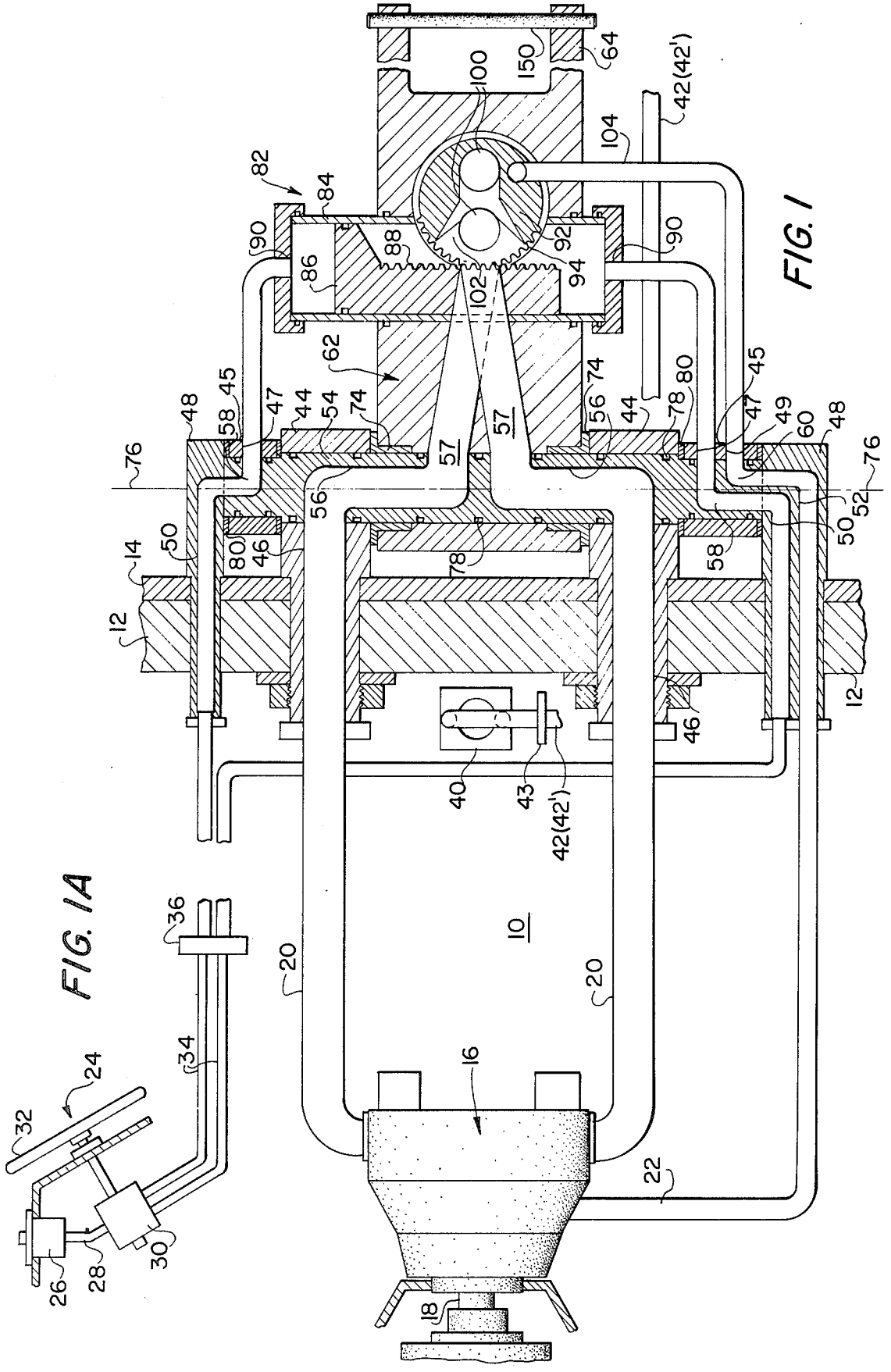
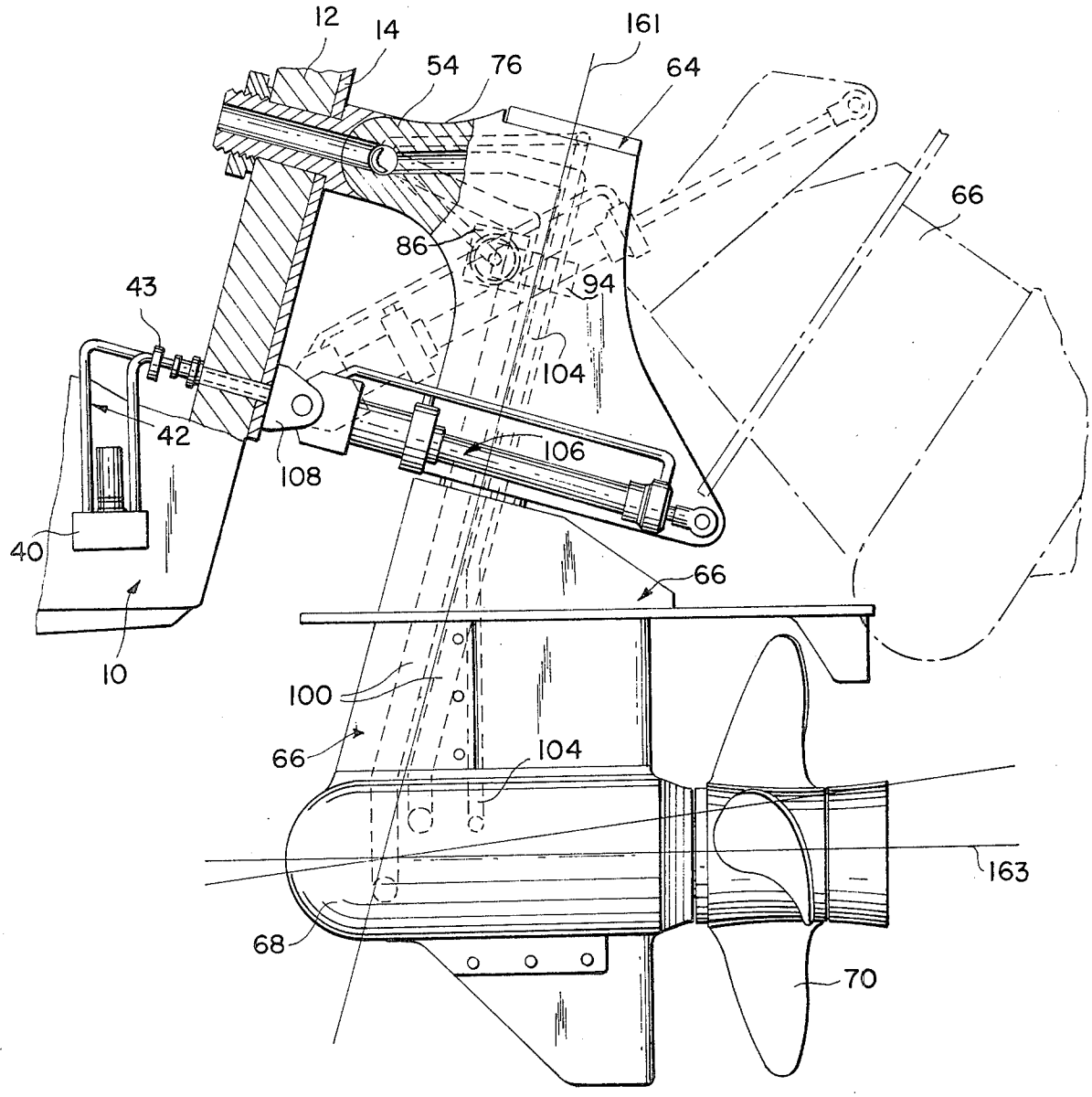

FIG. 1
FIG. 1A
10
12
14
16
18
20
22
24
26
28
30
32
34
36
40
42(42')
43
44
45
46
47
48
49
50
52
54
56
57
58
60
62
64
74
76
78
80
82
84
86
88
90
92
94
100
102
104
150

FIG. 2


12
14
54
76
161
64
66
86
94
43
104
42
106
108
40
66
10
100
66
104
163
68
70

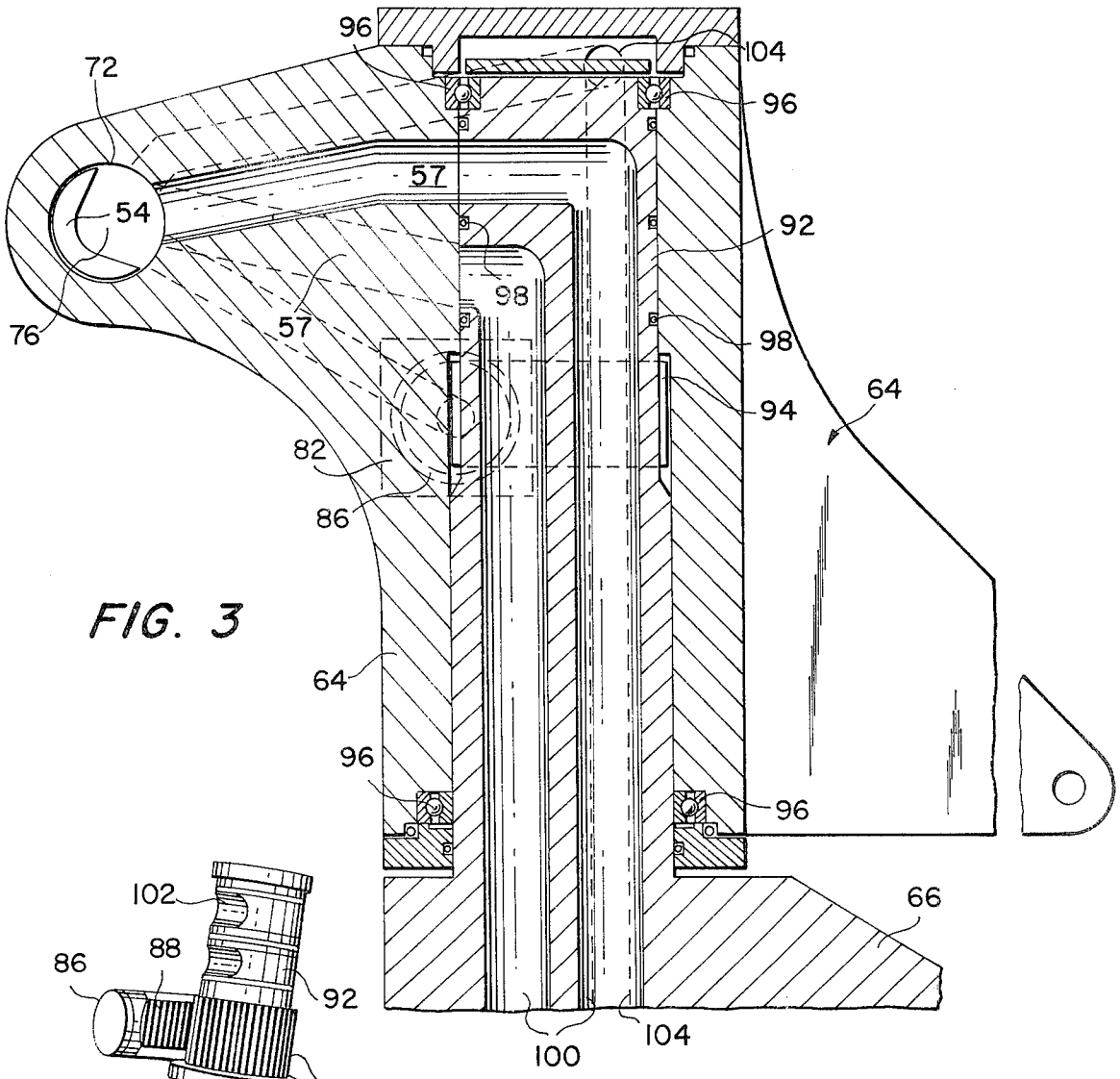

96
104
72
96
57
54
92
98
57
98
76
94
64
82
86
64
96
96

FIG. 3

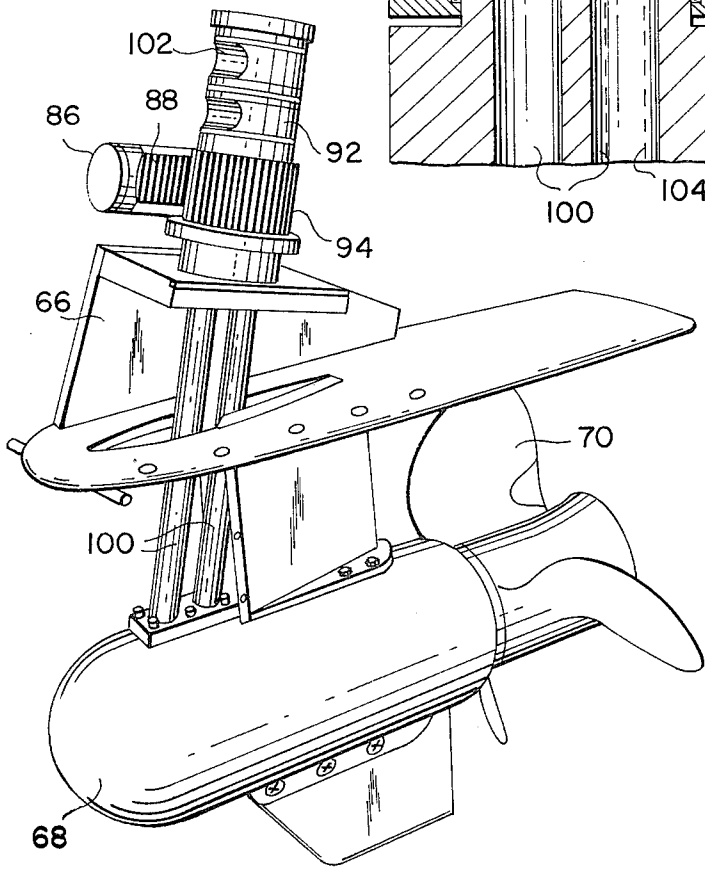

102
66
86
88
92
94
66
70
100
68

FIG. 4

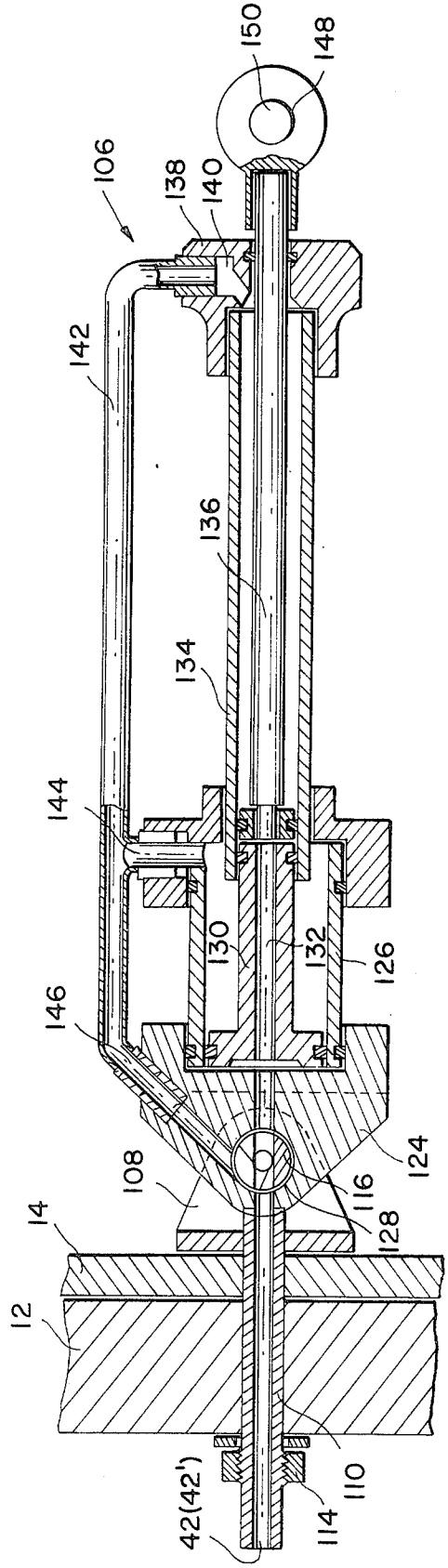

150
148
106
138
140
142
136
134
144
130
132
126
146
124
108
116
128
14
12
42(42')
114
110

FIG. 5

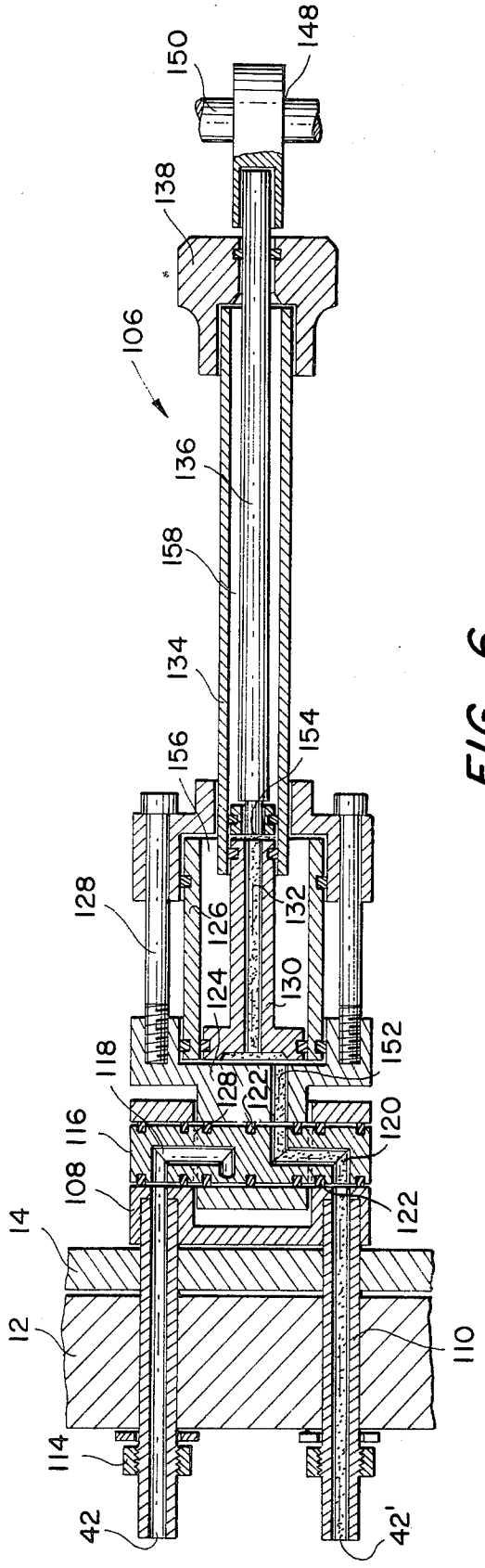

150
148
138
106
136
158
134
154
156
128
126
132
124
130
152
118
128
122
120
116
108
122
14
12
110
114
42
42'

FIG. 6

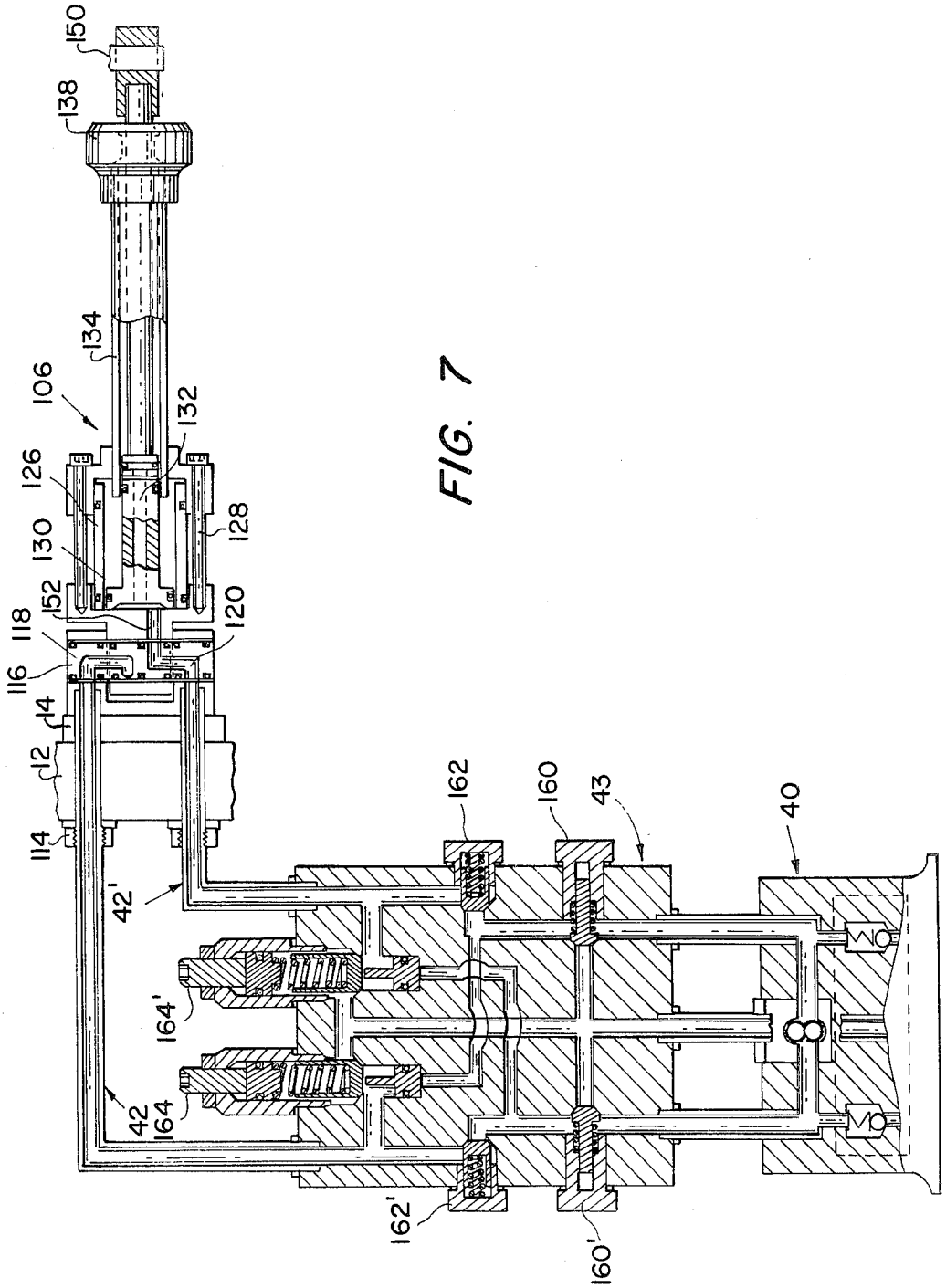

150
138
134
106
132
126
128
130
152
120
118
116
14
12
114
42'
162
160
43
40
164'
42
164
162'
160'

FIG. 7

HYDRAULIC MARINE PROPULSION AND GUIDANCE SYSTEM

BACKGROUND OF THE INVENTION

In U.S. Pat. No. 3,587,511 there is disclosed a hydraulic marine propulsion system featuring an inboard power plant operatively connected to a fluid pressure generating system and an outboard fluid driving system. The inboard pressure generating system disclosed in U.S. Pat. No. **3,587,511** is a reversible variable displacement axial piston pump provided with a lever-operated servosystem and appropriate speed control, charge pump and valve manifold units. The outboard fluid driving system consists of a fixed displacement axial piston fluid motor and propeller.

In U.S. Pat. No. **3,596,626** there is disclosed a steering and tilting system applicable for use with the basic hydraulic propulsion system disclosed in U.S. Pat. No. **3,587,511.** The steering system disclosed therein features the use of a hydraulic actuator and consists of two self-contained units comprising a helm pressure generating assembly positioned as desired within the vessel and a hydraulic rotary actuator assembly suitably mounted to the vessel guidance system. The tilting system likewise consists of two self-contained units comprising a first motor driven hydraulic pump positioned as desired within the vessel and a second hydraulic actuator assembly suitably mounted to the underwater propulsion system.

In U.S. Application Ser. No. **333,301,** now U.S. Pat. No. **3,847,107,** filed Feb. **16, 1973,** there is disclosed a hydraulic propulsion and guidance system featuring both single passage and multiple passage oscillating swivels mounted to the transom of the vessel and a steering clevis permitting the inboard pressure generating system and the outdrive fluid motor to be connected by rigid elements. The fluid conduits operatively connecting the helm pressure generating unit to the steering system and the pumping system to the tilting mechanism are also rigid. Moreover, steering of the fluid motor about an axis that slopes downwardly toward the vessel is permitted.

SUMMARY OF THE INVENTION

The invention disclosed herein solves many of the problems present in the hydraulic propulsion and guidance system art and features a stationary, manifold hinge shaft provided with multiple passageway construction and mounted to the outside of the transom with rigid hinge sections provided with fluid passageways. Similar hinge sections mounted for oscillation about the manifold hinge shaft and provided with passageways are also provided. The outdrive unit consists of upper and lower sections, the upper section mounted so as to oscillate in a vertical plane only about the manifold hinge shaft while the lower section which includes the fluid motor is provided with a steering shaft formed as an integral part thereof and which is mounted to oscillate with respect to the upper section. A first hydraulic system is mounted within the upper section of the outdrive and provided with a piston including a rack which meshes with a corresponding pinion gear formed integrally around the periphery of the shaft of the lower section of the outdrive. A second hydraulic system mounted to the outside of the transom, and featuring a two-cylinder tandem arrangement, is responsible for rotating the outdrive in a vertical plane about the manifold hinge shaft to perform the trim and lift functions. The two-cylinder tandem arrangement is controlled by an automatic positioning and holding valve manifold assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view partly in section illustrating the fluid pressure generating system within the vessel, the outdrive unit, the stationary manifold hinge shaft mounted to the transom about which the outdrive unit oscillates for trim and lift, and the hydraulic cylinder operated by the helm pressure generating unit for rotating the lower section of the outdrive unit for steering;

FIG. **1A** is a side elevational view partly in section illustrating the helm pressure generating unit which is operatively connected to the steering hydraulic cylinder;

FIG. **2** is a side elevational view partly in section illustrating the upper and lower sections of the outdrive unit, the fluid conduits passing therethrough, and the two cylinder tandem arrangement for rotating the outdrive about the manifold hinge to achieve trim and lift;

FIG. **3** is a cross sectional view taken from FIG. **2** illustrating in detail the arrangement for mounting the oscillating steering shaft, that is formed as an integral part of the lower section of the outdrive, within the upper hinged section of the outdrive;

FIG. **4** is a perspective view of the lower section of the outdrive unit illustrating in particular the steering shaft thereof which is provided with a gear that mates with the rack of the steering piston;

FIG. **5** is a side elevational view partly in section illustrating the hydraulic system for rotating the outdrive about the stationary, manifold hinge, and in particular the tandem trim and lift cylinder arrangement;

FIG. **6** is a top plan view partly in section illustrating the tandem trim and lift cylinder arrangement; and

FIG. **7** is a plan view partly in section illustrating the trim and lift system, including the gear pump, automatic control positioning and holding valve manifold assembly, and the tandem trim and lift cylinder arrangement.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIGS. **1** and **2** the reference numeral **10** designates generally a marine vessel terminating in a transom **12** to which a support plate **14** is secured. Within the vessel **10** is mounted a fluid pressure generating system **16** such as is disclosed in U.S. Pat. No. **3,587,511,** incorporated herein by reference, which may be a reversible variable displacement axial piston pump provided with an input shaft **18.** Although not illustrated in the drawings, the propulsion system includes servocylinders, a high pressure manifold valve assembly, check valves, and appropriate fluid connections. The reference numeral **20** designates the fluid circuit lines leading to the propulsion motor which will be described in detail hereinafter, whereas the reference numeral **22** designates the return conduit through which leakage and cooling oils pass.

As illustrated in FIG. **1A**, the reference numeral **24** designates generally the inboard helm pressure generating unit which consists of an atmospheric pressure or make up reservoir **26** connected by way of conduit **28** to a fluid radial piston pump **30** operated by the helm wheel **32.** The fluid lines **34** connect the pump **30** to a

double locking valve assembly designated by the reference numeral **36** in FIG. 1A. For further information regarding the construction and operation of such helm pressure generating units and locking valve assemblies, reference is made to U.S. Pat. No. **3,596,626,** incorporated herein.

The reference numeral **40** designates a high pressure, low-volume gear pump of conventional design driven by a reversible electric motor mounted within the vessel and provided with fluid lines **42** (**42'**) leading to and passing through the transom **12** of the vessel, and a control valve **43.**

As further illustrated in FIG. **1,** two hinge sections or eye bolts **44** are rigidly secured to the vessel and pass through the transom **12** and support plate **14.** Within each of the eye bolts is located a passageway **46,** the purpose of which will be described in detail hereinafter. Similarly, additional hinge sections **48** are rigidly secured to the vessel and pass through the transom **12** and support plate **14** and are provided with passageways **50** and **52.** Rigidly mounted within and to sections **44** and **48,** respectively, is a stationary manifold hinge shaft **54** provided with conduits **56, 58** and **60,** the purpose of which will be explained in detail hereinafter. Finally, hinge sections **45** provided with passageways **47** and **49** are mounted for oscillation about the stationary manifold hinge shaft **54.**

The reference numeral **62** designates generally the outdrive unit which consists of an upper section **64** and a lower section **66** within which the fluid motor **68** is mounted. As indicated in U.S. Pat. No. **3,587,511,** the fluid motor **68** may be a fixed displacement axial piston fluid motor to which the propeller **70** is attached.

As illustrated in FIGS. **1** and **2,** the stationary manifold hinge shaft **54** passes through an opening **72** within the upper section **64** of the outdrive. The bearings **74** permit the upper section **64** of the outdrive to rotate in a vertical plane about the stationary manifold hinge shaft **54,** the reference numeral **76** identifying the axis of rotation. The reference numerals **78** and **80** designate seals and fiber thrust and space washers, respectively, suitably positioned at the juncture of the stationary manifold hinge shaft **54** and the hinge sections, **44,** 45 and **48** and the opening **72** of the upper section **64** of the outdrive.

A hydraulic mechanism generally designated by the reference numeral **82,** as illustrated in FIG. **1,** is mounted within the upper section **64** of the outdrive and consists of a cylinder **84** within which is mounted the piston **86** provided with a rack of teeth **88.** Appropriate fluid openings **90** are provided within each end of the cylinder **84.**

As further illustrated in FIG. **1** to **4,** the lower section **66** of the outdrive terminates upwardly in a steering shaft **92** provided along the periphery thereof with a rack of teeth **94** which engage and mesh with the rack of teeth **88** of the piston **86.** The steering shaft **92,** as illustrated in FIG. **3,** is mounted for rotation within the upper section **64** of the outdrive, reference being made to numerals **96** and **98** which designate ball bearing suspension mechanisms and seals, respectively. The steering shaft **92** is further provided with fluid conduits **100** which pass downwardly through the lower section **64** of the outdrive into the fluid motor **68.** It will be further apparent from FIG. **4** that the conduits **100** terminate upwardly in the top section of the steering shaft **92** in passages **102** which are flared or expanded to correspond to the degree to which the steering shaft **92** oscillates during steering. It will be also apparent that the steering shaft **92** accommodates a passage **104** for leakage and cooling oils which are returned to the fluid pressure generating system **16.**

As illustrated in FIGS. **2, 5** and **6,** there is mounted to the transom support plate **14** a trim and lift hydraulic cylinder assembly generally designated by the reference numeral **106.** The reference numeral **108** designates a clevis which is mounted to the support plate **14.** A swivel pin **116** provided with passageways **118** and **120** is suitably journalled within the clevis **108,** the reference numeral **122** designating suitable seals. The projecting end **124** of the trim cylinder **126** is provided with an opening **128** through which the swivel pin **122** extends, thus permitting the trim cylinder **126** to rotate about the swivel pin **116.**

Within the trim cylinder **126** is mounted a piston and rod assembly **130** provided with a longitudinal passageway **132,** the purpose of which will be explained in detail hereinafter. The lift cylinder **134** is mounted to the trim cylinder **126** and contains a piston and rod assembly designated by the reference numeral **136** which is mounted for reciprocating movement therein. As illustrated in FIG. **5,** the end **138** of the lift cylinder **134** is provided with a passage **140** which functions as a damper orifice for impact control, as will also be explained hereinafter. Finally, conduits **142, 144** and **146** function as return fluid lines. The piston and rod assembly **136** is provided with an opening **148** through which the lift pin **150** passes, it being apparent from FIG. **1** that the lift pin **150** is journalled within the upper section **64** of the outdrive. It is further noted from FIGS. **1** and **6** that the lines **42** (**42'**) from the fluid pump **40** are connected to the hydraulic cylinder assembly **106** through the conduits **110.** In this manner, operation of the hydraulic cylinder assembly **106** by the pump **40** causes the outdrive **62** to rotate about the manifold hinge shaft **54.**

Interposed between the electric fluid pump **40** and the trim and lift hydraulic assembly **106** is an automatic control positioning and holding valve manifold assembly **43,** as illustrated in detail in FIG. **7.**

Where the flow is directed to the right side of manifold assembly **43,** it passes through the check valve **160.** Thereafter, the pressure opens the check valve **162** allowing fluid to flow through the conduit **42'** and enter the trim and lift hydraulic assembly **106,** which, in turn, moves the trim piston **130** to its designated position. As the trim piston **130** moves outwardly, it forces return oil through the conduit **42** into the lift side of the manifold **43.** Since this return flow is blocked by the check valve **162'** it must pass through the relief valve **164** which has been opened by the pilot pressure on the piston of the valve **164,** thus ensuring that the flow returns to the reservoir. To move the trim piston **130** inwardly the fluid flow is reversed by reversing the pump **40,** in which case the sequence of operation is the reverse of that previously described. When the flow from pump **40** is stopped, it is apparent that the pistons in the trim and lift assembly **106** are instantly locked and held inmovable in their respective positions.

As will be apparent from FIGS. **1** and **2,** the main circuit through which fluids pass from the pressure generating system **16** to the fluid motor **68** is defined by the conduits **20,** the passages **46** within the rigid hinge sec-

tions 44, the passages 56 within the stationary manifold hinge shaft 54, the passages 57 within the upper section 64 of the outdrive, and the flared passages 102 and the conduits 100 within the steering shaft 92 and lower section 66 of the outdrive. The circuit for leakage and cooling oils consists of the conduit 22, the passageway 52 within the rigid hinge section 48, the passageway 49 within the oscillating hinge section 45, and the conduit 104 which passes through the steering shaft 92 and the lower section 66 of the outdrive into the fluid motor 68.

The circuit connecting the helm pressure generating system 24 and the steering hydraulic cylinder assembly 82 comprises the conduits 34, the passageways 50 within the rigid hinge sections 48, the passageways 58 within the manifold hinge section 54, the passageways 47 within the oscillating hinge sections 45, and the conduits leading to openings 90 within the cylinder 84.

The fluid circuit operatively connecting the electric fluid pump 40 and the trim and lift hydraulic assembly 106 consists of the conduits 42 and 42' which lead into the conduits 110, as illustrated in FIG. 6. The pressure fluid line within the hydraulic assembly 106 comprises the passage 120 within the swivel pin 116, the passageway 152 within the trim cylinder 126, the passageway 132 located within the piston and rod 130, it being noted that thereafter the fluid pressure is transmitted to the face 154 of the lift piston 136. The above-defined pressure fluid line is designated by stippling in FIG. 6. The return fluid line comprises the space 156 between the trim cylinder 126 and the trim cylinder piston 130, the space 158 between the lift cylinder 134 and the lift piston 136, the damper orifice 140, the conduits 142, 144 and 146, the passageway 118 within the swivel pin 116, and the line 42.

Some of the advantages of the present propulsion and guidance system will now be briefly discussed. It is apparent that all of the hydraulic fluid conduits pass directly through the vessel's transom 12 into the stationary manifold hinge shaft 54. Thus, piping, hoses and tubing connections are eliminated reducing the cost of materials as well as installation time. Importantly, since the manifold hinge shaft 54 is stationary, it is possible to stabilize and improve the entire range of performance of the outdrive 62. Accuracy of steering is insured by eliminating slack and dead areas since the steering shaft 92 is held in perfect oscillating alignment by the ball bearing suspension units 96. As the propulsion fluid enters the outdrive unit 62 through the hinge defined by the manifold shaft 54 and the passage 72 within the upper section 64 of the outdrive, it is apparent that the fluid is directly routed to and from the propulsion motor 68, and since there are no connections the pressure drop is held to a minimum.

The fixed horizontal positioning of the manifold hinge shaft 54 also permits division of the outdrive 62 into two separate but connected sections, namely, the upper section 64 and the lower section 66. In this manner, the upper section 64 functions as the movable part of the hinge and is permitted to move only in a vertical arc and in perfect alignment with the trim and lift cylinder assembly 106. Thus, a three point triangle base suspension system is defined for absorbing the thrust generated by oscillating the lower section 66 during steering.

Moreover, the above noted hinge arrangement permits the angle of the steering axis 161, as illustrated in FIG. 2, to be optional. This is an important feature since angling of the steering axis 161 forward towards the front end of the vessel will cause a change in the angle of the propeller shaft centerline 163 as it travels in its oscillating arc for steering. With a planing vessel, the propeller shaft angle for straight line forward movement is usually set so as to lift the stern of the vessel and push the front down to a planing angle attitude. However, if the vessel is maneuvered in a short, tight turn a reverse attitude is required, and thus the stern should be pulled down and the bow lifted. This condition stabilizes the vessel and lessens the force necessary for steering since the stern is being forced deeper into the water resulting in the forward inertia being converted to a turning force preventing the stern from skidding. This downward pull lifts the bow thus reducing the length of the keel that is in the water shortening the turning radius so as to produce a smoother and shorter turn.

With respect to the trim and lift cylinder assembly 106 illustrated in FIGS. 5 and 6, it should be noted that the trim cylinder 126 is larger in diameter than the lift cylinder 134. Since the angle of trim is small, the stroke of the trim piston 130 is relatively short. It is desirable to trim while the propeller is operating at full thrust and therefore a larger diameter is required to overcome the thrust, whereas the lift cylinder 134 is only required to move the weight of the outdrive unit. It is important to note that the trim and lift cylinder assembly 106 is mounted to the transom 12 and not to a gimbal arrangement or universal joint. Since the cylinders operate only in a vertical plane it is possible to use a hydraulic clevis hinge through which the fluid flows and in so doing to eliminate the necessity of hoses and other connections. Moreover, as the trim and lift cylinders 126 and 134 are positioned in tandem, the larger trim piston 130 forces the smaller, lift piston 136 a predetermined length. This is the trim allowance which governs the magnitude of the trim strokes and keeps the cylinder from lifting the propeller out of the water under full power, an important safety feature.

The center passageway 132 within the trim piston 130 also performs another important function. Should the lower part of the outdrive 62 strike a submerged object, the lift piston 136 moves forward instaneously creating a vacuum within the lift cylinder 134 unless it is supplied with fluid through passageway 132. In the present invention, fluid is permitted to flow from the pump reservoir 40 through the valve system 43 to make up this deficiency. When the outdrive strikes an underwater object, the sudden flow of fluid is damped by being metered as it flows through the orifice 140 and thus the speed of travel of the lift piston and rod assembly 136 is slowed to a predetermined rate maintaining the outdrive under control. This sudden flow with increase in pressure is provided for by the pressure relief system located within the control valve system 43, as illustrated in FIG. 7. The control valve manifold system 43 is an automatically controlled pilot operated locking device which is responsible for holding the piston and rod assembly 106 in a locked, static position. It is therefore apparent that no push and pull cable system, operating levers with cams, check valves and the like are needed to control the reverse thrust of the propeller 70.

Moreover, it will be apparent that the valve manifold assembly 43 positions and locks the trim pistons 130 smoothly without jerks or shocks when under full load operating conditions. Since the valve manifold assem-

bly **43** always remains in a constant, static locked position, the outdrive propulsion unit **62** may be operated at full speed forward or in reverse, without the use of apparatus such as levers, cams, push-pull cables, linkage for shut off valves — as is necessary with present commercial systems.

It should further be noted that the relief valves **164,** 164′ are set to operate under average load conditions. Thus, if a sudden overload occurs, or the outdrive unit **62** strikes an underwater object, the relief valves **164,** 164′ open to protect the entire assembly.

Finally, it should be noted that the simplicity of the present propulsion and guidance system eliminates the necessity of utilizing equipment such as lateral pivots or gimbals, free floating pistons, interliner or telescoping members, internal relief valves, check valves or springs in the lift pistons and hoses.

I claim:

1. A hydraulic propulsion and guidance system for a marine vessel having a transom, comprising:

a main fluid pressure generating system within the vessel;

a helm pressure generating system within the vessel;

first hinge sections rigidly mounted to said transom and provided with supports;

a stationary manifold hinge shaft mounted to said supports of said first hinge sections and extending generally horizontally outside of the vessel along a first axis;

second hinge sections mounted for oscillation about said manifold hinge shaft;

an outdrive unit consisting of an upper section and a lower section, means mounting said upper section to oscillate about said manifold hinge shaft along said first axis, said lower section including a shaft, means mounting said lower section to said upper section such that said shaft and said lower section oscillate with respect to said upper section about a second axis, said lower section including a fluid motor;

first hydraulic means mounted within said upper section for oscillating said shaft and said lower section of said outdrive about said second axis;

first fluid conduit means operatively connecting said fluid pressure generating system and said fluid motor, including portions thereof forming a part of said first hinge sections, manifold hinge shaft, upper section and lower section of said outdrive, including said shaft of said lower section; and

second fluid conduit means operatively connecting said helm pressure generating system and said first hydraulic means, including portions thereof forming a part of said first hinge sections, manifold hinge shaft and second hinge sections.

2. A hydraulic propulsion and guidance system for a marine vessel as in claim **1,** including a fluid pump within said vessel, second hydraulic means mounted to said transom and connected to said upper section of said outdrive for turning same about said first axis, and third fluid conduit means operatively connecting said fluid pump and said second hydraulic means.

3. A hydraulic propulsion and guidance system as in claim **1,** wherein said first hydraulic means includes a cylinder, a piston slidably mounted within said cylinder and provided with a rack, said shaft of said lower section of said outdrive unit being provided with an integral gear along the periphery thereof mating with said rack of said piston such that as said helm pressure generating system is operated said piston rotates said shaft and said lower section of said outdrive unit for steering said vessel.

4. A hydraulic propulsion and guidance system as in claim **1,** wherein said portions of said first fluid conduit means forming a part of said shaft include passageways extending longitudinally through said shaft generally parallel to said second axis and terminating in openings in the side walls of said shaft flared outwardly along the periphery thereof to correspond to the maximum degree of oscillation of said shaft.

5. A hydraulic propulsion and guidance system for a marine vessel as in claim **1,** wherein the bottom of said second axis about which said lower section oscillates is inclined forwardly towards the front of the vessel.

6. A hydraulic propulsion and guidance system for a marine vessel as in claim **2,** wherein said second hydraulic means comprises a trim cylinder, a piston mounted for reciprocating movement within said trim cylinder and provided with a longitudinal passageway extending therethrough, a lift cylinder abutting and extending outwardly from said trim cylinder, a piston mounted for reciprocating movement within said lift cylinder and having one end abutting said passageway of said piston within said trim cylinder, the other end of said piston within said lift cylinder secured to said outdrive.

7. A hydraulic propulsion and guidance system for a marine vessel as in claim **6,** wherein said second hydraulic means further comprises a clevis mounted to the transom of the vessel, and a swivel pin mounted for movement with respect to said clevis, said trim cylinder being connected to said swivel pin.

8. A hydraulic propulsion and guidance system for a marine vessel as in claim **7,** wherein said third fluid conduit means passes through portions of said swivel pin.

9. A hydraulic propulsion and guidance system for a marine vessel as in claim **6,** including a control positioning and holding valve manifold means interposed between and operatively connected to said fluid pump and said second hydraulic means.

10. A hydraulic propulsion and guidance system for a marine vessel as in claim **9,** wherein said fluid pump includes a reservoir, and wherein said second hydraulic means includes a return conduit from said lift cylinder, and wherein said control positioning and holding valve manifold means interposed between and operatively connected to said fluid pump and said second hydraulic means comprises:

first check valve means;

second check valve means;

a first relief valve provided with pilot operated means;

a second relief valve provided with pilot operated means;

fourth fluid conduit means operatively connecting said fluid pump to said trim cylinder through said first check valve means;

fifth fluid conduit means operatively connecting said fluid pump to said return conduit from said lift cylinder;

sixth fluid conduit means operatively connecting said fourth fluid conduit means to said pilot operated means of said first relief valve;

seventh fluid conduit means operatively connecting said fifth fluid conduit means to said pilot operated means of said second relief valve; and

eighth fluid conduit means operatively connecting said first and second relief valves to said reservoir of said fluid pump.

11. A hydraulic propulsion and guidance system for a marine vessel as in claim **10,** wherein said first and second check valves comprise, respectively, separate check valves, said sixth and seventh fluid conduit means, respectively, intersecting said fourth and fifth fluid conduit means at points between said separate check valves.

12. A hydraulic propulsion and guidance system for a marine vessel having a transom, comprising:

main fluid and helm pressure generating systems within the vessel;

a manifold hinge shaft rigidly mounted along a generally horizontal axis outside the vessel;

hinge sections mounted for oscillation about said manifold hinge shaft;

an outdrive having an upper section mounted to oscillate about said manifold hinge shaft and a lower section provided with a fluid motor and mounted to oscillate with respect to said upper section, a hydraulic cylinder mounted within said upper section, a piston slidably mounted within said cylinder and provided with a rack, a shaft formed as a part of said lower section and having provided with a gear along the periphery thereof mating with said rack of said piston;

means connecting said main fluid pressure generating system to said fluid motor; and

means connecting said helm pressure generating system to said hydraulic cylinder such that as said helm pressure generating system is operated said piston slides within said cylinder rotating said shaft and said lower section of said outdrive unit relative to said upper section.

13. A hydraulic propulsion and guidance system for a marine vessel as in claim **12,** wherein said manifold hinge shaft is rigidly mounted along said horizontal axis by hinge sections mounted to said transom and provided with openings through which said manifold hinge shaft extends.

14. A hydraulic propulsion and guidance system for a marine vessel as in claim **13,** wherein said fluid conduit means connecting said main fluid pressure generating system and said fluid motor comprises passageways connecting said main fluid pressure generating system and said rigid hinge sections, passageways extending through said rigid hinge sections, passageways extending through said manifold hinge shaft, passageways extending through said upper section of said outdrive, passageways extending through said shaft of said lower section of said outdrive through said lower section into said fluid motor.

15. A hydraulic propulsion and guidance system for a marine vessel as in claim **14,** including hinge sections mounted for oscillation about said manifold hinge shaft.

16. A hydraulic propulsion and guidance system for a marine vessel as in claim **15,** wherein said fluid conduit means connecting said helm pressure generating system and said means oscillating said lower section comprises passageways extending from said helm pressure generating system to said rigid hinge sections, passageways extending through said rigid hinge sections, passageways extending through said manifold hinge shaft, passageways extending through said hinge sections mounted for oscillation and passageways extending to said cylinder.

17. A hydraulic propulsion and guidance system for a marine vessel, comprising:

an outdrive unit, means mounting said outdrive unit to said vessel permitting said outdrive unit to oscillate about an axis;

a hydraulic system connected to said outdrive for turning same about said axis comprising a trim cylinder, a piston mounted for reciprocating movement within said trim cylinder and provided with a longitudinal passageway extending therethrough, a lift cylinder abutting and extending outwardly from said trim cylinder, a return conduit from said lift cylinder, a piston mounted for reciprocating movement within said lift cylinder and having one end abutting said passageway of said piston within said trim cylinder, the other end of said piston within said lift cylinder being secured to said outdrive;

fluid pumping means provided with a reservoir;

a control positioning and holding valve manifold assembly interposed between and operatively connected to said fluid pumping means and said hydraulic system comprising first check valve means, second check valve means, a first relief valve provided with pivot operated means, a second relief valve provided with pilot operated means, first fluid conduit means operatively connecting said fluid pumping means to said trim cylinder through said first check valve means, second fluid conduit means operatively connecting said fluid pumping means to said return conduit from said lift cylinder, third fluid conduit means operatively connecting said first conduit means to said pilot operated means of said first relief valve, fourth fluid conduit means operatively connecting said second fluid conduit means to said pilot operated means of said second relief valve, and fifth fluid conduit means operatively connecting said first and second relief valves to said reservoir of said fluid pumping means.

18. In a hydraulic propulsion and guidance system for a marine vessel having a transom and provided with main and helm pressure generating systems within the vessel, the improvement comprising first hinge sections rigidly mounted to said transom and provided with supports, a stationary manifold hinge shaft mounted to said supports of said first hinge sections and extending outside of the vessel along a first axis, second hinge sections mounted for oscillation about said manifold hinge shaft, an outdrive unit having an upper section mounted to oscillate about said manifold hinge shaft along said first axis and a lower section mounted to oscillate with respect to said upper section about a second axis, and first fluid conduit means operatively connecting said fluid pressure generating system and said outdrive unit including portions thereof forming a part of said first hinge sections and said manifold hinge shaft and second fluid conduit means operatively connecting said helm pressure generating system and said outdrive including portions thereof forming a part of said first hinge sections, manifold hinge shaft and second hinge sections.

19. In a hydraulic propulsion and guidance system for a marine vessel having main fluid and helm pressure generating systems, an outdrive and conduit means operatively connecting same in fluid relationship, the improvement comprising said outdrive comprising an upper section, means mounting said upper section to oscillate about an axis extending generally horizontally outside of the vessel, a hydraulic cylinder mounted within said upper section of said outdrive and provided with a piston mounted for sliding movement therein and containing a rack of teeth, a lower section provided with a fluid motor and including a shaft provided with a rack of teeth along the periphery thereof mating with said teeth of said piston, said shaft of said lower section being mounted to oscillate with respect to said upper section, and wherein a portion of said conduit means operatively connects said main fluid pressure generating system and said fluid motor and passes through said shaft of said lower section.

* * * * *