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BOAT AND PROPELLER MECHANISM

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2 Sheets-Sheet 1

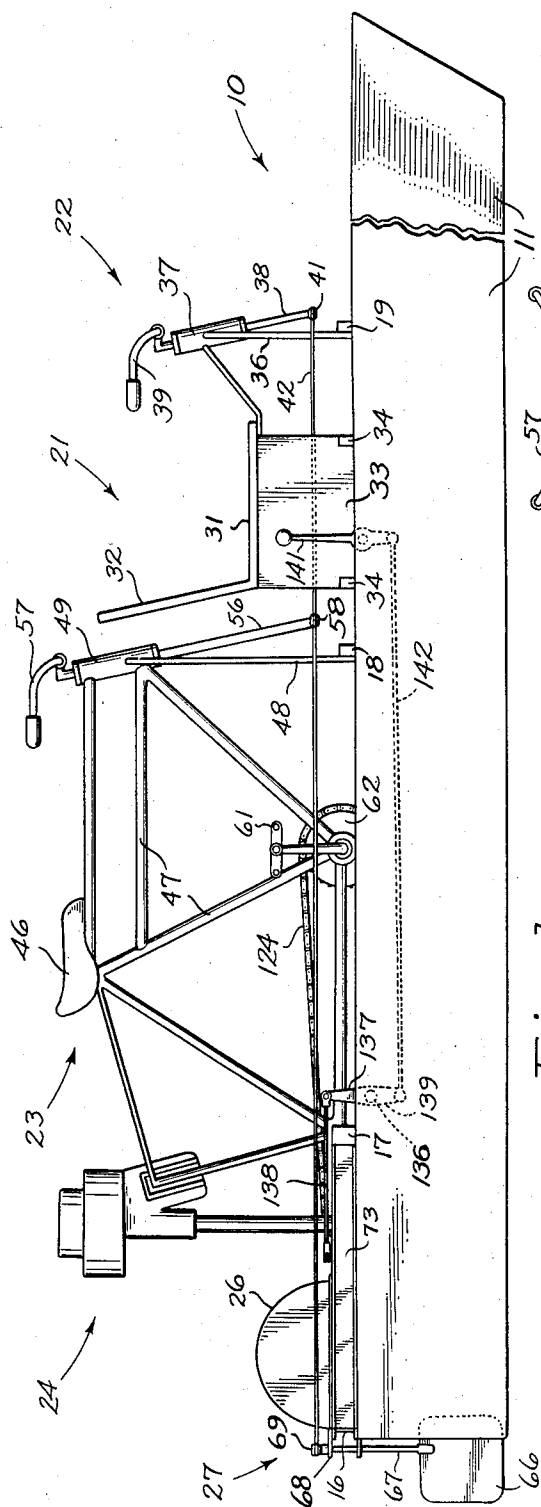


Fig. 1.

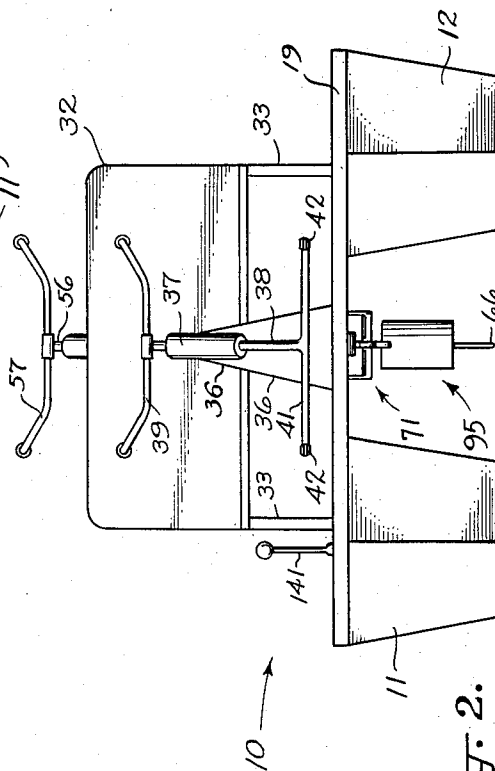


Fig. 2.

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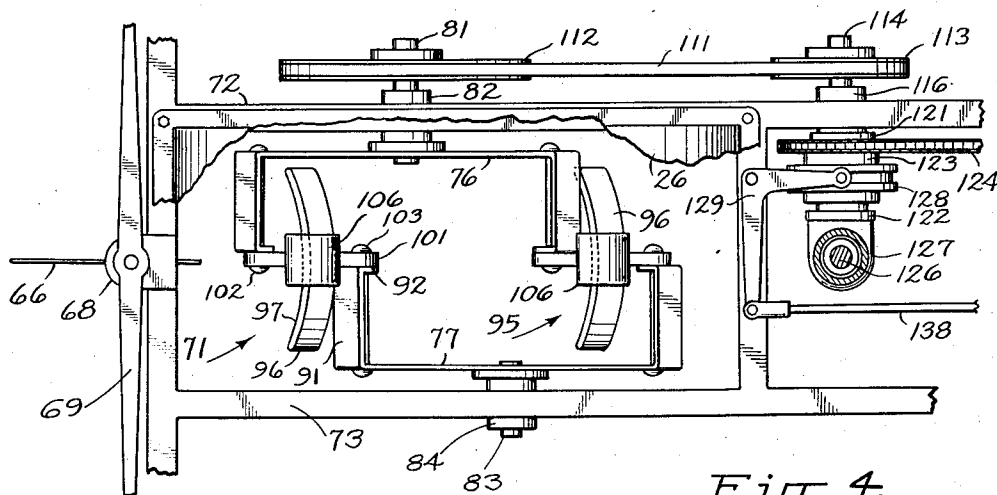


Fig. 4.

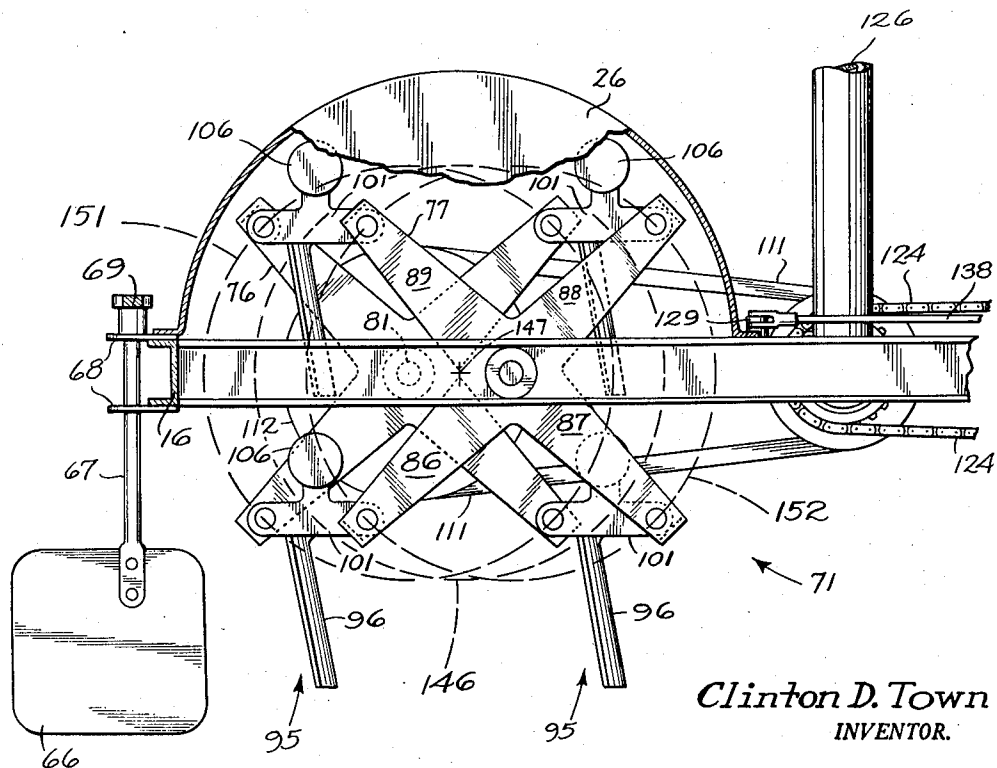


Fig. 3.

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BOAT AND PROPELLER MECHANISM

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9 Claims. (Cl. 115—67)

This invention relates to a novel boat and propeller construction, and more particularly to a shallow draft boat and a paddle propulsion mechanism therefore which is operable to drive the boat smoothly and steadily through the water. The paddle mechanism produces a constant, straight-line forward thrust, and is practical and efficient in shallow, grassy or weedy waters which cause fouling of the ordinary screw-type propeller.

It is a principal object of the invention to provide an improved type of boat and propeller construction wherein the propeller mechanism is located between twin hulls or at the rear of a single hull and is so organized that a straightforward, non-veering thrust is created which is relatively free of pulsations.

Another object is to provide a propulsion mechanism which comprises plural paddles moving in a common vertical plane about an axis extending transversely of the boat, as in the case of a paddle wheel, but wherein the paddles are maintained in an upright position on movement through the water and are so arranged that at all times a paddle is passing through the water in a power stroke.

In general terms, the paddle mechanism comprises a pair of crank members rotatable about axes extending transversely of the boat, with the rotation axis of one of the crank members radially offset and spaced forwardly of the rotation axis of the other. The crank members are also laterally offset, one toward one side and the other toward the other side of the boat, and plural paddles are secured to the two crank members, each being connected to each of the crank members. Rotation of the crank members rotates the paddles about a phantom axis extending parallel to the rotation axes of the crank members but located midway between the two.

The radially offset organization of the rotation axes enables the paddles to move through the water with the paddles continuously occupying throughout their power stroke an upright position. Thus a considerable forward thrust is produced by the paddles and power is not wasted.

Unlike mechanisms known heretofore, the paddle mechanism of this invention is particularly constructed with the purpose of reducing pulsations in thrust, and eliminating a tendency of imparting to a boat a skewing or veering motion with respect to the direction of the boat travel. To this end, at least three paddles, and preferably four, are connected to the crank members, with the paddles angularly displaced at regular modules about the phantom axis about which they revolve. By using three or more paddles, as compared to one or two, a paddle is at all times going through the water in a power stroke. Previous upstanding paddle constructions have employed less than three paddles, usually only one, and thus recurrently a condition existed where no part of the mechanism was undergoing a power stroke. The pulsations set up make such constructions completely unsuitable for any type of motor drive.

To prevent veering, the paddles are all rotated in a

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common vertical plane extending lengthwise of the boat, and the paddles all function to drive the boat in a common direction. This is to be compared with constructions wherein sequential paddles traveling through the water during the power portions of their strokes occupy offset planes of movement, with the result that the boat is urged first in one direction and then another.

A further feature and object of the invention is the provision of a novel paddle construction which comprises plural downwardly depending blade means for propelling the boat, and a counterweight for each blade means which functions to balance the blade means as it is revolved. A propulsion mechanism which is motor driven usually is rotated at a fairly high speed, and thus centrifugal forces are set up which tend to deflect the outer ends of the blades. The provision of counterweights counteracts this tendency, and also adds weight to the mechanism whereby a flywheel effect is produced.

The boat of this invention is ideally suited as a recreation vehicle and as an aid to sportsmen who must travel over water. The propulsion mechanism is little affected by weeds or water growth, and the hulls themselves draw relatively little water. The hulls, when separated from each other, may be used individually.

Other objects, features and advantages are attained by this invention, which is described hereinbelow in conjunction with the accompanying drawings, wherein:

Fig. 1 is a side elevation of a boat constructed according to an embodiment of the invention, showing the general outline of the boat;

Fig. 2 is a front view of the boat illustrated in Fig. 1;

Fig. 3 is an enlarged view of the propeller mechanism located at the end or stern of the boat, with parts removed; and

Fig. 4 is a top view of the propeller mechanism illustrated in Fig. 3.

Referring now to the drawings, and in particular to Figs. 1 and 2, 10 indicates generally a boat having twin-hull portions 11 and 12 arranged side by side but spaced apart one from the other. Hull portions 11 and 12 are rigidly secured together by transverse frame members 16, 17, 18, and 19. Preferably, these transverse frame members are detachably secured as by nut and bolt assemblies (not shown) to the hull portions, to enable detachment of the frame members and separation of the hulls. In a recreation-type boat, this has the advantage of enabling the hulls to be used individually when and if desired.

Straddling the space between the hull portions at the forward end or bow of the boat, is a passenger seat 21 and a bicycle-type handle bar assembly 22 for steering the boat. To the rear of passenger seat 21 is a bicycle-type frame structure 23 including a pedal mechanism which may be used for foot powering the boat. Rearwardly of frame structure 23, is a motor 24, a paddle mechanism covered by a hood structure 26, and a steering rudder assembly 27.

Specifically, passenger seat 21 comprises a base 31, and back rest 32, supported above the top plane of the hulls by side supports 33. Supports 33 are carried on braces 34, which rest on the boat hulls and extend transversely thereof.

Handle bar assembly 22 has an upright stanchion 36 supporting a lantern bracket 37. Lantern bracket 37 rotatably mounts a steering post 38, and has suitably secured to the upper end thereof a handle bar 39. Affixed to the lower end of the steering post and extending transversely thereof is a rod portion 41. A pair of steering lines 42 are attached to the outer ends of rod portion 41, one to each end. These lines run rearwardly along the boat where they have their rear ends suitably secured to rudder assembly 27.

Bicycle frame structure 23 comprises a saddle seat 46 supported on a frame 47 of tubular members. The

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rear end of frame 47 is carried on the boat by securing the same to transverse frame member 17. A stanchion 48, secured to frame member 18, supports the forward end of frame 47. Frame 47 includes at its forward end another lantern bracket 49.

Rotatably mounted in lantern bracket 49 is a second steering post 56. Steering post 56 is rotated by a second handle bar 57, secured to the top of the steering post. A rod portion 58 extending transversely across and affixed to the lower end of steering post 56 connects the steering post with steering lines 42.

A pair of foot pedals 61 (one of which is obscured from view in Fig. 1) is mounted at the base of bicycle frame 23. These are secured to a driving sprocket 62. Pedals 61 are pumped in a conventional manner when it is desired to propel the boat using foot power.

Rudder assembly 27 includes a rudder 66 secured to a rudder post 67. A bracket means 68, attached to transverse frame member 16, rotatably mounts the rudder post midway between the two boat hulls at the rear of the boat. The upper end of the rudder post has affixed thereto a transverse rod 69, and the ends of rod 69 are secured to the rear ends of steering lines 42. Thus the vessel is steered by manipulation of the rudder, which in turn is manipulated by a passenger turning either handle bar 39 or handle bar 57.

Forwardly of the rudder and shielded by hood structure 26 is a paddle mechanism 71, best illustrated in Figs. 3 and 4. The paddle mechanism is relatively shallow draft mechanism, and is constructed so that paddles of the mechanism on being drawn through the water occupy at all times a substantially upright position.

Paddle mechanism 71 is supported in the space between the boat hulls by a pair of longitudinal frame members 72, 73. These frame members are joined at their rear ends to transverse frame member 16 and have their forward ends supported on transverse frame member 17.

Turning now to the construction of paddle mechanism 71, the mechanism comprises a pair of crank members 76, 77. The crank members are laterally offset, one to one side and one to the other side of the boat and have the same size and configuration. The members are mounted on frame members 72, 73 so that they rotate about a pair of axes which are parallel to each other, but radially offset one from the other with one rotation axis forwardly of the other.

Specifically, crank member 76 is secured to a stub shaft 81 rotatably mounted on frame member 72 by bearing 82. Horizontally aligned with shaft 81, but forwardly thereof is a second stub shaft 83. This shaft is rotatably mounted on frame member 73 by bearing 84. Crank member 77 is secured to the inner end of shaft 83. The inner ends of the shafts are spaced apart from each other enabling the crank members and the paddle mechanism to rotate in the space between the shafts.

In the embodiment illustrated, each of the crank members has four arms designated at 86, 87, 88, and 89 for arm 77. These arms are angularly displaced one from another at regular modules about the center of the shaft mounting the arms and thus the rotation axis for the arms.

Each of the arms has a turned-over outer end portion 91 which is turned inwardly to extend transversely of the boat. Each is also provided with an ear portion 92 at the end of the turned over portion. These turned-over outer end and ear portions constitute mounting portions for the crank members. Plural paddles 95 are provided, each of which interconnect the two crank members. Each paddle interconnects mating mounting portions of the crank members, i.e., mounting portions which occupy the same angular position relative to the respective crank member axes.

In the embodiment illustrated, each paddle includes a depending blade portion 96 having a concave face 97

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facing toward the stern of the boat. By making the rear face concave, when the paddle blade is drawn through the water it tends to scoop back water and impart a greater forward thrust to the boat. The particular design of the blade face, however, is not of prime importance in the invention as the blade face may be flat or formed of plural concave face portions arranged side by side.

The top of each paddle includes a cross link 101 rigidly secured intermediate its ends to the blade portion and pivotally connected at 102 and 103 to a pair of mating mounting portions of the crank members.

Carried above the depending blade portion of each paddle is a counterweight 106. This is also rigidly secured to the cross link portion of the paddle intermediate the ends of the cross link.

On fast rotation of the paddle mechanism it has been found that centrifugal force tends to urge the lower or base ends of the paddle blades outwardly, creating stresses in the parts and clearance difficulties. The counterweights, as they are disposed on the side of the pivot connections located away from the blade, balance the construction. Further, the counterweights in unison function as a flywheel means contributing to smoothness in operation.

The paddle, or propeller mechanism, is rotated by a belt 111 trained about a pulley 112 secured to rear stub shaft 81. The forward end of the belt is driven by a pulley 113 secured to a jack shaft 114, which is rotatably mounted in a bearing 116 mounted on frame member 72. In operation, the paddles are moved in a clockwise direction in Fig. 3 or downwardly from right to left and then upwardly in Fig. 4. The power stroke of each paddle, i.e., that portion of its movement where the paddle is moving through the water, occurs when the paddle is moving from right to left in Figs. 3 and 4. When, as in the embodiment illustrated, only one of the crank members is connected to a driving means with the other only following this one, it has been found preferable to drive the shaft connected to the rearmost crank member. In this way, during the power stroke of the paddle, the paddle is pulled instead of pushed through the water. If both of the shafts are driven, the pulling action produced by the rearmost shaft is complemented by a pushing action produced by the foremost shaft.

As best seen in Fig. 4, jack shaft 114 rotatably carries on its inner end of pair of driving clutch members 121, 122. These clutch members, while rotatable on the inner end of the jack shaft, are fixed in a suitable manner against axial movement relative to the shaft. Clutch member 121 is connected to sprocket 123 which has trained thereover a chain 124 connecting the sprocket to sprocket 62. Clutch member 122 is connected to be driven by a motor shaft 126 through a gear box 127.

Intermediate the two driving clutch members is a driven clutch member 128. Clutch member 128 is axially shiftable on jack shaft 114 but fixed against relative rotary movement as by alpine connections between the member and the shaft. Clutch member 128 is shifted by a pivoted lever 129 to place the member in engagement either with clutch member 121 or clutch member 122. Thus, drive to the paddle mechanism may be either through driving clutch member 121 and the driven clutch member or through driving clutch member 122 and the driven clutch member. Motor 24 when actuated rotates motor shaft 126 and driven clutch member 122.

Referring to Figs. 1 and 4, to control pivoted lever 124, a rock shaft 136 is provided which is rotatably mounted in the side walls of hull portion 11. Arm 137 integral with the inner end of the rock shaft is connected to lever 129 by a cable 138. Another arm 139 integral with the outer end of the rock shaft and located intermediate the side walls of the hull is connected to a pivoted clutch handle 141 at the forward end of the boat by a cable 142. Pivotal movement of the upper end of clutch handle 141 rearwardly operates to move driven clutch

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member 128 so that it engages driving clutch member 122. Conversely, movement of the clutch handle in the other direction operates to move clutch member 128 into engagement with clutch member 121.

Referring to Fig. 3, the dotted line 146 indicates the path of movement of center top portions of the paddle blades on rotating movement of the crank members. It will be seen that the paddle portions move in a circular path, about an axis spaced intermediate the rotation axes of shafts 82, 84. This phantom axis is indicated at 147. While the paddles are moved in a circular path, the blade portions of the paddles at all times are in an obliquely upright position.

The blades of the paddles are slightly inclined, with the bottom ends of the blades carried slightly forwardly of the top ends. This construction is used in order to reduce backwash and for the purpose of obtaining smoother operation.

It will also be noted that the paddles all occupy and move in a common vertical plane extending longitudinally of the boat in the space between the boat hulls. This is best illustrated in Fig. 4. When the paddle mechanism is rotated, the thrust produced is always along a line which is common for all the paddles and which is spaced intermediate the two boat hulls and extends longitudinally of the boat. Regardless of which particular blade is in the water, the boat is always propelled straight forward and twisting or skewing of the boat's course never occurs.

Also important is the fact that at least three, preferably four or more paddle blades are used. With one or two paddles, there are always points during the rotation of a paddle mechanism where there is a complete absence of forward thrust. As a result, with two paddles or less, an extremely pulsating type of thrust results. With three or more paddle blades, a forward thrust is imparted to the boat at all times.

In constructing a paddle mechanism with three or more equally spaced paddles which all move in a common vertical plane, it has been found expedient to mount the crank members so that the orbits described by the mounting portions of the members overlap each other. In Fig. 3, dotted line 151 represents the orbits of the mounting portions of member 76 and dotted line 152 represents the orbits of the mounting portions of member 77. These overlap as shown in the figure. If the orbits of the mounting portions overlap it will be evident in viewing Fig. 3 that the paddles may be moved in a circle without encumbering each other. This is so since the links of the paddles which interconnect mating mounting portions may be constructed to have a length somewhat less than the diameter of the orbits. With the lengths less than the diameter of the orbits, the links move out of the way of each other when moved vertically past each other. Thus, a multiple number of blades may be used, each clearing the others without offsetting the blades.

The paddle mechanism of this invention draws little water, and employs no parts rotating entirely under water likely to become fouled with grass or weeds. This is particularly advantageous in boats for hunters and sportsmen, where shallow, weedy waters are common.

It is claimed and desired to secure by Letters Patent:

1. A propeller mechanism for a boat comprising a pair of crank members rotatably mounted on the boat for rotation about parallel and horizontally spaced apart axes extending transversely of the boat, each of said crank members having plural mounting portions carried radially outwardly of and angularly displaced one from another at regular modules about its rotation axis, each mounting portion of one crank member having a mating mounting portion in the other crank member, the mounting portions of mating pairs having the same angular position relative to the respective crank member axes, the mounting portions of the two crank members on rotation of the members describing circular orbits, the cir-

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cular orbits described by the mounting portions of one crank member overlapping the circular orbits described by the mounting portions of the other crank member, and a paddle portion interconnecting mating pairs of mounting portions and connected to the mounting portions of a mating pair by spaced pivot connections, each of said paddle portions having blade means carried below and counterweight means carried above the pivot connections mounting the paddle portion.

2. A propeller mechanism for a boat comprising a pair of crank members, each rotatably mounted on the boat for rotation about parallel and horizontally spaced apart axes extending transversely of the boat, at least three paddle portions, said paddle portions occupying a common substantially vertical plane extending longitudinally of the boat, and pivot means pivotally connecting each paddle portion to each of said crank members, said paddle portions being displaced one from another at regular angular modules about a phantom axis extending parallel to the rotation axes of said crank members but located midway between the two.

3. A boat construction comprising the combination of a pair of elongated boat hulls, means securing the boat hulls side by side but in spaced apart relation, plural upright paddle portions, said paddle portions occupying a common substantially vertical plane extending longitudinally of but intermediate said boat hulls, and means mounting said paddle portions for rotation of said paddle portions about a common axis with the paddle portions maintaining an upright position, said last-mentioned means comprising a pair of crank members spaced intermediate said boat hulls and rotatably mounted on the boat hulls for rotation about parallel and horizontally spaced apart axes extending transversely of said boat hulls, each of said paddle portions being pivotally connected to each of said crank members.

4. A boat construction comprising the combination of a pair of elongated boat hulls, means securing the boat hulls side by side but in spaced apart relation, at least three upright paddle portions, said paddle portions occupying a common substantially vertical plane extending longitudinally of but intermediate said boat hulls, and means mounting said paddle portions for rotation about a common axis with the paddle portions maintaining an upright position, said last-mentioned means comprising a pair of crank members intermediate said boat hulls rotatably mounted on said boat hulls for rotation about parallel and horizontally spaced apart rotation axes extending transversely of said boat hulls, each crank member having plural mounting portions, each radially spaced from its rotation axis, corresponding in number to the number of said paddle portions and movable in a circular path about the rotation axis for the member, the mounting portions of one crank member moving in paths which overlap the paths of the mounting portions of the other, and pivot means pivotally connecting each of said paddle portions to a mounting portion of each of said crank members.

5. The boat construction of claim 4 wherein each of said paddle portions has means depending downwardly from the pivot connections connecting the paddle portion to said crank members, and wherein the blade means inclines from the vertical with the bottom spaced forwardly of the top of the blade means.

6. A propeller mechanism for a boat comprising a pair of parallel but radially offset shafts arranged end to end, each mounted on said boat for rotation about a rotation axis extending longitudinally of the shaft and transversely of the boat, a pair of crank members of substantially the same size and configuration secured to the inner ends of said shafts, one to each of said shafts, each of said crank members having plural mounting portions carried radially outwardly of the shaft for the member and angularly displaced one from another at regular modules about the rotation axis of the shaft for the member, each mounting

portion of one crank member having a mating mounting portion in the other crank member, the mounting portions of mating pairs having the same angular position relative to the respective crank member axes, the mounting portions of the two crank members on rotation of the members describing circular orbits, the orbits described by the mounting portions of one crank member overlapping the orbits described by the mounting portions of the other crank member, and a paddle portion interconnecting mating pairs of mounting portions carried between the inner ends of said shafts.

7. A propeller mechanism for a boat comprising a pair of parallel but radially offset shafts arranged end to end, each mounted on said boat for rotation about a rotation axis extending longitudinally of the shaft and transversely of the boat, a pair of crank members of substantially the same size and configuration secured to the inner ends of said shafts, one to each of said shafts, each of said crank members having plural mounting portions carried radially outwardly of the shaft mounting the same, each mounting portion of one crank member having a mating mounting portion in the other crank member, the mounting portions of mating pairs having the same angular position relative to the respective crank member axes, the mounting portions of the two crank members on rotation of the members describing orbits, the orbits described by the mounting portions of one crank member overlapping the orbits described by the mounting portions of the other crank member, and a paddle portion interconnecting mating pairs of mounting portions and connected to the mounting portions of a mating pair by pivot connections, each of said paddle portions having blade means carried below the pivot connections for the mounting portion and counterweight means carried above these pivot connections.

8. A boat construction comprising the combination of a pair of elongated boat hulls, means securing the boat hulls side by side but in spaced apart relation, a pair of crank members comprising a first crank member and a

second crank member intermediate said boat hulls rotatably mounted on said boat hulls for rotation about parallel rotation axes extending transversely of said boat hulls, the rotation axis of the first crank member being spaced forwardly of the rotation axis of the second crank member, plural paddle portions, said paddle portions occupying a common substantially vertical plane extending longitudinally of said boat hulls but intermediate the hulls, means securing each of said paddle portions to each of said crank members, and drive means for rotating said crank members, said drive means comprising pedal mechanism, and clutch means for connecting selectively said pedal mechanism to the second crank member.

9. A propeller mechanism for a boat comprising a pair of crank members rotatably mounted on the boat for rotation about parallel axes extending transversely of the boat, at least three paddle portions disposed between the crank members and substantially aligned longitudinally of the boat, pivot means connecting each paddle portion to each of the crank members, the pivot means for the various paddle portions having connections with each crank member disposed at substantially regular angular modules about the rotation axes of the crank member, the connections of the pivot means with each crank member on rotation of the member describing orbits, the orbits described by the connections of the pivot means with one crank member overlapping the orbits described by the connections of the pivot means with the other crank member.

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