Sept. 4, 1962 F. J. KENEFICK 3,052,093

STEERING AND REVERSING MECHANISM FOR HYDROJET PROPULSION UNITS FOR BOATS

Filed May 24, 1961 2 Sheets-Sheet 1

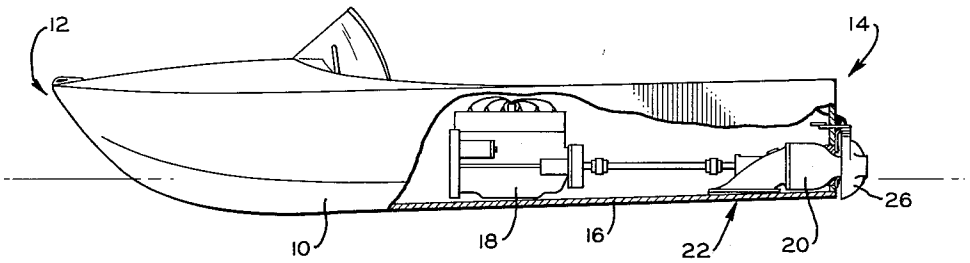


FIG. 1.

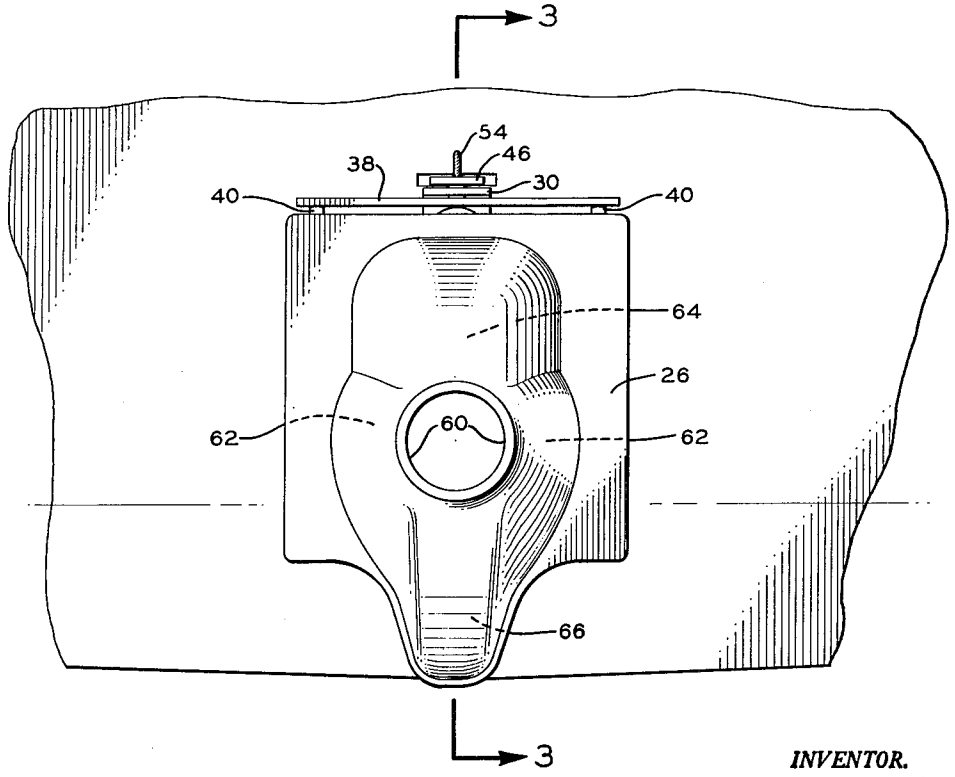


FIG. 2.

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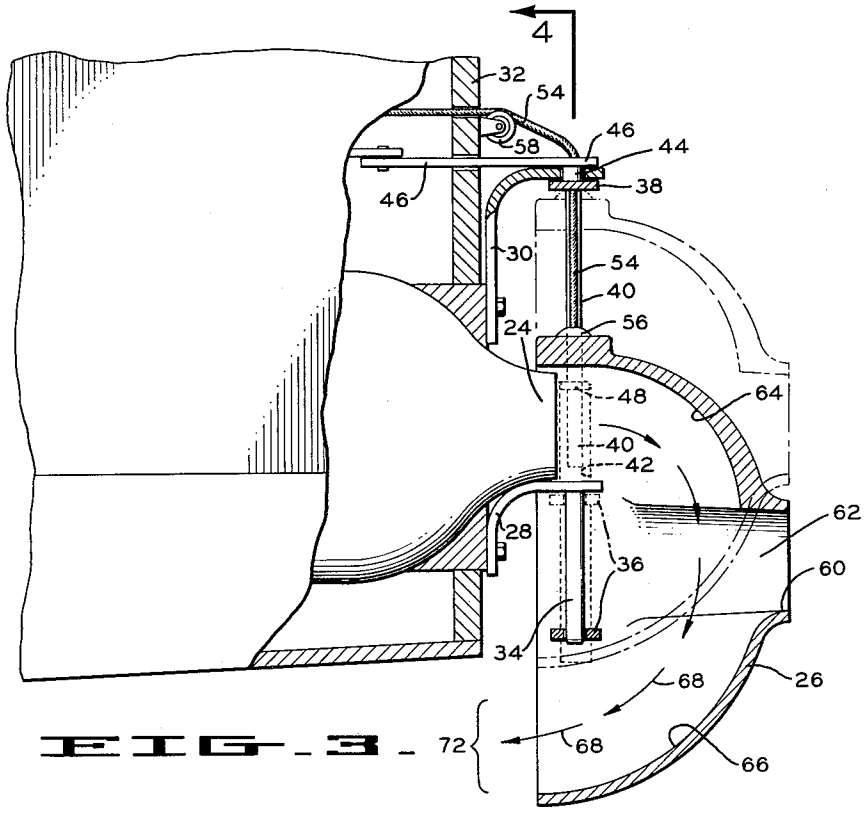


FIG. 3.

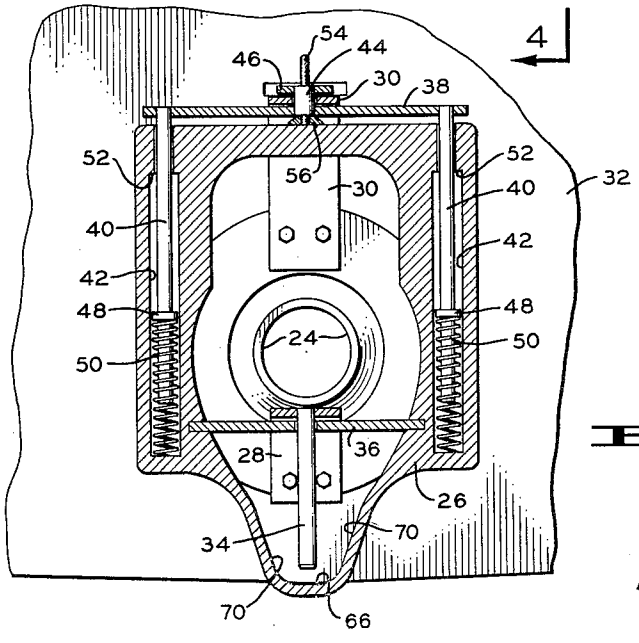


FIG. 4.

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STEERING AND REVERSING MECHANISM FOR HYDROJET PROPULSION UNITS FOR BOATS

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10 Claims. (Cl. 60—35.54)

This invention relates to watercraft and more particularly to improved steering and reversing means for use on watercraft which are propelled by water pumps mounted to deliver a thrust producing jet stream of water emanating from the craft.

It is a prinicpal object of this invention to provide improved steering and reversing means for watercraft that are propelled by a generally horizontal jet stream of water emanating from a nozzle on the craft.

It is another object of the invention to provide such improved steering and reversing means by which full power and steering control can be obtained with either forward or reverse thrust of the jet stream applied to the craft.

It is another object of the invention to provide such an improved steering and reversing mechanism in which a single element may be manipulated for steering the craft with either forward or reverse thrust.

It is another object of the invention to provide such improved steering and reversing means which are simple in design and manner of operation so that it may be constructed and installed inexpensively and so that it will not require frequent adjustment when in use.

Other objects and advantages of the invention will become apparent from the following description read in conjunction with the attached drawings in which:

FIG. 1 is a side elevational view partially broken away of a power boat incorporating the improved steering and reversing means of this invention;

FIG. 2 is an elevational view of a portion of the stern of the boat illustrated in FIG. 1;

FIG. 3 is a vertical sectional view taken along the plane and in the direction indicated by the line and the arrows at 3—3 in FIG. 2 with the elements of the invention shown in reverse thrust position; and

FIG. 4 is a vertical sectional view taken along the plane and in the direction indicated by the line and the arrows at 4—4 in FIG. 3 with the elements of the invention shown in forward thrust position.

Referring now in detail to the drawings and particularly to FIG. 1, a boat hull **10** having bow and stern ends **12** and **14** respectively and a bottom **16** is provided with a prime mover **18** and a pump **20** connected to and driven by the prime mover **18**. The pump **20** is arranged to pump water from an intake passageway **22** and to deliver a jet stream of water through a nozzle **24** (see FIGS. 3 and 4). As is well known in the art, the delivery of the jet stream of water through the nozzle **24** provides a reactive thrust on the hull of the craft by which the craft is propelled through the water.

A deflector body **26** is mounted on the stern end of the watercraft **10** by means of brackets **28** and **30** (see FIGS. 3 and 4) which are bolted to the transom **32** of the boat hull. A generally vertical pin **34** is mounted on the bracket **28** and is received in an aperture in an internal support bar **36** inside the deflector body **26**. A transverse yoke **38** is mounted on the deflector body **26** by a pair of spaced-apart rods **40** received in vertical passageways **42** in the deflector body **26**. The yoke **38** is pivotally mounted on the bracket **30** by means of a hollow shaft **44** rigidly connected to the yoke **38** and pivotally received in an aperture in the bracket **30**. A steering arm **46** is rigidly attached to the shaft **44** on top of the bracket **30** and may be manipulated to effect pivotal movement of the

deflector body **26** about a vertical axis extending through the center of pin **34** and the center of shaft **44**. As will appear hereinafter, the brackets **28** and **30** are preferably attached to the transom **32** of the boat in such a position that this vertical axis of pivotal movement of the deflector body **26** passes through the center of the jet stream of water emanating from the nozzle **24**.

As most clearly seen in FIG. 4, the vertical rods **40** are provided with shoulders **48** thereon, and compression springs **50** are mounted in the passageways **42** below the shoulders **48**. In this manner the compression springs **50** spring bias the deflector body **26** to a position where the shoulders **48** on the rods **40** contact shoulders **52** adjacent to the upper ends of the passageways **42** in the deflector body **26**.

A forward and reverse shifting cable **54** is attached to the deflector body **26** by suitable means such as a weld **56** and extends upwardly from the deflector body **26** through the central aperture in shaft **44** and over a pulley **58** mounted on the transom of the boat. The application of tension to the forward and reverse shifting cable **54** effects movement of the deflector body **26** in opposition to biasing springs **50** so that the deflector body **26** moves from the full line position of FIG. 3 to the phantom line position of FIG. 3.

As illustrated in the drawings, the steering arm **46** and the forward and reverse shifting cable **54** extend through suitable apertures in the transom of the boat; however, these elements may extend upwardly from their illustrated positions adjacent to the bracket **30** and pass over the top of the transom **32**.

The deflector body **26** is provided with an interior cavity (best seen in FIG. 3) and a generally central aperture **60** communicating with the cavity. The aperture is positioned to be in alignment with the nozzle **24** when the deflector body **26** is in its upper position, that is the position shown in FIG. 4 and the phantom outline position shown in FIG. 3. The walls of the cavity in the deflector body **26** define a pair of forward steering deflector surfaces **62** and upper and lower reverse motion surfaces **64** and **66** respectively (see FIGS. 2 and 3). The forward steering surfaces **62** extend from opposite sides of the aperture **60** and lie in substantially the same horizontally extending area as the aperture **60**, and the surfaces **62** are inclined to the axis of the aperture **60** with the tangents to the surfaces **62** at points adjacent to the aperture **60** extending through the aperture **60**. Accordingly, when the deflector body **26** is pivoted about the pin **34** and shaft **44** from the central position where the jet stream from nozzle **24** passes through aperture **60**, the jet stream from nozzle **24** strikes one of the deflector surfaces **62** and is deflected through the aperture **60** at an oblique angle to path of the jet stream emanating from the nozzle **24**. The deflected jet stream produces a reacting thrust on the boat in a direction inclined to the axis of the nozzle **24** to permit steering of the boat.

When it is desirable to break forward motion of the boat or cause it to move rearwardly, tension is relaxed from the cable **54** permitting the deflector body **26** to assume its downward position as illustrated in FIG. 3 where the jet stream emanating from nozzle **24** impinges on the upper reverse motion deflector surface **64**. The deflector surface **64** is curved to bend the jet stream from nozzle **24** downwardly and to direct it to pass across the aperture **60**. Thus, the geometrical tangents to the surface **64** at points adjacent to the aperture **60** extend across the aperture **60** and intersect the surface **66**. The deflector surface **66** is further curved to bend the jet stream along the path indicated by arrows **68** so that the jet stream emanates from the deflector body **26** in a direction facing opposite to the opening of aperture **60**.

It should be noted that the portion of the deflector body **26** which defines the lower reverse motion surface **66** is generally scooped shape (as best illustrated in FIG. 4) with a pair of generally vertical surfaces **70** forming the side walls of the scoop. The surfaces **66** and **70** thereby define a discharge mouth (indicated generally at **72** in FIG. 3) from which the jet stream from nozzle emanates when deflector body **26** is in its lower position. Pivotal movement of the deflector body **26** about the vertical pin **34** and shaft **44** pivots this discharge mouth **72** so that the manipulation of steering arm **46** while the deflector body **26** is in its lower position is effective to provide full steering control of the boat with reverse thrust.

While a preferred embodiment of this invention has been illustrated and described in detail herein, it is obvious that many modifications in the structure disclosed may be made without departing from the spirit and scope of the invention.

I claim:

1. In a watercraft having a hull adapted to float in a body of water, a water pump mounted on said hull and adapted to pump water from said body of water, and a nozzle connected to said pump and adapted to direct the fluid output of said pump as a generally horizontal jet stream of water for propelling said craft, the improved means for steering and reversing said craft comprising: a deflector body having a generally central aperture therethrough, means for mounting said deflector body in a normal position on said hull with said aperture aligned with said jet stream to pass said jet stream therethrough, steering means for pivoting said deflector body about a generally vertical axis, forward steering deflector means on said deflector body for deflecting said jet stream horizontally responsive to pivotal movement of said deflector body, reverse steering means including a delivery mouth on said deflector body facing in a direction generally opposite to said aperture and reversing deflector means positioned on said body normally out of said jet stream for deflecting said jet stream through said mouth, and reverse shifting means for moving said reversing deflector means into said jet stream.

2. In a watercraft having a hull adapted to float in a body of water, a water pump mounted on said hull and adapted to pump water from said body of water, and a nozzle connected to said pump and adapted to direct the fluid output of said pump as a generally horizontal jet stream of water for propelling said craft, the improved means for steering and reversing said craft comprising: a deflector body having a concave surface therein and a generally central aperture therethrough communicating with said concave surface, means for mounting said deflector body on said hull in fluid receiving relation to said jet stream and with said deflector body pivotally mounted for rotation about a generally vertical pivotal axis which extends through said jet stream and is spaced from said aperture, steering means for pivoting said deflector body about said axis, and shifting means for moving said deflector body generally parallel to said axis between a forward motion position with said aperture positioned in alignment with said jet stream and a reverse position with said aperture positioned adjacent to said jet stream and with a reverse motion portion of said concave surface adjacent to said aperture in alignment with said jet stream whereby the reverse portion of said concave surface deflects said jet stream across said aperture.

3. The improved steering and reversing means of claim 2 in which said concave surface has a pair of forward steering surface portions on opposite sides of said aperture and lying in substantially the same horizontal plane as said aperture with said forward steering portions of said surface having edges adjacent to said aperture, the tangents to which extend through said aperture.

4. The improved steering and reversing means of claim 2 in which said reverse motion portion of said concave surface has an edge thereof adjacent to said aperture with the tangent to said reverse steering portion at said edge extending across said aperture.

5. The improved steering and reversing means of claim 2 in which said concave surface has a reverse steering portion thereof on the side of said aperture opposite to said reverse motion portion and positioned to receive fluid flow from said reverse motion portion, said reverse steering portion being generally scoop shaped with a curved bottom wall and generally vertical side walls.

6. In a watercraft having a hull adapted to float in a body of water, a water pump mounted on said hull and adapted to pump water from said body of water, and a nozzle connected to said pump and adapted to direct the fluid output of said pump as a generally horizontal jet stream of water for propelling said craft, the improved means for steering and reversing said craft comprising: a deflector body mounted on said hull over said nozzle for pivotal movement about a vertical axis which extends through said jet stream, said deflector body having an aperture therethrough which is spaced from said axis, means for supporting said deflector body in a normal position with said aperture aligned with said jet stream through said deflector body, said deflector body having a cavity therein between said aperture and said axis with the walls of said cavity defining a pair of forward steering surfaces on opposite sides of said aperture and lying in substantially the same horizontally extending area as said aperture and a pair of reverse steering surfaces on opposite sides of said aperture and lying in substantially the same vertically extending area as said aperture, said forward steering surfaces being inclined to said aperture with the tangents thereto at points adjacent to said aperture extending through said aperture, one of said reverse steering surfaces being curved with the tangents thereto at points adjacent to said aperture extending across said aperture inside of said cavity and the other of said reverse steering surfaces being curved and having one end thereof intersecting said tangents to said one reverse steering surface and the other end thereof terminating in a discharge mouth facing generally horizontally and in a direction opposite to said aperture, said other reverse steering surface having a pair of generally vertical side wall portions on opposite sides of said axis, forward and reverse shifting means for moving said deflector body between said normal position with said jet stream directed toward said horizontally extending area of said aperture and said forward steering surfaces and a reverse motion position with said jet stream directed toward said one reverse steering surface, and steering means for pivoting said deflector body about said axis when said body is in said normal position and reverse motion position.

7. The improved steering and reversing means of claim 6 in which said one reverse steering surface terminates at a first edge adjacent to said aperture; said other reverse steering surface terminates in a second edge adjacent to said aperture, and said first edge lies closer to said axis than said second edge.

8. The improved steering and reversing means of claim 6 in which said shifting means comprises means for moving said deflector body longitudinally of said axis.

9. The improved steering and reversing means of claim 6 in which said one reverse steering surface lies vertically above said other reverse steering surface, and said shifting means comprises slidable mounting means supporting said deflector body on said hull and permitting sliding movement of said deflector body between an upper, forward motion position and a lower, reverse motion position, spring biasing means resiliently urging said deflector body into said lower position, and a shifting cable attached to said deflector body for pulling said deflector body into said upper position.

10. A watercraft having a hull with a bottom, a bow end and a stern end, a water pump mounted on said hull and having an intake passageway extending through said bottom of said hull, a fluid delivery nozzle mounted on

said stern end of said hull adjacent to said bottom of said hull and connected to said pump to direct the fluid output of said pump as a generally horizontal jet stream for propelling said craft, and means for steering and reversing said craft comprising: a deflector body mounted on said stern end of said hull over said nozzle for pivotal movement about a vertical axis which extends through said jet stream, said deflector body having an aperture therethrough which is spaced from said axis and a cavity therein surrounding said aperture and defining a pair of forward steering surfaces and a pair of reverse steering surfaces adjacent to said aperture and facing toward said axis, said forward steering surfaces lying in substantially the same horizontally extending area as said aperture and on opposite sides of said aperture with the tangents thereto at points adjacent to said aperture extending through said aperture, said reverse steering surfaces lying in substantially the same vertically extending area as said aperture with an upper one of said reverse steering surfaces lying above said aperture and being curved with the tangents thereto at points adjacent to said aperture extending across said aperture and with a lower one of said reverse steering surfaces lying below said aperture

and intersecting said tangents to said upper surface, said lower reverse steering surface being generally scoop shaped with a curved bottom surface extending downwardly from said aperture and toward said axis and a pair of generally vertical side surfaces on opposite sides of said axis with said scoop shaped lower surface terminating in a discharge mouth facing generally horizontally and in a direction opposite to said aperture, forward and reverse shifting means for sliding said deflector body in a direction parallel to said axis between a forward motion position with said aperture aligned with said jet stream and said deflector positioned above said bottom of said hull and a reverse motion position with said upper reverse steering surface intercepting said jet stream and said mouth of said lower reverse steering surface positioned below said bottom of said hull, and steering means for pivoting said deflector body about said axis when said body is in said forward and reverse motion positions.

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