June 26, 1962 C. J. DAHLE 3,040,696

PROPULSION AND STEERING UNIT FOR BOATS

Filed April 8, 1960 3 Sheets-Sheet 1

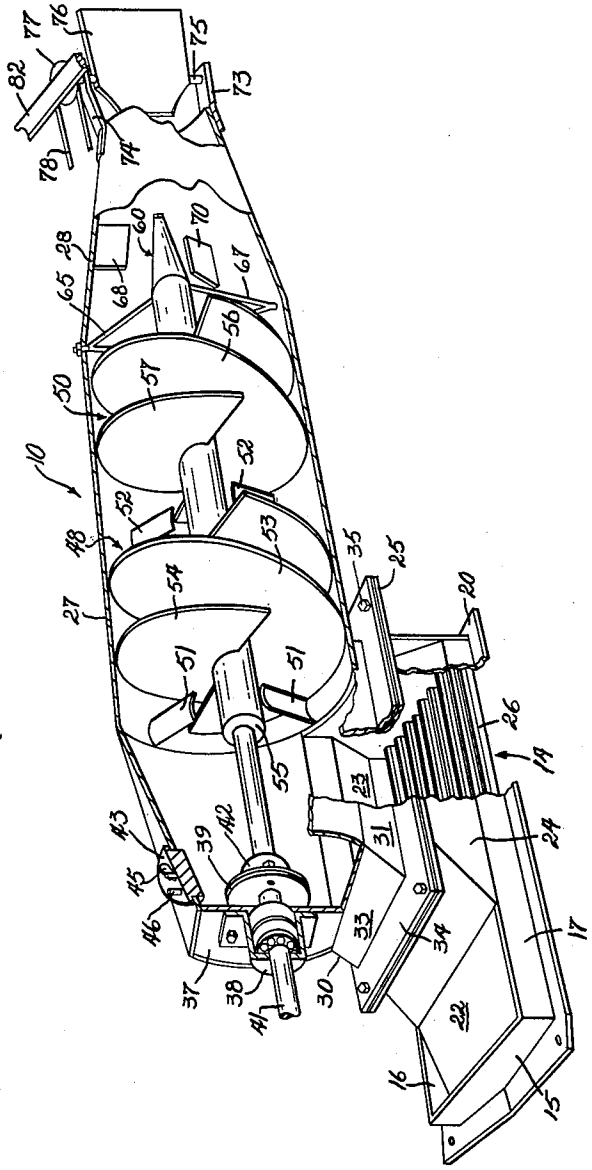


Fig. 1

INVENTOR.

Charles J. Dahle

BY Grubbs

Atty.

June 26, 1962 C. J. DAHLE 3,040,696

PROPULSION AND STEERING UNIT FOR BOATS

Filed April 8, 1960 3 Sheets-Sheet 2

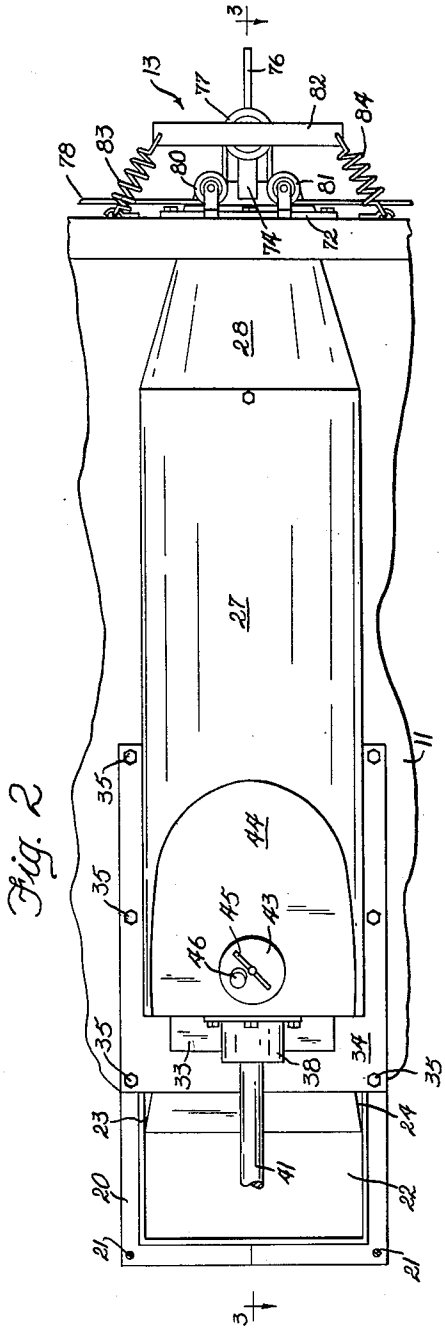


Fig. 2

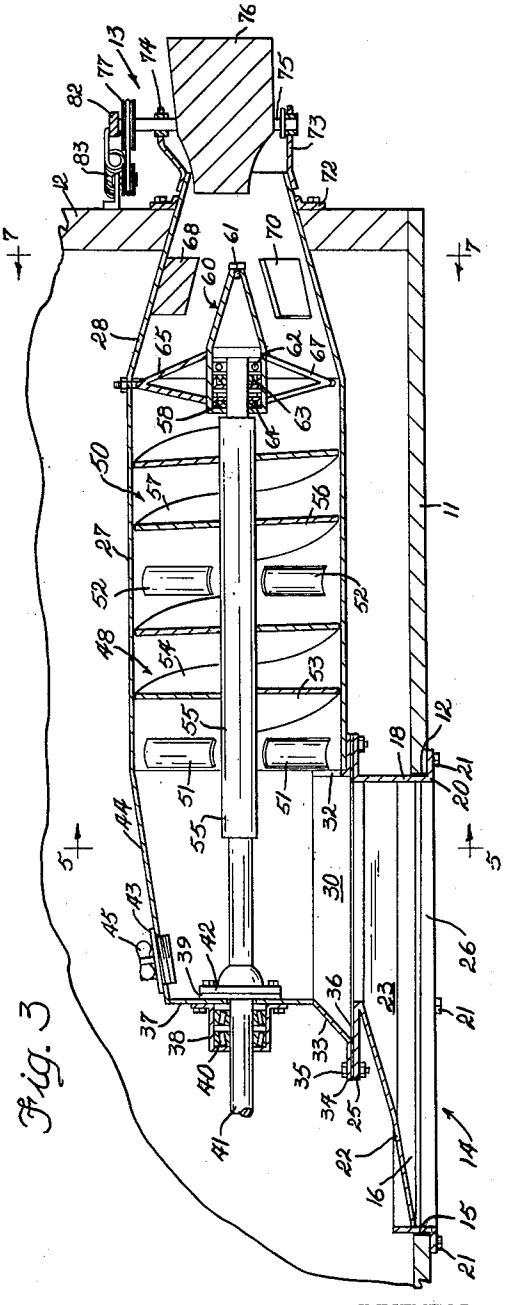


Fig. 3

INVENTOR.

Charles J. Dahle

BY Grubbs

Atty.

June 26, 1962 C. J. DAHLE 3,040,696

PROPULSION AND STEERING UNIT FOR BOATS

Filed April 8, 1960 3 Sheets-Sheet 3

Fig. 4

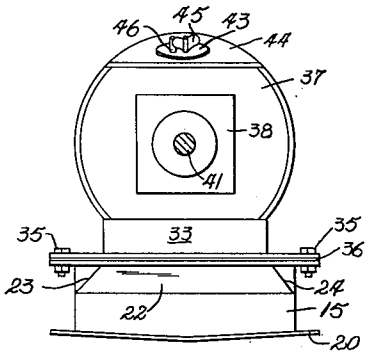


Fig. 5

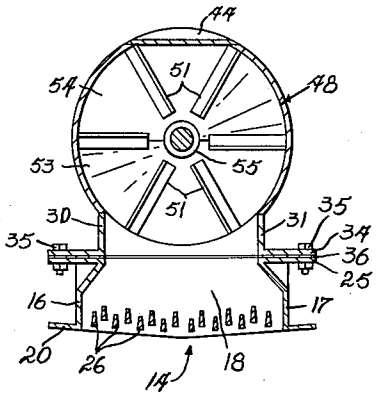


Fig. 6

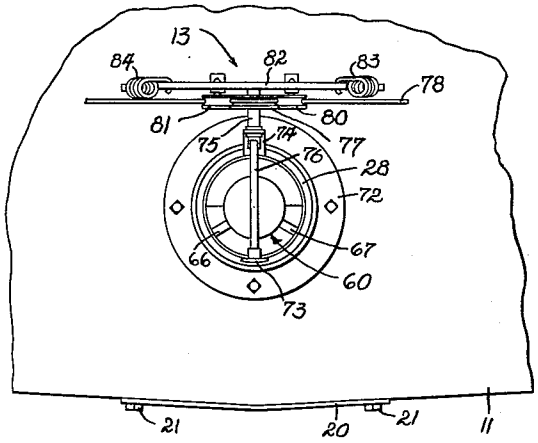
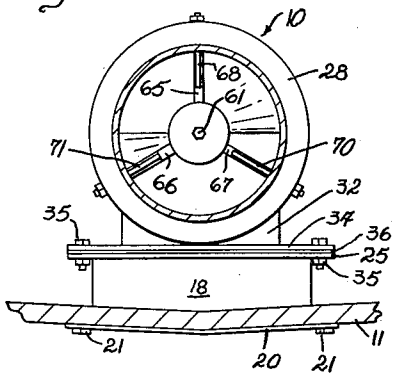


Fig. 7



INVENTOR.

Charles J. Dahle

BY Grubb Wells

Atty.

United States Patent Office 3,040,696 Patented June 26, 1962

3,040,696

PROPULSION AND STEERING UNIT FOR BOATS

Charles J. Dahle, Salmon, Idaho

Filed Apr. 8, 1960, Ser. No. 20,921
3 Claims. (Cl. 115—16)

This invention relates to a novel propulsion and steering unit for use in boats, wherein water is forced through the unit and ejected through a nozzle to provide propulsion, with a rudder located within the resulting stream to provide steering control.

It is an object of this invention to utilize an auger-type impeller to force water through the stern nozzle with high efficiency and low turbulence. It is a further object to design a water-jet propulsion system which will maintain the nozzle above the water line during use, but will allow the nozzle to slip below the water level at rest so as to maintain the priming of the pump unit while at rest.

It is another object of this invention to provide a safe pump unit having no outside moving parts within the boat. This unit is precision designed and has adjustably positioned bearings for the impeller assembly. The unit is readily adaptable to any size boat and can be installed in new or already existing models with equal ease.

These and still further objects will be evident from a study of the following description and the accompanying drawings which illustrate a preferred form of my invention. It is to be understood at the outset that this embodiment is not the only possible form within the scope of the invention, but is merely a practical example of its application.

In the drawings:

FIGURE 1 is a fragmentary perspective view of the unit with portions of the housing being broken away to show the interior parts;

FIGURE 2 is a fragmentary top view of the unit with portions of the hull and transom being broken away;

FIGURE 3 is a sectional view cut along line 3—3 in FIGURE 2;

FIGURE 4 is an end view of the unit as seen from the left in FIGURE 2;

FIGURE 5 is a sectional view taken along line 5—5 in FIGURE 3;

FIGURE 6 is a fragmentary end view of the transom and unit as seen from the right in FIGURE 2; and

FIGURE 7 is a sectional view taken along line 7—7 in FIGURE 3.

Referring now to the drawings, there is illustrated an exemplary form of the invention adapted to be installed in conventional boats. The pump unit, generally designated as 10, is positioned directly above the keel line of the boat hull 11 and protrudes through the transom 12 of the boat. A rudder assembly, generally designated as 13, is attached to the rear end of the pump unit 10 and is used to control the steering of the boat.

The intake area of pump unit 10 consists of a grill 14 mounted flush with the lower surface of hull 11. The grill 14 is framed by a front vertical wall 15, side walls 16 and 17 and a rear wall 18, all of which are securely joined and sealed to a surrounding mounting plate 20 which is formed to the contour of the boat bottom. Plate 20 is secured to the bottom of hull 11 by means of bolts 21. Obviously, plate 20 may be secured to hull 11 by a weld or by any suitable method desired in a particular application. The front wall 15 of grill 14 has fixed to it a rearwardly sloping wall 22 which extends upwardly to form the forward wall of a box structure. Sloping walls 23 and 24, joined to the top of walls 16 and 17 respectively, complete the box and converge into a flanged horizontal mounting plate 25.

Fixed between the walls 15, 22 and the rear wall 18, are two staggered rows of wedge bars 26, which form the actual baffle grill. The bars 26 are spaced so as to allow water to flow freely between them, but are designed to prevent entry of foreign debris into the pump unit 10. The grill 14 is a solid unit and is fitted into the boat from the outside.

The pump unit 10 comprises a cylindrical shell 27 which terminates in a reduced conical nozzle section 28. The forward bottom portion of cylindrical shell 27 is open and has fixed to it a pair of vertical side walls 30, 31, a rear vertical wall 32 and a sloping forward wall 33. These four walls 30, 31, 32 and 33 form a sealed box structure which terminates in an outwardly extending horizontal mounting plate 34. Plate 34 is adapted to be bolted to plate 25 by means of bolts 35 to thereby mount the forward end of the pump unit 10. An intermediate gasket 36 provides an effective seal between plates 25 and 34 to prevent water from entering the boat interior.

Mounted upon the forward wall 37 of shell 27 is an outside bearing housing 38. Housing 38 encloses a double-taper roller bearing assembly 40 of common construction, adapted to withstand end thrusts. Supported for rotation is the main shaft 41 of the pump unit 10. Shaft 41 extends forwardly beyond pump unit 10 and may be connected to the prime mover unit by any desired means. It may be directly splined to the motor shaft, or may include a clutch or universal connection depending upon the conditions of use to be encountered.

Shaft 41 extends through an aperture in forward wall 37, which is sealed from the interior by a packing gland 42 including a gasket 39. Packing gland 42 effectively serves to seal the interior of the pump unit 10 from the interior of the boat, and is bolted securely to wall 37. In order to service packing gland 42, an inspection plate 43 is secured to an angular flat area 44 formed on shell 27. Plate 43 may be locked in place by any desired means. In the device illustrated, plate 43 is threaded into an opening cut through area 44. Plate 43 may be gripped by handle 45 and removed when desired. In order to reduce pressure within the pump unit 10 before removing plate 43, a pressure relief valve 46 of standard construction, is tapped through the plate 43. By releasing valve 46, the priming within unit 10 may be lost in order to enable one to service or replace packing gland 42 without dismantling the entire apparatus.

The pump unit 10 has mounted within it a two stage impeller consisting of two double flights of auger impellers 48 and 50. Each of these double flights is preceded by a row of concave turbulence fins designated respectively as 51 and 52. The fins in each row are arranged symmetrically about the inner circumference of the shell 27. Each fin is inserted within the shell 27 from the outside through corresponding slots, and then sealed in place by welding. The auger impeller 48 is comprised of two 360 degree blades 53 and 54 which interlock and which extend radially to positions adjacent the smooth inner surfaces of shell 27. The blades 53, 54 are welded to an enlarged portion 55 formed on shaft 41. The second double flight of impellers 50 is composed of similar blades 56, 57 which are also secured to the enlarged shaft portion 55.

The rear end 58 of shaft 41 is formed with a reduced diameter and is encased by a housing 60. Housing 60 tightly surrounds shaft 41 at its forward end, and has a conical rear and terminating in a grease cap 61 through which grease may be forced into the interior of housing 60. Housing 60 contains a roller bearing 62 which rotatably mounts the rear end 58 of shaft 41. It also contains a grease seal 63 and a water seal 64 which protect the bearing assembly. Housing 60 is rigidly supported

by three strut assemblies 65, 66, 67 which extend through the shell 27 and are capped by locknuts. By adjusting the position of the struts 65—67 and securing the locknuts, the required position of shaft 41 may be accurately maintained within the shell 27.

The conical portion of housing 60 extends within the conical nozzle section 28 of shell 27. Mounted on the inner walls of nozzle section 28 are three straight fins 68, 70, 71, which serve to decrease turbulence and to direct water from the nozzle section 28 in a straight rearward flow.

The nozzle section 28 protrudes through the transom 12 of the boat above the water line and is sealed by a surrounding ring 72 bolted to the exterior surface of transom 12. Mounted between two extensions 73, 74 extending from conical section 28 in the rudder assembly 13, a rudder shaft 75 is rotatably carried by extensions 73, 74 and has fixed thereto a butterfly rudder 76 which extends within conical section 28. Shaft 75 has fixed thereto a pulley 77 around which a rope 78 is entrained in the usual manner for controlling the angular position of the rudder 76. Rope 78 is guided by two idler pulleys 80, 81 mounted on transom 12 and the rope is controlled in the normal fashion by means of a steering mechanism (not shown) mounted in the boat. The top end of shaft 75 is capped by a stabilizing bar 82 which has a tension spring 83, 84 mounted between each of its ends and the transom 12. Spring 83, 84 maintain bar 82, and therefore rudder 76, in a straight-ahead center position with respect to the conical nozzle section 28.

The operation of the device is as follows. The shaft 41 is turned by the boat motor at a high rate of speed. The turning impellers 48 and 50 draw water through grill 14 and direct it under pressure through the nozzle section 28 where it is forcibly ejected from the boat. The reaction from this ejection propels the boat in a forward direction. The speed of the boat may be controlled by controlling motor speed.

When brought ito rest, the open end of section 28 will slip below the water surface due to the boat weight. This will maintain the shell 27 full of water, thereby removing any need for subsequent priming. The speed of the boat when traveling will create a slip stream of water below the transom, which will maintain section 28 above the water line when the boat is in motion. The low draft of this arrangement is particularly advantageous in rocky or shallow waters where a propellor driven craft would be impractical. Furthermore, by placing the entire mechanism above the water line, the consequent drag on the boat is greatly reduced when compared to conventional marine propelling and guiding systems.

The rudder assembly 13 serves to direct a portion of the ejected water for steering purposes. When a hard turn is desired, rudder 76 is turned until it contacts shell 27 and thereby cuts off a portion of the nozzle area. This results in a pressure boost in the outlet stream directed in the direction opposite to the desired direction of turn. The resulting turn is therefore quickly carried out without disturbing the motor settings.

An important feature of the use of auger-type impellers is the fact that they are able to pump sand and gravel without serious damage to the blades other than normal wear. The blades will not fling such fine articles which may come through the grill. Instead, the sand or gravel will merely be pushed rearwardly in a smooth flow of water. This feature is particularly advantageous when negotiating over shallow sand bars or near shallow beaches.

A boat equipped with this unit is extremely versatile. Full control is afforded by varying the speed of the motor and controlling the rudder position. For reverse motion, the input shaft rotation may be reversed by any standard transmission means. Water will then be sucked into the nozzle and ejected through the grill by the impeller blades. Being symmetrical, the auger blades may act in either direction.

A final benefit of the auger blades is the reduction of cavitation losses over impellers which rely on centrifugal force to pump water. This results in less maintenance and longer impeller life.

The number of impeller flights can be varied to suit motor and boat requirements in each particular instance without deviating from the instant invention. If added pressure is required, more impellers may be added. Various obvious modifications will necessarily present themselves to one skilled in this art without changing this basic inventive concept as described. Therefore only the following claims are intended as definitions of the scope of the invention.

Having thus described my invention, I claim:

1. In a propulsion and steering unit for boats, a shell housing located within the boat in a longitudinal position, said shell housing having a conical nozzle section protruding through the boat transom and terminating in an open end of reduced diameter, an intake grill box sealed within an aperture cut through the hull along the keel line, said shell housing having an open forward section adapted to be hydraulically sealed in communication with said intake grill box, said grill box including spaced longitudinal bars adapted to prevent entry of foreign material into the shell housing and to reduce water turbulence, an impeller shaft rotatably journalled within said shell housing and extending forwardly thereof, spiral auger impeller means fixed to said impeller shaft, and guide means fixed within said shell housing adapted to direct water axially through said shell housing and through said conical nozzle section, said guide means comprising concave radial fins secured through slots formed in the shell housing, said fins being adapted to direct water to the impeller means in a constant, non-turbulent stream.

2. In a propulsion and steering unit for boats, a shell housing located within the boat in a longitudinal position, said shell housing having a conical nozzle section protruding through the boat transom and terminating in an open end of reduced diameter, an intake grill box sealed within an aperture cut through the hull along the keel line, said shell housing having an open forward section adapted to be hydraulically sealed in communication with said intake grill box, said grill box including spaced longitudinal bars adapted to prevent entry of foreign material into the shell housing and to reduce water turbulence, an impeller shaft rotatably journalled within said shell housing and extending forwardly thereof, spiral auger impeller means fixed to said impeller shaft, and guide means fixed within said shell housing adapted to direct water axially through said shell housing and through said conical nozzle section, said impeller means comprising a plurality of sets of double flight auger blades fixed to the impeller shaft in longitudinally spaced relation, said guide means being located forward of each set of blades.

3. In a propulsion and steering unit for boats, a shell housing located within the boat in a longitudinal position, said shell housing having a conical nozzle section protruding through the boat transom and terminating in an open end of reduced diameter, an intake grill box sealed within an aperture cut through the hull along the keel line, said shell housing having an open forward section adapted to be hydraulically sealed in communication with said intake grill box, said grill box including spaced longitudinal bars adapted to prevent entry of foreign material into the shell housing and to reduce water turbulence, an impeller shaft rotatably journalled within said shell housing and extending forwardly thereof, spiral auger impeller means fixed to said impeller shaft, and guide means fixed within said shell housing adapted to direct water axially through said shell housing and through said conical nozzle section, said spiral auger im-

peller means comprising a first pair of complementary spiral blades mounted on said impeller shaft adjacent said open forward section of said shell housing, a second pair of complementary spiral blades mounted on said impeller shaft rearward of said first pair of blades, said guide means comprising a first set of fixed guide vanes located radially about said impeller shaft intermediate said first and second pair of blades and a second set of fixed guide vanes mounted on said shell housing rearward of said second pair of blades, each blade of said first and second pair of blades extending radially from said impeller shaft outwardly to said shell housing through its circumferential length.

References Cited in the file of this patent

UNITED STATES PATENTS

1,000,678 Henderson ---------- Aug. 15, 1911

1,498,919 Jensen ---------- June 24, 1924
2,636,467 Johnson ---------- Apr. 28, 1953

FOREIGN PATENTS

304,476 Italy ---------- Jan. 9, 1932
658,900 Great Britain ---------- Oct. 17, 1951
739,315 Great Britain ---------- Nov. 10, 1953
782,628 Great Britain ---------- Sept. 11, 1957

OTHER REFERENCES

Yachting Magazine, vol. 106, No. 5, November 1959, pages 70 and 71.