United States Patent [19]

Usborne

[11] **3,811,397**

[45] **May 21, 1974**

[54] **PROPULSION DEVICES**

[75] Inventor: **Andrew Charles Usborne**, Sheffield, England

[73] Assignee: **UA Engineering Limited**, Sheffield, England

[22] Filed: **Nov. 15, 1971**

[21] Appl. No.: **198,562**

[30] **Foreign Application Priority Data**

Nov. 13, 1970 Great Britain 54281/70

[52] **U.S. Cl.** **115/14,** 60/221

[51] **Int. Cl.** **B63h 11/02**

[58] **Field of Search** ..... 60/221, 222; 115/14, 34 A, 115/42; 114/151

[56] **References Cited**

UNITED STATES PATENTS

915,255	3/1909	Weisz	60/222
3,475,912	11/1969	Angier	60/222
3,336,752	8/1967	Smith	60/221
2,993,463	7/1961	McKinney	60/222 X
3,342,032	9/1967	Cox	60/221

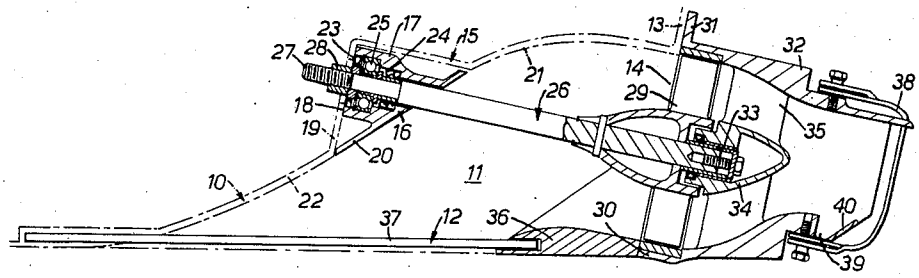
Primary Examiner—Clarence R. Gordon

Attorney, Agent, or Firm—Irvin S. Thompson et al.

[57] **ABSTRACT**

The intake duct of a propulsion device for a water-borne vessel is defined by first and second members, one of which provides the major portion of the wall of the intake duct and the other of which extends between an inlet opening and an outlet of the intake duct.

4 Claims, 3 Drawing Figures



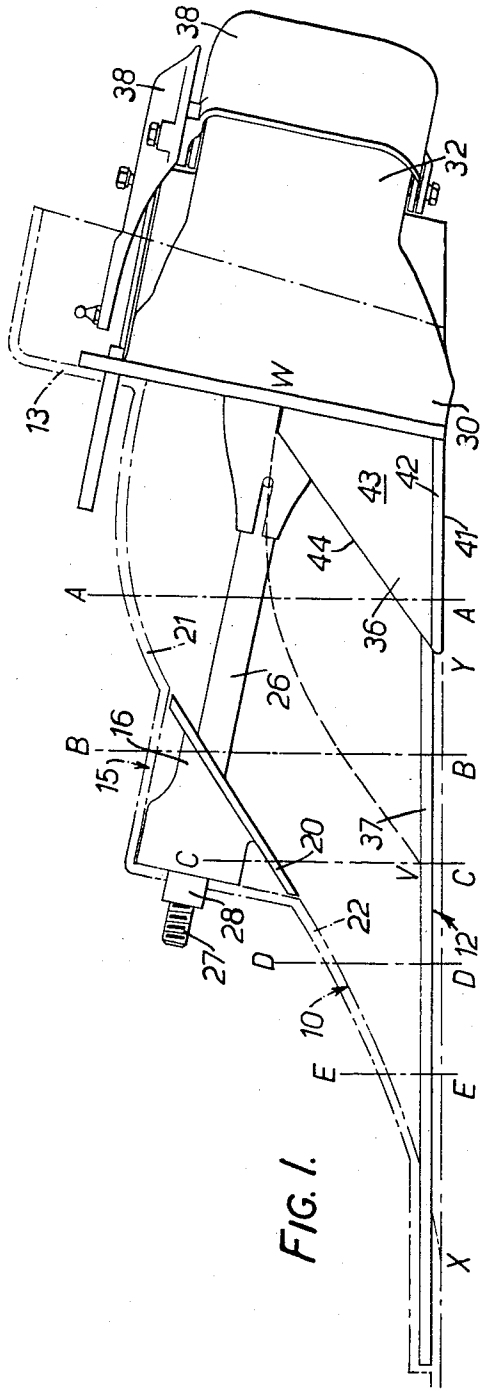

38
38
32
13
W
30
43
42
44
41
A
21
36
A
26
Y
B
16
15
B
20
37
C
V
C
28
22
27
D
12
D
10
E
E
X

FIG. 1.

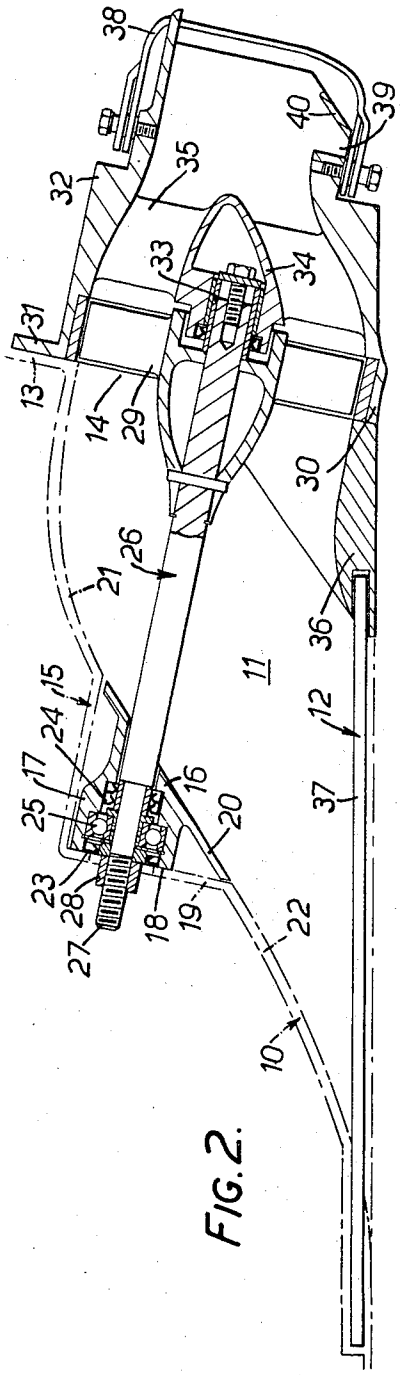

38
40
39
32
35
33
34
31
13
14
29
30
26
21
36
11
15
12
24
17
16
25
20
37
23
28
18
19
22
27
10

FIG. 2.

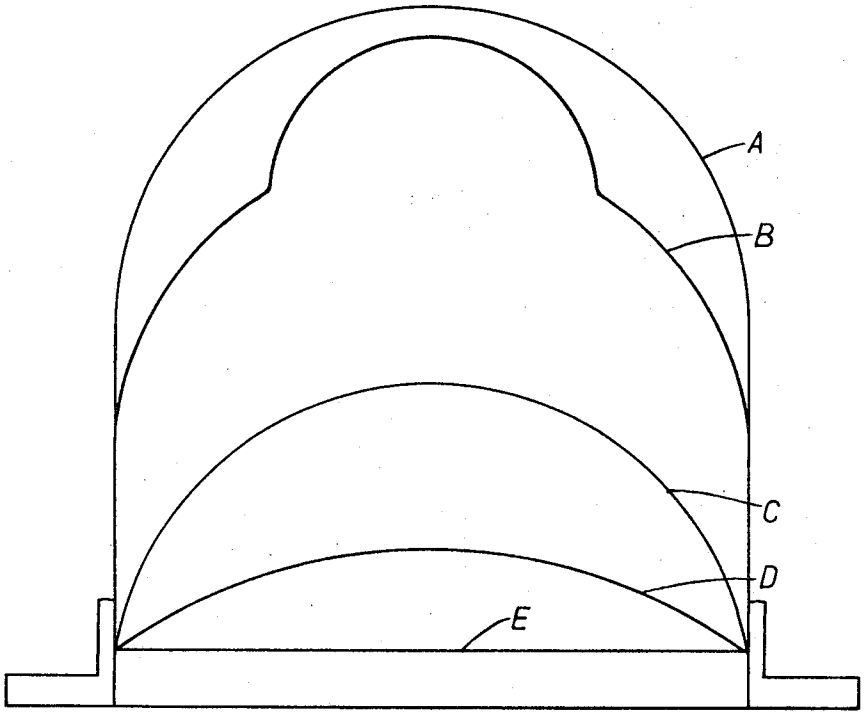


FIG. 3.

PROPULSION DEVICES

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to propulsion devices for water-borne vessels.

2. Description of the Prior Art

Jet propulsion devices are known which comprise an intake duct, and outlet duct and a rotary impeller mounted between the intake and outlet ducts and in which the intake duct has an inlet opening and an outlet which communicates with the outlet duct via the rotary impeller, the intake duct being so shaped that, in use, flow of fluid through the inlet opening is in a different direction to flow of fluid through the outlet thereof.

It is an object of the invention to provide an improved jet propulsion device of the above kind in which the means forming the intake duct are such as to improve and simplify manufacture of the device.

SUMMARY OF THE INVENTION

The intake duct is defined by first and second members, the first member defining the major portion of the wall of the intake duct and the second member being attached to the first member and defining the remainder of the wall of the intake duct.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of a hydraulic jet propulsion device for a water-borne vessel, part of the rear of the vessel being shown in outline,

FIG. 2 is a sectional view of the device, showing the rotary impeller which has a drive shaft extending forwardly through the intake duct of the device, and

FIG. 3 illustrates the cross-sectional configuration of said part of the rear of the vessel at a number of positions spaced along the length of the intake duct.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The vessel hull **10** shown in the drawings is moulded from glass-fibre-reinforced polyester resin with a rear section formed to provide an intake duct **11** which sweeps upwardly and rearwardly from a bottom intake opening **12** to a rear transom **13** at the bottom of which the duct outlet **14** is formed. Within the formed section and above the intake opening **12** there is a mounting **15** for a shaft bearing and seal assembly **16** disposed in line with the centre of the circular outlet **14.**

The assembly **16** includes a main body **17** having an end face **18** in which a plurality of tapped apertures (not shown) are formed for the reception of threaded fasteners for attachment of the body **17** to a wall **19** of the formed section. The body **17** is formed integrally with a flange **20** the configuration of which is such that it forms a continuation of the adjacent parts **21** and **22** of the wall of the intake duct **11.** The body **17** contains a pair of sealing arrangements **23** and **24** disposed one on each side of a roller bearing **25** for supporting the shaft **26.** The shaft **26** has a threaded end portion **27** for attachment thereof to a drive element of an engine within the hull and a spacer **28** of hexagonal external cross-section is provided on said threaded end portion and bears against the inner element of sealing arrangement **23.**

A propulsion unit attached to the formed section comprises a rotary axial flow impeller **29** within a casing **30** which has a flange **31** which is bolted to the back of the transom **13.** The impeller casing is formed integrally with an outlet duct **32** from the rear end of which the propulsion jet issues. The impeller drive shaft **26** extends rearwardly through the intake duct **11** to the casing **30** within which it is supported by a bearing **33** contained within a bearing housing **34** connected by vanes **35** to the outlet duct **32.**

The formed hull section provides the side walls and the top wall of the intake duct **11** the bottom wall of which is provided by a separately fitted member **36** which extends from the rear of the intake opening **12** to the transom **13** thus blanking off part of a bottom opening initially formed in the hull moulding. A plurality of rods, of which one **37** is shown in the drawings, extend forwardly of the member **36** across the intake opening **12** to exclude flotsam and other debris from the intake duct **11.** Each rod **37** has its rear end received in a socket in the member **36** and its forward end received in a socket in the formed section of the hull.

As shown in FIG. **3,** the cross-sectional configuration of the intake duct **11** varies from the inlet end to the outlet end, the sections A—A, B—B, C—C, D—D and E—E of FIG. **1** corresponding to the lines A, B, C, D or E respectively of FIG. **3.** The spacings between the sections A—A, B—B, C—C, D—D and E—E are the same. The approximate centre line of the intake duct **11** is indicated by the line V–W of FIG. **1** and the front and rear extremities of the inlet opening **12** are indicated at X and Y respectively. It is to be noted that the section line C—C has been taken through the flange **20** which forms part of the wall of the intake duct and that the end wall **19** of the mounting **15** engaged by end face **18** of the body **17** is of generally rectangular form.

The fore and aft dimension of the inlet opening **12** as measured in the direction X–Y is greater than the diameter of the intake duct **11** as measured in a plane at right angles to the line V–W which in turn is approximately twice the diameter of the discharge duct **32** as measured immediately to the rear of the bearing housing **34.**

The line V–W extends initially at an inclination to the horizontal of 35° and the longitudinal profile of the formed section of the hull is such that the midpoint of the duct is defined by a line which initially is of arcuate form and merges into a straight line in the vicinity of the flange **20** and then becomes arcuate terminating at its rearward end in a portion inclined downwardly relative to the horizontal.

The separately fitted member **36** has a flat bottom **41** which provides a pair of side flanges **42** for bolting of the member **36** to the formed section. Side walls **43** extend upwardly from the flat bottom **41** and the upper edge **44** of each side wall **43** is inclined rearwardly at an angle of 35° parallel to the line V–W. The upwardly presented surface of the member **36** is of arcuate form in transverse section varying in a smoothly curved manner from an almost flat configuration at the forward end thereof to a semi-circular form at the rear thereof.

As shown the separately fitted member **36** is formed in one piece but it is to be understood that it may be formed as two or more pieces, for example, there may be a front piece which is formed with sockets to receive the ends of the rods **37** with said front piece attached

to a main body which provides the major part of the separately fitted member.

The outlet duct **32** carries a steering unit comprising a pair of buckets **38** and the lower portion of the wall of the outlet duct is cut away at **39** to provide a lower discharge opening. A vane **40** is positioned adjacent the lower discharge opening to deflect water issuing therethrough in a forward direction.

As described in British Patent Specification No. 1,190,735 the two buckets **38** are pivotable about a common vertical axis and are controllable to deflect the water jet issuing through the outlet duct for steering purposes.

The buckets are also movable into positions in which they close the outlet duct **32** to deflect the jet downwardly through the lower discharge opening and thus forwardly beneath the hull.

As shown the transom **13** is inclined rearwardly and upwardly so that the jet, which, in forward movement, issues at right angles to the transom, has a slight downward component.

I claim:

1. A waterborne vessel having a hull having a formed section and a transom, the vessel having propulsion means comprising an intake duct extending between an inlet opening formed in the base of the vessel and an outlet opening in line with the transom, an outlet duct arranged in communication with the intake duct, an impeller mounted between the two ducts and means for the transmission of drive to said impeller, said intake duct being defined in part by said formed section of the hull of the vessel, said section providing a downwardly open channel extending longitudinally of the vessel from said inlet opening to the transom and that part of said channel which is adjacent the transom being closed by a separately fitted member which defines the rear edge of the inlet opening and a portion of the wall of the intake duct, said intake duct being so shaped that water entering the intake duct has an upward component of velocity whereas water discharged through the outlet opening has a downward component of velocity.

2. A vessel according to claim **1**, wherein said separately fitted member has a substantially straight transversely extending leading edge defining said rear edge of the inlet opening and a pair of side walls the upper edges of which are rearwardly and upwardly inclined, the base of said member having side flanges for the reception of bolts for attachment of the separately fitted member to the formed section of the hull.

3. A vessel according to claim **1**, wherein said separately fitted member has a rear end portion the upper surface of which is of substantially semi-circular form in transverse cross-section, said rear end portion defining the lower part of the outlet of the intake duct.

4. A vessel according to claim **1**, wherein the means for transmission of drive to the impeller comprises a drive shaft which is inclined to the horizontal and which is supported by bearing means disposed in a recess in the wall of the formed section of the hull.

* * * * *