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[54] **FLUID DRIVEN PROPULSION AND GENERATOR MECHANISM**

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[52] **U.S. Cl.** **60/221,** 114/151, 115/14, 417/410, 417/436

[51] **Int. Cl.** **B63h 1/36**

[58] **Field of Search** 417/410, 436; 60/221, 222; 114/151; 115/14

[56] **References Cited**

UNITED STATES PATENTS

3,307,358	3/1967	Kerandraon	60/221
3,464,380	9/1969	Thorden	417/436 X

FOREIGN PATENTS OR APPLICATIONS

167,983	9/1950	Austria	417/436
193,723	2/1957	Austria	417/410

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Assistant Examiner—Richard Saer
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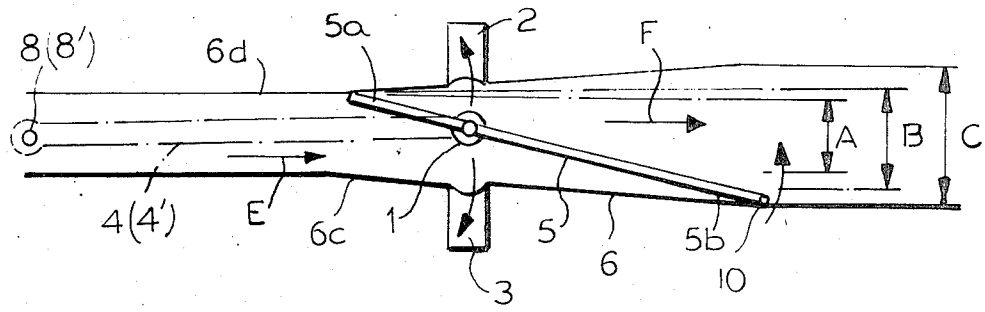
[57] **ABSTRACT**

A duct is formed through a vessel. An electro-magnet is positioned around the duct at a point such that the poles thereof form opposed portions of the duct. A vane is positioned within the duct to move from side-to-side thereof and has a permanent magnet attached thereto in a position between the two opposed poles of the electro-magnet. At the rearward end of the vane there is provided an extension pole having a contact at the upper end thereof. This pole extends through the upper wall of the duct into an air tight chamber. Mounted on opposite sides of the chamber are a plurality of change-over terminals which are connected to a switching arrangement which is in turn connected to the coils of the electro-magnet such that movement of the contact operates to reverse the polarity of the poles of the electro-magnet. Alternatively, the pole of the vane is an extension of a shaft mounting the vane. The permanent magnet is attached to the top of this extension. A plurality of electro-magnets are arranged outwardly of the duct in a manner that movement of the permanent magnet will sequentially interrupt fields generated by the electro-magnets.

4 Claims, 6 Drawing Figures



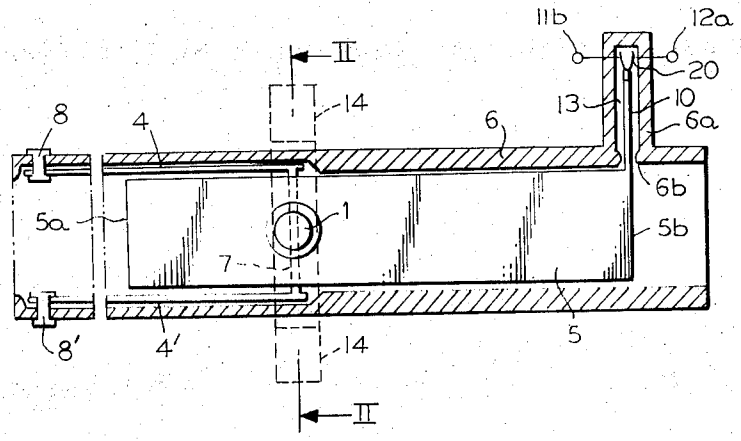


FIG. 1

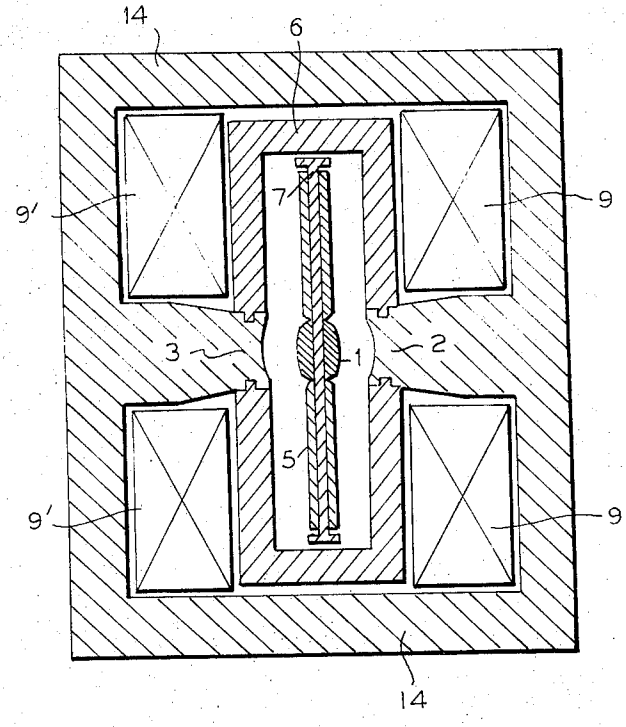


FIG. 2

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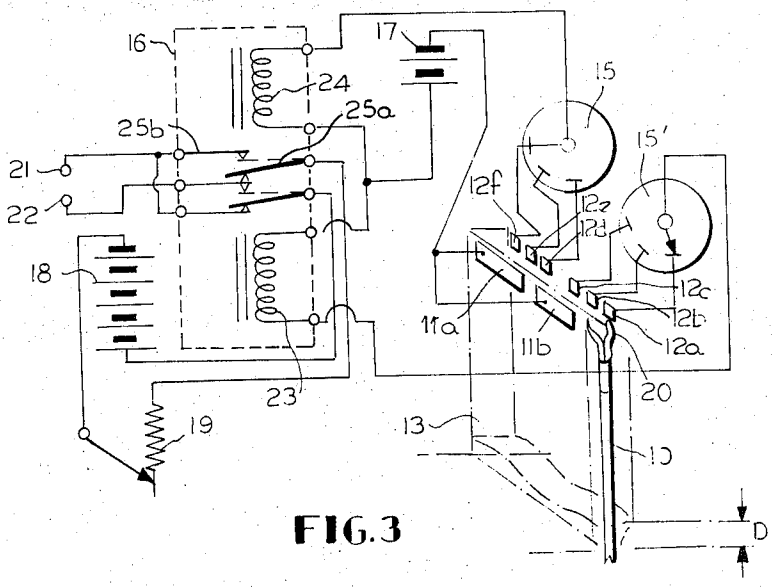

FIG. 3

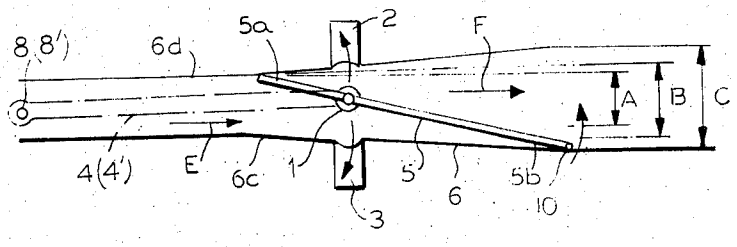

FIG. 4

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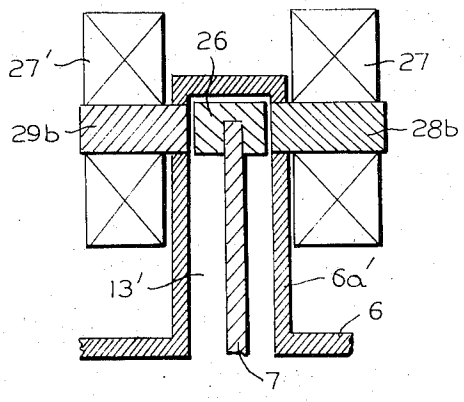

FIG. 5

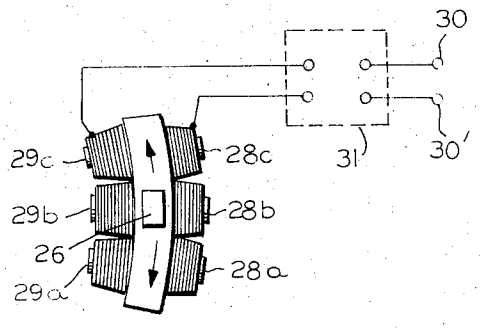

FIG. 6

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FLUID DRIVEN PROPULSION AND GENERATOR MECHANISM

BACKGROUND OF THE INVENTION

The present invention relates to a fluid driven mechanism which may be used to propel a vessel or generate electricity. More particularly, the present invention relates to such a mechanism which is particularly adapted for use in bodies of water and which employs movement therethrough of the water.

In the past there have been attempts to provide propulsion systems for vessels wherein movement of water through the vessel is the source of propulsion. Furthermore, there have been various attempts in permanent structures near bodies of water, for instance lighthouses, to provide electrical generators of the type wherein movement of water through the structure is the power source. However, all of these devices have suffered from certain inherent disadvantages. A particular problem in such prior devices has been providing isolation of the various electrical components thereof from the water. It is of course readily apparent that contamination by water of any electrical component is extremely undesirable.

OBJECTS AND BRIEF DESCRIPTION OF THE INVENTION

With the above discussion in mind, it is a primary object of the present invention to provide a fluid driven mechanism which may be used as a means of propelling a vessel through a body of water.

It is a further object of the present invention to provide a fluid driven mechanism which may be used in a permanent installation near a body of water as an electrical generator and uses movement of water therethrough as a power source.

It is a still further object of the present invention to provide such a mechanism which inherently insures isolation from the water of the various electrical components of the mechanism.

These objects are achieved in accordance with the present invention by the provision of a water tight duct extending through the vessel or structure and through which water is adapted to flow. In the case of a vessel which moves through the water, an electro-magnet is positioned around the duct at a point such that the poles thereof form opposed portions of the duct. A vane is positioned within the duct to move from side-to-side thereof and has a permanent magnet attached thereto in a position between the two opposed poles of the electro-magnet. At the rearward end of the vane there is provided an extension pole having a contact at the upper end thereof. This pole extends through the upper wall of the duct into an air tight chamber. Mounted on opposite sides of the chamber are a plurality of change-over terminals which are connected to a switching arrangement which is in turn connected to the coils of the electro-magnet such that movement of the contact operates to reverse the polarity of the poles of the electro-magnet. As the electro-magnet poles are first energized, the permanent magnet is attracted to one side of the duct. This causes the vane to move toward one side of the duct. This in turn causes the contact to change the polarity of the electro-magnet whereby the permanent magnet and thus the vane are attracted to the opposite side of the duct. Therefore, continued movement of the vane causes continued reversal of the polarity of the electro-magnet and forced movement of the water through the duct. Thus, the vessel is propelled through the water.

With regard to use of the fluid driven mechanism of the prsent invention in a permanent installation as an electrical generator, the pole of the vane is an extension of a shaft mounting the vane. The permanent magnet is attached to the top of this extension. A plurality of electro-magnet are arranged outwardly of the duct in a manner that movement of the permanent magnet will sequentially interrupt fields generated by the electro-magnets. This causes generation of electricity which may be stored in any conventional manner.

The chambers employed in the various embodiments of the present invention contain air pockets and are thus inherently protected from contamination by water from the duct.

Other objects and features of the present invention will become apparent from the following detailed description taken together with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal sectional view of a first embodiment of the present invention;

FIG. 2 is a cross-sectional view taken along line II—II of FIG. 1;

FIG. 3 is a schematic wiring diagram of the electrical system of the embodiment of FIG. 1;

FIG. 4 is a schematic plan diagram illustrating the operation of the first embodiment of the present invention;

FIG. 5 is a longitudinal sectional view illustrating a second embodiment of the present invention; and

FIG. 6 is a cross-sectional view taken along line VI—VI of FIG. 5.

DETAILED DESCRIPTION OF THE INVENTION

With reference to FIGS. 1–4, a detailed description of the fluid driven mechanism of the present invention used as a propulsion device for a vessel that moves through the water will be described in more detail.

A duct 6 is provided centrally of and extending in the longitudinal direction of a vessel such as a ship (not shown). Duct 6 is made of suitable materials and in a suitable manner to be water tight and air tight with regard to the interior of the ship and provides a passage through which water flows. A movable vane 5 is positioned vertically within the duct 6 by means of a shaft 7 which is attached to first ends of a pair of connecting links 4 and 4'. The opposite ends of links 4 and 4' are attached to the duct 6 by means such as fixed pins 8 and 8' located respectively on the top and bottom walls of the duct 6. Attached to the shaft 7 is a permanent magnet 1 presenting opposite poles on opposite faces of the vane 5.

Surrounding duct 6 at a location corresponding to the permanent magnet 1, is an electro-magnet 14 having suitable exciting coils 9 and 9'. Electro-magnet 14 also has a pair of poles 2 and 3 which extend inwardly and form a portion of the inner surfaces of duct 6 in a manner to oppose each other with the permanent magnet 1 therebetween. Shaft 7 is positioned such that it is closer to the forward end 5*a* than the rearward end 5*b* of vane 5.

At the rearward end 5*b* of the vane 5 is an upwardly extending rod 10 having suitable contacts 20 on the

upper end thereof. An upper housing 6a forming a chamber 13 therein extends upwardly from duct 6 at a location to receive rod 10 and contacts 20. Rod 10 extends into chamber 13 through slit 6*b* in the upper wall of duct 6.

As shown in FIG. 3, positioned in chamber 13 adjacent the front wall of housing 6a are a first group of change-over terminals. In the illustrated embodiment, this first group consists of a pair of change-over terminals 11*a* and 11*b*. Also in chamber 13 adjacent the back wall of housing 6a are located a second group of change-over terminals. In the illustrated embodiment, this second group consists of six change-over terminals 12*a*–12*f*. Contacts 20 are dimensioned to provide electrical connection between terminal 11*b* and one of terminals 12*a*–12*c*, or between terminal 11a and one of terminals 12*d*–12*f*.

Terminals 12a-12c are connected to a first change-over switch 15' adapted to provide contact from only one of the three terminals at a time. Similarly, terminals 12*d*–12*f* are connected to a second change-over switch 15 which will provide electrical contact to only one of the terminals. First change-over switch 15' is connected to a first end of a first solenoid 23 of a relay system 16, and second change-over switch 15 is connected to a first end of a second solenoid 24 of the relay system 16. The other ends of the solenoids 23 and 24 are connected via a relay battery 17 to the first group of change-over terminals 11*a* and 11*b*. A pair of movable contacts 25*a* are positioned between the coils of solenoids 23 and 24 and are urged toward one or the other thereof by suitable means such as springs (not shown).

Movable contacts 25*a* are adapted to be moved selectively to contact two of the three stationary contacts 25*b* to reverse the polarity of current appearing at stationary contact terminals 21 and 22. Connected to terminals 21 and 22 are the exciting coils 9 and 9' of the electro-magnet. Movable contacts 25*a* are connected to a variable resistor 19 and a power battery 18.

The operation of the embodiment of the present invention illustrated in FIGS. 1–4 will now be described. Assume that change-over switches 15' and 15 are set as illustrated in FIG. 3, that is with electrical contact to terminals 12a and 12*f*, and that contacts 20 are in the central, neutral position. Variable resistor 19 is adjusted for infinite resistance to gradually less resistance. As this occurs, battery 18 energizes coils 9 and 9' of the electro-magnet through contacts 25*a* and 25*b* and terminals 21 and 22. Assume that movable contacts 25*a* are in the dotted line position illustrated in FIG. 3. By this action an electro-magnetic field is created in the electro-magnet 14 which imparts a given polarity to the poles 2 and 3. Dependent upon this polarity and the polarity of the poles of permanent magnet 1, permanent magnet 1 is urged toward one of the poles 2 and 3.

Assuming that permanent magnet 1 is urged toward pole 3, this will cause the shorter, forward end 5*a* of vane 5 to approach wall 6*c* of duct 6. Continued movement of magnet 1 toward pole 3 will result in the entire length of vane 5 contacting wall 6*c*. At the end of this movement, rod 10 of the vane will be positioned between terminals 11*b* and 12*a* such that contacts 20 provide electrical connection therebetween. This connection actuates solenoid 23 through change-over switch 15' and relay battery 17 such that movable contacts 25*b* are moved to the solid line position of FIG. 3. This reverses the current at terminals 21 and 22 and thus reverses the current in the electro-magnet 4 and the polarity of poles 2 and 3. It will be apparent that permanent magnet 1 is thus repulsed from pole 3 and is urged toward pole 2. As this occurs, shorter, forward end 5*a* of vane 5 will be caused to contact wall 6*d* of duct 6. As this occurs, fluid is drawn into the wedge-shaped section of the duct between the wall 6*c* and the vane 5 as illustrated by the arrow E in FIG. 4. Furthermore movement of magnet 1 toward pole 2 causes the remainder of the vane 5 to move toward wall 6*d*. As this occurs, fluid in the wedge-shaped area between wall 6*d* and the vane is forced in the direction indicated by the arrow F. This forcing of the fluid causes the fluid to generally flow through the duct 6 in the direction of the arrows.

When rearward end 5*b* of the vane arrives at wall 6*d*, contacts 20 on the top of rod 10 create an electrical connection between terminals 11*a* and 12*f*. This causes solenoid 23 to be inactive and actuates solenoid 24. This causes movable contacts 25*a* to return to the dotted line position shown in FIG. 3 and results in a further reversal of the polarity of the current at terminals 21 and 22 and thus a reversal of the polarity of the poles 2 and 3 of the electro-magnet 14. This initiates a further swinging of the vane back toward pole 3.

It will apparent that this continued reciprocation of the vane causes the inducement of a fluid stream in the direction of the arrows in FIG. 4, and that forward motion is thus imparted to the vessel at a predetermined speed. It will be further apparent that variable resistor 19 may be regulated to control the current supplied to the system from the battery, thereby controlling the speed of reciprocation of the vane and thus the speed of the vessel. It will be even further apparent that if change-over switches 15' and 15 are reset to create contact at terminals 12*b* and 12*e*, the amplitude of movement of the vane will be shortened. This is represented in FIG. 4 by the dimension B. Accordingly, reciprocation of the vane will occur more often and the speed of the vessel will thus be increased. Similarly, setting of switches 15' and 15 at terminals 12*c* and 12*d*, respectively, will further shorten the amplitude of movement of the vane as indicated by A in FIG. 4, thus even further increasing the speed of the vessel.

Additionally, the vessel may be steered by the selective setting of change-over switches 15' and 15. For instance, assume that switch 15' is set at terminal 12*b* and that switch 15 is set at terminal 12*d*. It will be apparent that the amplitude of movement of the vane will be greater in the lefthand side and that thus the vessel will be caused to turn to the right.

Accordingly, it will be seen that a relatively simple mechanism has been provided for imparting propulsion to a vessel to be moved through the water. It will be further apparent that chamber 13 will have therein an air space which will prevent water from entering therein and contaminating the various electrical components. Furthermore, although the width of the duct at the point of positioning of the magnets is limited by the capacity of the electro-magnet employed, the dimensions of the movable vane may be freely adjusted as necessary to provide for most efficient operation.

The above discussion has been related to the use of the present invention for imparting propulsion to a vessel to be moved through the water. However, it is known that many permanent structures located adjacent bodies of water rely upon movement of the water,

such as created by tidal currents, as a power source to generate electricity. It will be apparent to those skilled in the art that the mechanism of the present invention by minor adjustments may be employed as such a generator. With reference now to FIGS. 5 and 6 of the drawings, a preferred embodiment of such an arrangement will be described.

This arrangement of the present invention is similar to that of FIGS. 1–4. However, in this embodiment a housing 6*a'* is provided extending upwardly from duct 6 above the location of shaft 7 which supports vane 5. Furthermore, shaft 7 is extended upwardy into chamber 13' within housing 6*a'* and supports thereon a permanent magnet 26. A suitable number of electro-magnets 28*a*–28*c* and 29*a*–29*c* are mounted adjacent the top of housing 6*a'* and have associated therewith suitable exciting coils 27 and 27'. The electro-magnets present suitable poles which form portions of the inner surface of chamber 13'. It will be apparent that the entire apparatus of the electro-magnets are isolated from water flowing within duct 6. It will be further apparent that as water moves through duct 6, for instance as a result of tidal currents, vane 5 and thus shaft 7 will be caused to move from side-to-side within the duct. As this occurs, the fields of the electro-magnets will be interrupted, thus generating an electric current which may be stored in any convention manner such as in a battery connected to regulator 31 through terminals 30 and 30'.

Although preferred embodiments of the present invention have been described in detail, such description is intended to be illustrative only, and not restrictive, since many details of the invention may be altered without modifying the scope thereof.

What is claimed is:

1. A fluid mechanism comprising a duct extending through a structure and adapted to have water flow therethrough; a vane vertically positioned in said duct to extend in the longitudinal direction thereof; means supporting said vane for allowing said vane to reciprocate transversely across said duct, said means for supporting said vane comprising a vertical shaft attached to said vane nearer the forward end than the rearward end thereof; a permanent magnet attached to said support means and having opposite poles; electro-magnet means having opposed poles positioned on opposite sides of said permanent magnet poles; and upper and lower connecting links having first ends thereof attached to said shaft and second ends connected to said duct.

2. A fluid mechanism as claimed in claim 1, wherein said structure is a vessel and said mechanism is a means for propelling said vessel through the water.

3. A fluid mechanism as claimed in claim 2, wherein said electro-magnet poles form portions of the inner surfaces of said duct; and further comprises a housing forming therein a chamber above said duct and communicating therewith, a rod attached to said rearward end of said vane and extending upwardly into said chamber, contacts attached to the top of said rod, and means positioned to be actuated by said contacts for reversing the polarity of said electro-magnet poles.

4. A fluid mechanism as claimed in claim 3, wherein said means for reversing polarity comprises a first group of change-over terminals positioned along the front wall of said housing; a second group of change-over terminals positioned along the rear wall of said housing; a pair of change-over switches connected to said second group of change-over terminals; and a relay system connected to said change-over switches and to said first group of change-over terminals, said system having terminals connected to said electro-magnet means and contacts for reversing the polarity of current to said terminals.

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