Jan. 25, 1966 H. D. NETTLES 3,230,698

MARINE ENGINE DRIVE

Filed Dec. 9, 1964 2 Sheets-Sheet 1

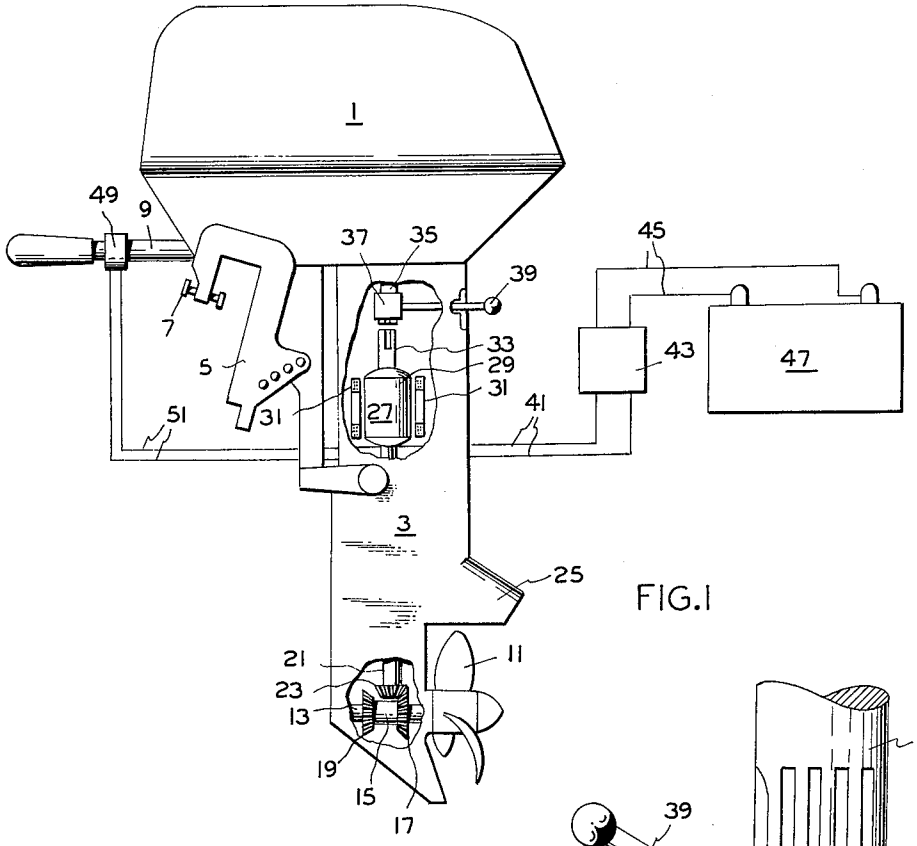

FIG.1

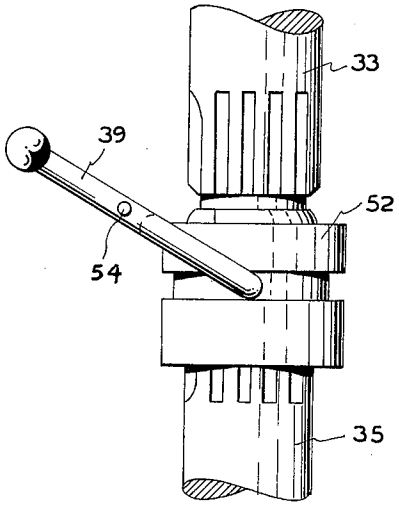

FIG.3

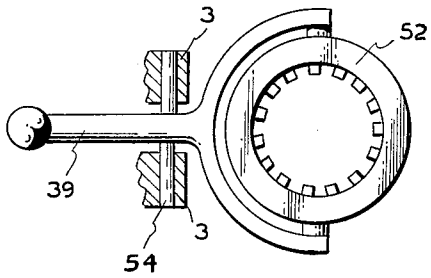

FIG.4

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MARINE ENGINE DRIVE

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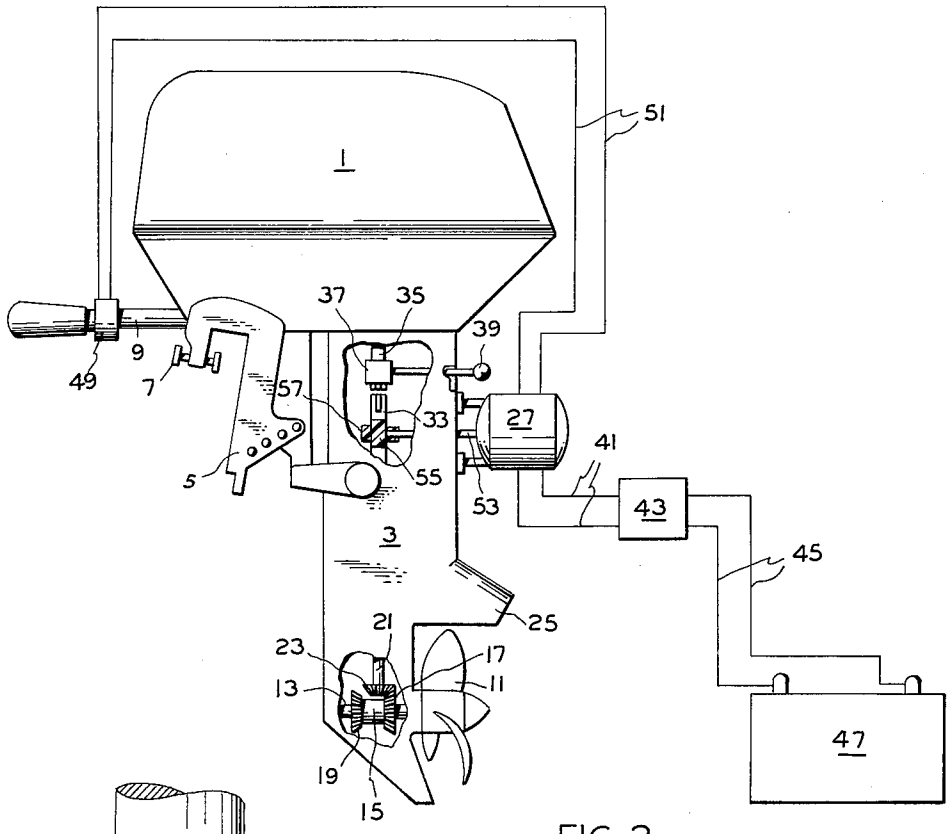

FIG. 2

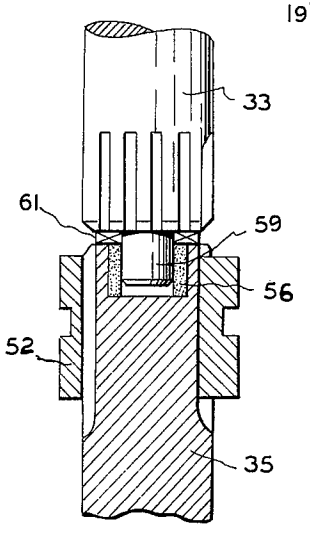

FIG. 5

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3,230,698

MARINE ENGINE DRIVE

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6 Claims. (Cl. 60—6)

The present invention relates to power means for small boats. More particularly, the present invention relates to an improved power unit of an outboard-type small boat.

In the operation of small boats for fishing, it is highly desirable that one be able to drive the boat silently with a minimum of vibration and at a relatively slow speed. This, of course, is particularly desirable when trolling, It is a well known fact that these requirements cannot be met by conventional internal combustion engines, which are the common motive means for small boats. Obviously, an electrical motor would provide an ideal answer to the requirements set forth above. However, it is also quite obvious that such a motor is practically useless for driving the boat to and from the fishing location or for any considerable distance. Accordingly, it has been recognized that an internal combustion engine must still be used as the primary source of motive power, even though it has been suggested that an electric motor also be combined with the internal combustion engine to provide the flexibility of operation discussed above. In all of these prior art efforts to combine the advantages of both an internal combustion engine and an electric motor, complex mechanisms have been required and major modifications of the conventional internal combustion engine are specified. These mechanisms are unreliable and contribute greatly to the initial cost of the motive unit and have not had commercial acceptance.

It is therefore an object of the present invention to provide an improved outboard motive unit for a boat.

A further object of the present invention is to provide an improved motive unit for a boat, including an internal combustion engine and an electric dynamo.

Another and further object of the present invention is to provide an improved motive unit for a boat, in which an internal combustion engine and an electric dynamo are utilized and the internal combustion engine is releasably coupled to the propeller drive shaft.

Still another object of the present invention is to provide an improved motive unit for boats, including, an internal combustion engine and an electric dynamo in which the dynamo is permanently coupled to the propeller drive shaft.

A still further object of the present invention is to provide an improved motive unit for a boat, including, an internal combustion engine and an electric dynamo in which the internal combustion engine is releasably coupled to the propeller drive shaft while the dynamo is permanently coupled to said drive shaft.

A further object of the present invention is to provide an improved motive unit for a boat in which the armature of an electric dynamo is formed about the drive shaft of the propeller and an internal combustion engine is releasably coupled to said drive shaft.

These and other object and advantages of the present invention will be apparent from the following detailed description when read in conjunction with the drawings, wherein:

FIGURE 1 is a side view, partially in section, of the preferred form of the motive unit of the present invention;

FIGURE 2 is a side view, partially in section, of an alternate motive unit in accordance with the present invention; and

FIGURES 3, 4 and 5 show a preferred clutch.

In accordance with the present invention, the drive

shaft leading from a conventional internal combustion engine is modified in a manner such that an electric dynamo is permanently coupled to the drive unit at all times while an internal combustion engine is detachably coupled to the drive shaft. By this means, it is possible to decouple the internal combustion engine from the propeller drive shaft and utilize the dynamo as a motor to drive the boat or, in the alternative, to couple the internal combustion engine to the propeller drive shaft and operate the dynamo as a generator to provide electrical energy for the charging of a battery and the supply of electricity to electrical devices.

In the preferred form of the present invention, which is shown in FIGURE 1, a side elevation of an outboard motor unit is shown. This unit includes internal combustion engine **1** connected to lower housing unit **3**. Mounted on lower housing unit **3** and motor **1** is clamping bracket **5**, which is adapted to be clamped to the rearward end of a boat by means of clamp screws **7**. Clamping bracket **5** is not only adapted to support the motive unit on the boat, but conventionally permits the unit to pivot in a vertical direction if a foreign object is struck by lower housing **3**. Horizontal pivoting of the propeller **11** for purposes of guiding the boat is performed by control lever **9**. Located in the lower end of housing **3** is a drive mechanism for propeller **11**. Propeller **11** is mounted on a spindle **13**, which is horizontally disposed in the lower end of housing **3**. It is conventional to have a sliding dog-type gear **15** slideably mounted on spindle **13**. Formed on the ends of gear unit **15** are forward bevel gear **17** and reverse bevel gear **19**. By sliding gear means **15** on spindle **13**, by an appropriate gear shift lever (not shown), it is possible to couple gears **17** or **19** to drive shaft **21** through bevel gear **23**. It is quite obvious from this simplified version of the gear shift mechanism that propeller **11** may be driven in a direction such that the boat is moved forwardly, in a neutral position where gear **23** is idling between gears **17** and **19**, or in such a way that the propeller will drive the boat in the reverse direction. Also located near the lower end of housing **3** is exhaust **25** adapted to release exhaust gases from internal combustion engine **1**. Mounted adjacent the upper end of drive shaft **21** is electrical dynamo **27**. Dynamo **27**, as shown in FIGURE 1, has its armature **29** formed about and fixedly attached to drive shaft **21**. Accordingly, when drive shaft **21** is turned, armature **29** will also turn. Conventionally mounted about armature **29** and fixedly attached to housing **3** are dynamo field coils **31**. The configuration and electrical connection of the wires forming field coils **31** and armature **29** of the dynamo are well known to those skilled in the art. The free end **33** of drive shaft **21**, which extends above armature **29**, is aligned with drive shaft **35** of internal combustion engine **1**. However, as shown in FIGURE 1, drive shaft **21** and drive shaft **35** are separate entities and may be rotated independently. To couple and uncouple drive shaft **35** and drive shaft **21**, there is provided coupling means **37** operated by clutch handle **39**. As shown, clutch means **37** is a simple spline type clutch adapted to couple and decouple drive shafts **21** and **35**.

When drive shaft **35** is coupled to drive shaft **21** and internal combustion engine **1** is operating, dynamo **27** is operated as a generator supplying electricity through lines **41**. Lines **41** are connected to the input of voltage regulator **43**. Voltage regulator **43** operates in a conventional manner to control and maintain a steady electrical current. Current from voltage regulator **43** passes through electrical lines **45** to a battery **47**. Obviously, lines **45** could be connected directly to appropriate electrical equipment, but it is preferred that the connection be through battery **47**. Also, quite obviously, battery

47 may be used as a source of electrical energy when neither dynamo 27 nor internal combustion engine are operating, and when shaft 35 is coupled to shaft 21 an internal combustion engine 1 is operating battery 47 will be charged. When shaft 35 is decoupled from shaft 21, as shown in the drawings, dynamo 27 may be operated as a motor on current supplied by battery 47 through lines 45 and 41. When dynamo 27 is operating as a motor, rheostat 49 mounted on control handle 9 may be used to turn on and control the speed of dynamo 27 through electrical lines 51. The connection of electrical lines 41 and 51 to dynamo 27 and the means of changing the operation of dynamo 27 from a generator to a motor and vice versa are conventional and well known to those skilled in the art and therefore are not shown or described in detail.

FIGURE 2 of the drawings shows an alternative apparatus built in accordance with the present invention. In FIGURE 2, like numbers have been utilized to designate corresponding elements of FIGURES 1 and 2. Referring specifically to FIGURE 2, it is to be observed that internal combustion engine 1 is attached to housing 3, which may be slightly shorter than in the previous embodiment. The lower end of housing 3 encompasses horizontal spindle 13, sliding dog gear means 15 having bevel gears 17 and 19, and bevel gear 23, attached to drive shaft 21. Mounted exteriorly of housing 3 on spindle 13 is propeller 11, all as previously shown in connection with FIGURE 1. In addition, exhaust 25 is located adjacent the lower end of housing 3, and clamping bracket 5 with clamping screws 7 are mounted on motor 1 and housing 3 near the juncture of these two units. As shown in FIGURE 2, dynamo 27 is fixedly attached to the exterior of the upper portion of housing 3. Extended spindle 53 of dynamo 27 pases through housing 3 to a point adjacent the upper end 33 of drive shaft 21. Mounted on the free end of spindle 53 is an angle-type spiral gear 55. Mounted on shaft 21 and cooperatively engaging gear 55 is spiral gear 57. It is to be observed therefore that spindle 53 of dynamo 27 will either drive shaft 21 or be driven by shaft 21, depending upon the position of clutch 37, which is adapted to couple and uncouple internal combustion engine drive shaft 35 to propeller drive shaft 21. As in the previous drawing, clutch 37 is operated by clutch handle 39. Also, as previously pointed out in the discussion of FIGURE 1, rheostat 49 is mounted on control handle 9 and may be used to control the operation of dynamo 27 through electrical lines 51 when the dynamo is operating as a motor. When dynamo 27 is operating as a generator, electrical energy is supplied through electrical lines 41 to voltage regulator 43, and thence to battery 47 through electrical lines 45, all in the manner previously described.

It is to be recognized as a result of the description set forth above, that the motive unit of the present invention can be provided in either form without any change whatsoever in conventional internal combustion engine 1, and with only minor changes in the propeller drive shaft. The simplest modification is of course, shown in FIGURE 2 and this modification can be applied to an existing motor and drive shaft simply by separating a conventional drive shaft or removing a short section thereof and mounting the clutch and gear units therein. With almost equal facility, the embodiment of FIGURE 1 can be incorporated on a conventional internal combustion and drive assembly by simply severing the drive shaft, incorporating the clutch, and inserting a drive shaft section carrying dynamo 27. The only other modification necessary would be to, in some cases, add an additional length of housing, or a complete housing section containing the dynamo 27, having an enlarged body to accommodate dynamo 27.

FIGURES 3, 4 and 5 of the drawings show the preferred spline-type clutch in detail. In these drawings

shafts 33 and 35 are shown releasably connected by clutch collar 52. Collar 52 has attached thereto clutch lever 39. Clutch lever 39 is appropriately pivoted in housing 3 on pivot pin 54. Guide bearing 56 is annularly disposed about shaft extension 59. Shaft extension 59 keeps shaft 33 in line with shaft 35 and prevents misalignment as well as reduces the number of bearings needed. Also mounted annularly about extension 59 and between shafts 33 and 35 is thrust bearing 61.

Various modifications and variations of the present invention will be apparent to those skilled in the art and, therefore, the present invention is to be limited only in accordance with the appended claims.

I claim:

1. An outboard motor apparatus for use on small boats comprising:

(a) an internal combustion engine having a short vertically-disposed engine drive shaft protruding from the bottom of said engine;

(b) a spline-type clutch mounted on the lower end of said engine drive shaft;

(c) a vertically-disposed propeller drive shaft below and vertically aligned with said engine drive shaft;

(d) said clutch being adapted to alternatively couple and uncouple said engine drive shaft and said propeller drive shaft;

(e) an electric dynamo permanently and operatively coupled to said propeller drive shaft below and adjacent said clutch;

(f) said dynamo having its armature coupled to said propeller drive shaft to rotate when said propeller drive shaft rotates and being adapted to operate as a generator when said engine drive shaft is coupled to said propeller drive shaft and as a motor when said engine drive shaft is uncoupled from said propeller drive shaft;

(g) transmission means operatively associated with the lower end of said propeller drive shaft and adapted to drive a horizontally-disposed propeller spindle in either a clockwise or counterclockwise direction by means of said propeller drive shaft or to be uncoupled from said propeller drive shaft;

(h) propeller means fixedly attached to said propeller spindle;

(i) voltage regulator means electrically connected to said dynamo and adapted to produce a predetermined output voltage from the voltage received from said dynamo when said dynamo is operating as a generator;

(j) rheostat means electrically connected to said dynamo and adapted to control the speed of said dynamo when said dynamo is operating as a motor.

2. An apparatus in accordance with claim 1 wherein the dynamo is mounted independently of the propeller drive shaft with its armature spindle extending to a point adjacent said propeller drive shaft, a first spiral gear is mounted on the free end of said armature spindle and a second spiral gear is mounted on said propeller drive shaft adjacent said first spiral gear and operatively engaging said first spiral gear.

3. An aparatus in accordance with claim 1 wherein the armature of the dynamo is formed about the propeller drive shaft and fixedly attached thereto.

4. A motor for use on small boats comprising:

(a) an internal combustion engine;

(b) an engine shaft extending downwardly from the bottom of said engine and operatively coupled to said engine to be driven by said engine;

(c) a propeller drive shaft disposed immediately below said engine shaft and axially aligned therewith;

(d) propeller means operatively coupled to the lower end of said propeller drive shaft;

(e) clutch means operatively associated with said engine shaft and said propeller drive shaft to alter-

nately couple said engine shaft to and uncouple said engine shaft from said propeller drive shaft; and

(f) an electric dynamo operatively coupled to said propeller drive shaft below said clutch means and having its armature fixedly coupled to said propeller drive shaft, whereby said armature rotates when said propeller drive shaft rotates and said dynamo operates as a generator when said engine shaft is coupled to said propeller drive shaft and as a motor when said engine shaft is uncoupled from said propeller drive shaft.

5. An apparatus in accordance with claim 4 wherein the dynamo armature is mounted independently of the propeller drive shaft and said armature is fixedly coupled to said propeller drive shaft through an armature spindle and a gear means to rotate said propeller drive shaft,

said gear means, said spindle and said armature simultaneously.

6. An apparatus in accordance with claim 4 wherein the dynamo armature is formed about the propeller drive shaft and is fixedly attached thereto.

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