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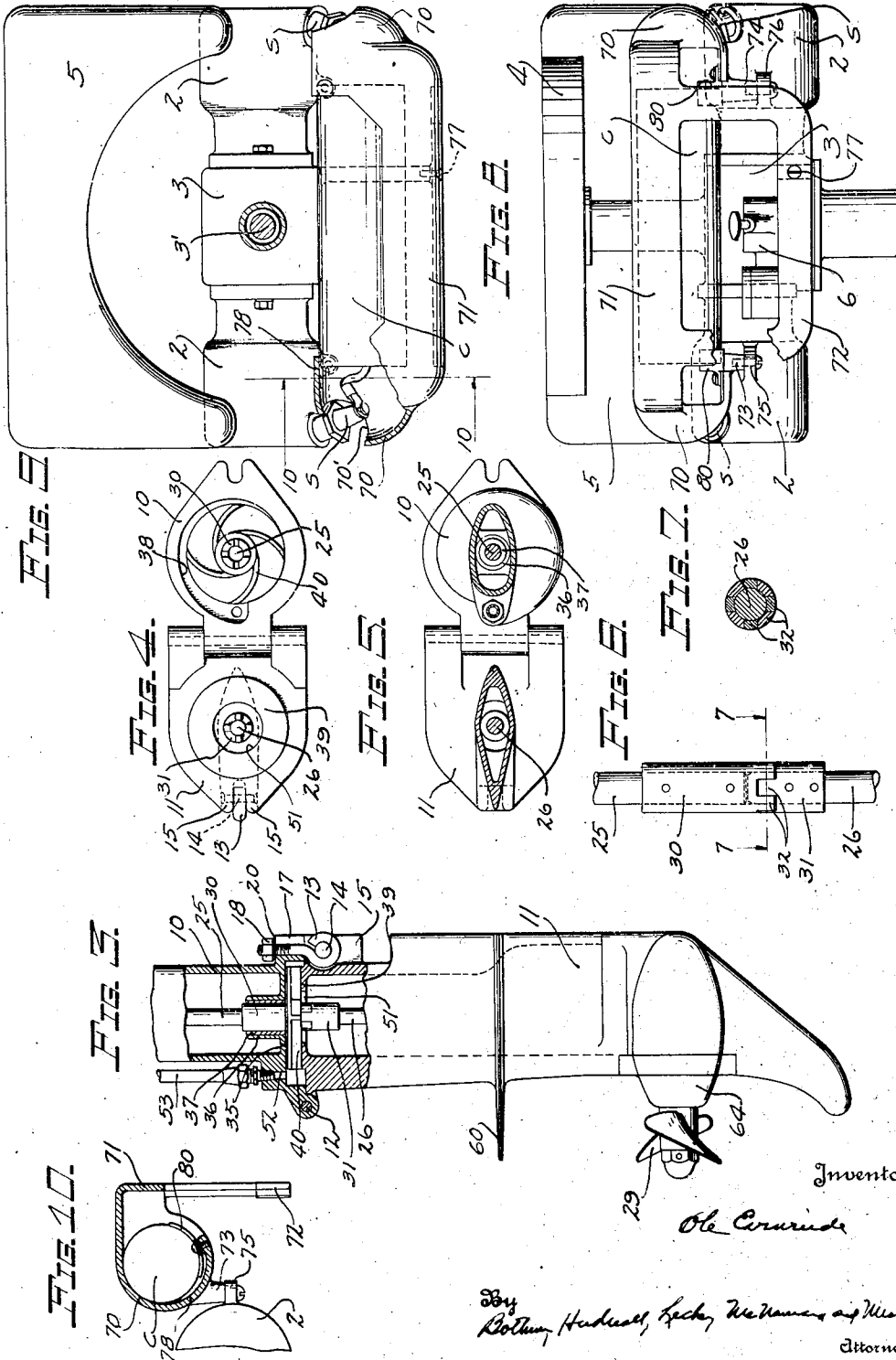
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FOLDABLE OUTBOARD MOTOR

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FOLDABLE OUTBOARD MOTOR

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This invention relates in general to outboard motors and more particularly to an outboard motor which is so constructed and organized as to be foldable into a small compact space when being transported from or to its place of use and yet may be easily and quickly set up when it is to be applied to a boat.

Outboard motors are frequently carried over considerable distances either in automobiles or otherwise to the place where they are to be used and to be adapted for such transportation it is, of course, desirable that the motor be small, compact and of light weight. In use, such motors are supported on the stern of the boat with the flywheel, which carries the starting handle and which is fixed to the crank shaft or engine shaft just above the engine cylinders, positioned above the stern of the boat so as to be accessible for starting the motor. Now, as the propeller must be properly submerged in the water and as it must be driven from the motor located well above the water line, the propeller and motor are necessarily spaced a rather substantial vertical distance. This spacing of the propeller from the motor proper is effected by employing a rather long vertical drive shaft which is coupled to the engine shaft and geared to the horizontal propeller shaft, this shafting and gearing being enclosed in an elongated housing fixed to the crank casing of the engine. It is further necessary for this housing to be rigid and strong as it provides the only support for the bearings required for the shafting. The necessity of providing this rather elongated housing and the shafting between the engine and the propeller has rendered the outboard motors heretofore proposed rather large and cumbersome and their transportation in an automobile or otherwise has been attended with difficulty and inconvenience.

The present invention proposes to make this elongated housing and the shafting contained therein foldable so that while the motor is being transported it may be folded up into a compact, well balanced and easily handled article. For this purpose the drive shaft housing and the drive shaft are each made up

of two sections detachably connected together in such manner that the lower section of the housing and the drive shaft section contained therein may be easily folded up against the upper housing section and releasably held in such position. The arrangement is such that when the motor is to be set up the lower section may be easily brought back into alignment with the upper section and secured in such position. Preferably, the securing of the housing sections in alignment automatically couples the drive shaft sections. In one form of the invention the lower section of the housing is hinged to the upper section and in conjunction with the hinge a releasable fastening means is provided which locks the housing sections aligned or operatively assembled. Upon release of the fastening means the lower housing section may be swung around against the upper section and releasably latched in such position.

Another feature of the invention resides in the provision of a protector for the spark plugs of the motor which precludes splashing and wetting of the spark plugs and consequently grounding thereof. This protector is also designed and adapted to serve as a support for the ignition coil and may also be adapted to provide a handle for carrying the motor.

Other objects and advantages reside in certain novel features of the construction, arrangement and combination of parts which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings forming a part of this specification, and in which:

Figure 1 is a view in rear elevation of an outboard motor embodying the present invention and showing the same folded up;

Figure 2 is a view partly in side elevation and partly in central longitudinal vertical section further illustrating the motor in the position shown in Figure 1;

Figure 3 is a view partly in side elevation and partly in section illustrating how the sections of the motor are coupled together;

Figure 4 is a bottom plan view of the parts positioned as shown in Figures 1 and 2;

Figure 5 is a view in section taken on line 5—5 of Figure 2;

Figure 6 is a fragmentary detail view in elevation illustrating the coupling between the drive shaft sections;

Figure 7 is a detail sectional view taken on line 7—7 of Figure 6;

Figure 8 is a fragmentary view in front elevation showing the combined spark plug protector and coil holder and associated parts;

Figure 9 is a view in top plan of the parts shown in Figure 8, with the flywheel removed for the sake of illustration; and

Figure 10 is a detail sectional view on line 10—10 of Figure 9.

Referring to the drawings, it will be seen that the outboard motor embodies in many respects the features of the conventional outboard motor in that it has a pair of cylinders 2 connected to the opposite sides of the crank case 3. The crank shaft or engine shaft 3' projects above and below the crank case and has a flywheel 4 fixed to its upper end and carrying the usual starting handle (not shown). The motor has the usual equipment such as a gas tank 5, carburetor 6 and muffler 7.

The present invention proposes to construct a drive shaft housing with two sections, that is, an upper section 10 which has its upper end bolted to the crank case and a lower section 11 so connected to the upper section as to be foldable thereon as illustrated in Figures 1 and 2. The connection between the housing sections 10 and 11 may comprise a hinge 12 pivotally connecting the sections at one side of the housing. For the purpose of releasably securing the housing sections 10 and 11 in alignment suitable releasable fastening means may be provided between the sides of the sections opposite the hinge 12. One type of such a fastening means is shown and comprises an eye-bolt 13 pivotally supported on a pin 14 carried by spaced lugs 15 integrally formed with the section 11. When the sections 10 and 11 are alined the eye-bolt 13 is positioned as shown in Figure 3 and its shank passes upwardly between lugs 17 formed integral with the section 10. A nut 18 is threaded on the shank of the eye-bolt and may be tightened up to bear against a lock washer 20 mounted on the shank of the eye-bolt and interposed between the nut 18 and the lugs 17. When the nut 18 is tightened up the sections of the drive shaft housing are securely clamped and held together and the motor has all of the features of strength and rigidity of the conventional type of rigid housing. When the motor is folded up or knocked down the nut 18 is loosened and the eye-bolt is swung around to the position shown in Figure 2. The lower section 11 may then be swung around to the position

shown in Figures 1 and 2. As shown in Figure 2, the lower section 11 is releasably held in its folded position by means of a spring latch 21 which may be carried by the muffler or other stationary part of the motor and which engages the skid or lower end of the drive shaft housing.

The drive shaft is also made up of two sections, there being upper section 25 which has its upper end fixedly coupled to the crank shaft 3' of the engine, and a lower section 26 geared as at 27 to the propeller shaft 28. Externally of the lower section of the housing the propeller shaft 28 carries the usual propeller designated at 29. A coupling is provided between the drive shaft sections 25 and 26 and is designed to automatically connect these drive shaft sections when the housing sections are brought into alignment. As shown in Figures 2, 6 and 7, the coupling comprises coupling sleeves 30 and 31 pinned or otherwise fixed to the drive shaft sections 25 and 26, respectively. The meeting ends of the sleeves 30 and 31 project beyond their respective drive shaft sections and are formed with alternate projections and recesses designated at 32 and 33, respectively, the projections of the coupling sleeve 30 being designed to interfit with the recesses of the coupling sleeve 31 and vice versa. The upper section 10 of the drive shaft housing is formed with a transverse partition 35 adjacent its lower end, the partition 35 having a flanged central opening 36 lined with a bushing 37 and providing a bearing for the lower end of the drive shaft section 35. The partition 35 also coacts with a peripheral flange-like structure 38 formed at the lower end of the housing section 10 to form the top and side wall of a pump chamber. The lower wall of this chamber is defined by a partition 39 integrally formed with the upper end of the lower housing section 11. The partition 39 is offset upwardly to a slight extent from the main body of the housing section 11 and is of a reduced diameter so that it also provides a flange structure adapted to interfit with the flange structure 38 at the lower end of the housing section 10. This interfitting flange arrangement has the advantage of relieving the hinge and fastening means of a great part of the strain imposed upon the connection thus had between the sections of the housing.

A centrifugal impeller 40 operates in the pump chamber thus provided, the impeller 40 being pinned to the coupling sleeve 30 and to the drive shaft section 25. The lower housing section 11 is formed with a partition 45 having an integral tubular portion 46 lined with a bushing 47 to provide a bearing for the lower drive shaft section 26. The partition 45 also defines in the lower housing section 11 an enclosed chamber 48 for the propeller shaft and the gearing employed to connect the drive shaft thereto and entirely

separates this chamber 48 from a water inlet passage 49 afforded by the balance of the interior of the lower housing section 11. The inlet passage 49 communicates at its lower end with the exterior through an inlet 50 provided with a strainer 50' and at its upper end communicates with the pump chamber through an opening 51 provided in the partition 39 and leading into the center of the pump chamber. As will be understood from Figure 3, when the motor is set up for operation the inlet 50 faces forwardly and thus functions as a scoop for feeding the water up to the pump chamber. The pump chamber is provided with an outlet 52 which communicates with a pipe 53 leading to the water jackets of the engine cylinders. After circulating through the engine cylinders the water is discharged in any conventional or desired manner. The upper section 10 of the housing may also have an inwardly depressed portion accommodating part of the pipe 53 to afford the space required for the nut on the outer end of the propeller shaft.

An anti-cavitation plate 60 may be integrally formed with the lower section of the housing but it is notched to accommodate the pipe 53 in the folded position of the motor.

The propeller shaft 28 is rotatably supported in a combined radial and thrust bearing 63 which is supported in the gear chamber and which may also be designed to take the end thrust of the lower section of the drive shaft. The usual detachable cap or end plate 64 is also provided and has a bushing 65 affording another bearing for the propeller shaft.

In conjunction with this motor, protective means is provided for preventing its spark plugs S from being splashed or wet with water and thereby short-circuited or grounded, and comprises a pair of substantially semi-spherical shells 70 integrally formed at the ends of a connecting bar 71 of angle shape in cross section. Integral with one of the flanges of the connecting bar is the U-shaped frame member 72. The semi-spherical shells are formed with lugs 73 and 74 which abut lugs 75 and 76 formed integral with the crank case and which are secured thereto by screws or the like. A screw 77 also fastens the frame 71 to an abutment provided therefor on the crank case. The shells 70 are cut out or formed with openings 70' to receive the spark plugs S of the engine but the binding posts on the spark plugs are contained within the confines of the shell and are thus protected. The wrench engaging portion of the spark plugs are accessible, as shown in Figure 2. The confronting ends of the shells 70 are provided with semi-circular extensions 78 which afford supports for the ends of the coil C of the type usually employed in the ignition system of this type of outboard motor. The extension 78 may be provided with

spring clips 80 for releasably holding the coil C in position. The frame 71 also provides a convenient handle for carrying the motor from place to place.

With this construction, an outboard motor is provided which, when in use, possesses all of the desirable characteristics of the conventional type of outboard motor and yet when it is to be transported from place to place it may be knocked down and folded up into a compact and easily handled bundle of small compass.

This foldable feature is had without any difficult or laborious assembling and disassembling operations requiring the expenditure of skill and strength. On the contrary, all that is required is the loosening and tightening of a single nut. Thus, to fold up the motor the nut 18 is loosened and the eye-bolt swung around from the position shown in Figure 3 to the position shown in Figure 2 and the lower section of the housing is also rotated about its hinge 12 to the position shown in Figures 1 and 2. The latch 21 releasably holds the motor folded. In this way the overall length of the motor is practically cut in half and the folded parts lie within the lateral confines of the assembly at the upper end or head of the motor. To set up the motor for operation it is necessary merely to swing the lower housing section around to the position shown in Figure 3 from the position shown in Figure 2, the latch 21 yielding to permit this swinging of the lower section. When the sections 10 and 11 are aligned the flange structures 38 and 39 interfit and then by swinging the eye-bolt around in between its lugs 17 and tightening up the nut 18 the parts may be locked in set up position. During this setting up of the housing sections the drive shaft sections are automatically coupled as the projections and recesses of the coupling sleeves automatically interfit when the housing sections are brought together. If desired, the extremities of the projections 32 of the coupling sleeves may be slightly tapered or rounded to facilitate this interfit. Between the sections 10 and 11 of the housing a suitable packing gasket may be interposed.

The invention claimed is:

1. An outboard motor having a drive shaft made up of sections, a housing for the drive shaft also made up of sections foldable upon each other, means for releasably securing the sections of the housing in operative alinement and means for coupling the sections of the drive shaft when the housing sections are aligned.

2. An outboard motor having a sectional drive shaft, a sectional housing for the drive shaft, a hinge between the sections of the housing, a releasable fastening device for securing the sections of the housing together and means for coupling the sections of the

drive shaft when the housing sections are operatively alined.

3. An outboard motor including a drive shaft made up of upper and lower sections, a housing having upper and lower sections in which the upper and lower shaft sections are rotatably mounted, means connecting the housing sections in such manner as to permit the lower section to be folded upon the upper section, and means for automatically coupling the sections of the drive shaft when the housing sections are operatively alined.

4. An outboard motor having a drive shaft made up of a pair of sections, a housing therefor including a pair of sections having interfitting flanges at their meeting ends, a hinge between the sections of the housing, a releasable fastening device for securing the housing sections operatively alined, and means for coupling the drive shaft sections when the housing sections are alined.

5. An outboard motor having a conventional crank case and cylinder assembly and conventional equipment associated therewith, a drive shaft housing including an upper section secured to the crank case and a foldable lower section, a hinge pivotally connecting said sections whereby the sections may be extended in operative alinement or folded back against each other to reduce the length of the motor, the sections, when folded, being located within the lateral confines of the crank case and cylinder assembly and associated equipment, a drive shaft made up of sections mounted in the sections of the housing and means for connecting the drive shaft sections when the housing sections are operatively extended with respect to each other.

6. An outboard motor having a water cooling system and including a housing made up of sections adapted to be extended in operative relation when the motor is in use and also adapted to be collapsed to reduce the size of the motor when the same is not in use, a shaft section carried by each section of the housing and collapsed and extended therewith, means on the shaft sections for coupling the same when the housing and shaft sections are extended, cooperating means on the housing sections providing interfitting flange structure for strengthening the connection between the sections in the operative assembly and also defining a pump chamber, an impeller fixed to one of the shaft sections and operating in the pump chamber, one of said housing sections having means providing an inlet to said pump chamber, and means connecting the outlet of the pump chamber to the cooling system of the motor.

7. An outboard motor having a sectional drive shaft, a sectional housing for the drive shaft, a hinge between the sections of the housing, a bolt pivoted to one of said housing sections and having a nut thereon, means on the other housing section adapted to coact

with the bolt and nut for securing the sections together, and means for coupling the sections of the drive shaft.

8. An outboard motor including a crank case and cylinder assembly, a propeller and motion transmission means for driving the propeller from the motor and including a sectional drive shaft, a sectional housing therefor, said housing sections carrying said shaft sections and being adapted to be extended in operative relation when the motor is set up for use and also being adapted to be collapsed to reduce the size of the motor, when desired, means for securing the housing sections extended, means for connecting the shaft sections, and means for releasably holding the housing sections collapsed.

9. An outboard motor including a crank case and cylinder assembly, a drive shaft housing having an upper section secured to the crank case, and a lower section connected to the upper section so as to be foldable thereagainst or extended therefrom, releasable means for securing the sections extended, a drive shaft including a section rotatably mounted in the upper housing section and a section rotatably mounted in the lower housing section, coupling means between said shaft sections automatically engaged when the sections are extended and automatically released when the sections are folded, a propeller shaft rotatably mounted in the lower housing section and geared to the lower drive shaft section and a propeller rotated with said propeller shaft.

10. A protector for the spark plugs of an outboard motor including a pair of protective shells apertured to receive the spark plugs and a connecting element between said shells.

11. A protector for the spark plugs of an outboard motor including a pair of protective shells apertured to receive the spark plugs, a connecting element between said shells, and an attaching frame rigid with the connecting element and also adapted to constitute a handle.

12. A protector for spark plugs of an outboard motor, including a pair of protective shells apertured to receive the spark plugs and a connecting element between said shells, the confronting ends of the shells being adapted to receive and support the ends of a coil.

13. An outboard motor including the combination with an engine and a propeller, of a shaft housing structure connecting said engine and propeller and comprising normally aligned sections hingedly joined for collapse upon each other, separable drive shaft parts respectively journaled in the several sections and provided with couplings engageable only when said sections are aligned, and a releasable connecting device adapted to secure said sections normally in alignment.

14. An outboard motor including an en-

gine, a propeller and collapsible driving and supporting connections therebetween including a sectional drive shaft, a sectional housing structure in the component parts of which the several sections of the drive shaft are respectively mounted, means for releasably fastening the sections of the housing structure together in axial alignment, the drive shaft sections being provided with couplings operatively engageable for the transmission of motion when the sections of the housing are so aligned, and a hinged connection between the component parts of the housing structure, whereby said parts are collapsible upon each other.

15 15. An outboard motor including an engine having a crank shaft, in combination with a substantially upright drive shaft section, a first housing section enclosing said upright drive shaft section, a second housing section hingedly connected with the first and provided with a securing device adapted to maintain said housing sections in alignment, a second drive shaft section provided with a coupling operatively engageable with the first drive shaft sections when said housing sections are aligned, a propeller shaft carried by said second shaft housing section and intergeared with said second drive shaft section, and a propeller on said propeller shaft movable in the hinged movement of said shaft housing sections to a position in which it is nested with respect to said engine.

20 16. In an outboard motor, the combination with spaced cylinders and spark plugs having binding posts projecting from said cylinders, of shells mounted on said engine and apertured to receive the respective ends of said plugs, a connection between said shells, and a coil connected with said binding posts and shielded by said connection between said shells.

In witness whereof, I hereto affix my signature.

OLE EVINRUDE.