July 5, 1960 C. B. BENSON ET AL 2,943,592

AIR-COOLED OUTBOARD MOTOR

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Fig. 1

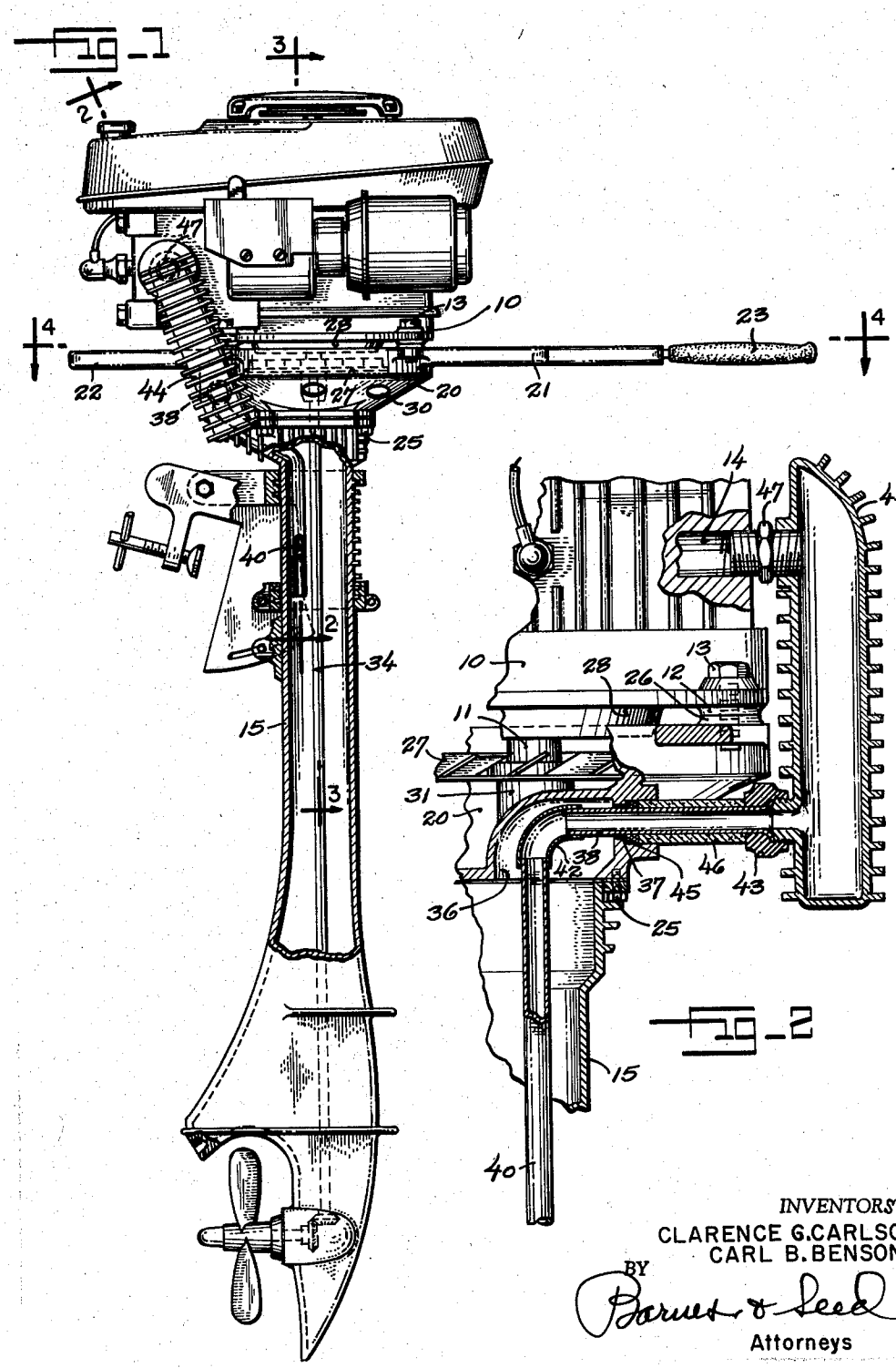


Fig. 2

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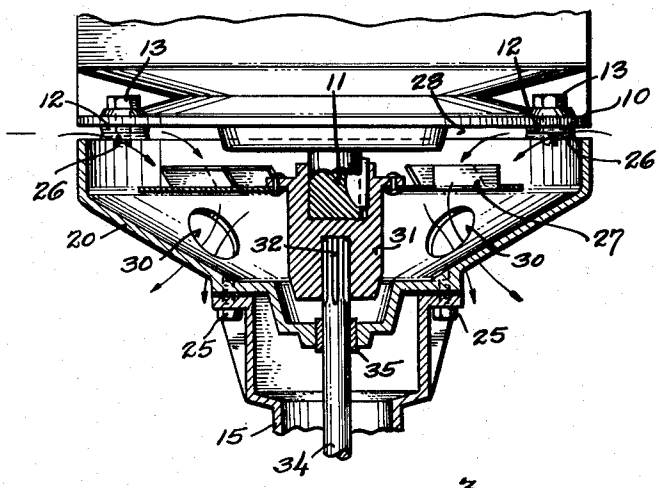
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Fig. 3



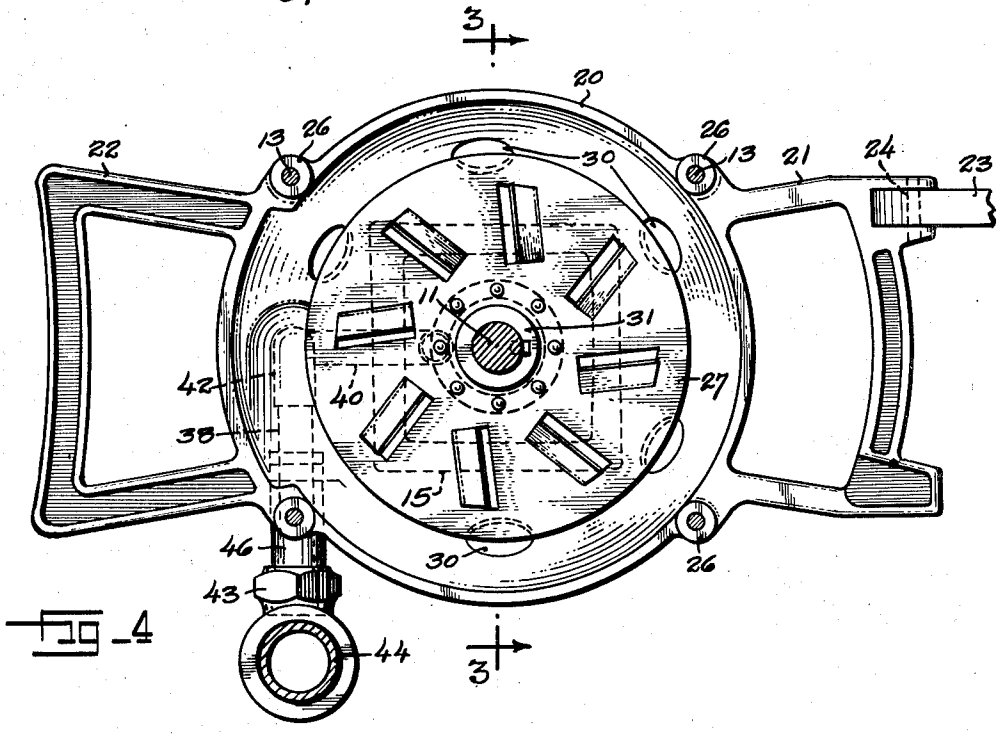


Fig. 4

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AIR-COOLED OUTBOARD MOTOR

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13 Claims. (Cl. 115—17)

This invention relates to outboard motors, particularly one in which the power plant is an air-cooled internal combustion engine and having an underwater discharge for the exhaust gases.

It is standard practice with modern outboard motors, in carrying exhaust gases from the engine to an underwater discharge opening, to pass the same along the interior of the motor's power leg. With water-cooled engines, pumped water issuing from the jackets of the engine is commonly mixed with said exhaust gases, as the same pass along the interior of the power leg, in an effort to preclude the above-water portion of the leg from becoming unduly hot. Air-cooled engines have in some instances finned their legs, and in other instances have employed a pump for the sole purpose of lifting water to the head end of the leg and there charging the same into the exhaust gases. Finning has been only moderately effective, wherefore most outboard motors heretofore produced, whether air-cooled or water-cooled, have commonly incorporated a water pump. Aside from the liability of the opening to the pump becoming clogged from sea-weed or other water-borne foreign matter, or the pump itself giving out, the inside surfaces of the power leg are subject to corrosion when water being pumped is sea water. Where the surfaces attacked are relatively inaccessible for periodic cleaning the damage from corrosion can be substantial.

The present invention, for its general object, aims to provide an outboard motor in which an air-cooled engine is used for the power plant and with the exhaust gases being passed through the interior of the power leg to obtain an underwater exhaust, and so engineered that such power leg can be maintained in a cool condition, relatively speaking, without recourse to water as a cooling medium.

It is a more particular object to provide an outboard motor of the character described having a blower contained in a housing placed to occupy an intervening position between the engine and the power leg, and employing a rapidly moving column of air blown by said blower as a means of dissipating heat from such housing and the upper portion of the power leg.

As a further particular object the invention aims to provide an outboard motor of the character described peculiarized in that the exhaust gases leaving the engine are caused to by-pass the blower compartment, in course thereof traversing a radiator exposed to the atmosphere so that a substantial portion of the contained heat of combustion is dissipated from said gases before the same have access to the interior of the power leg.

A yet further important object is to so engineer a motor of the described character as to preclude exhaust gases from within the power leg entering the blower compartment, thus preventing exhaust fumes from being charged into the atmosphere together with the column of air expelled from said compartment.

Further still more particular objects and advantages will, with the foregoing, appear and be understood in

the course of the following description and claims, the invention consisting in the novel construction and in the adaptation and combination of parts hereinafter described and claimed.

In the accompanying drawings:

Figure 1 is a view partly in side elevation and partly in vertical section to illustrate an outboard motor constructed to embody the preferred teachings of the present invention.

Fig. 2 is a fragmentary transverse vertical sectional view drawn to an enlarged scale on line 2—2 of Fig. 1.

Fig. 3 is a fragmentary transverse vertical sectional view on line 3—3 of Fig. 4; and

Fig. 4 is a horizontal sectional view on line 4—4 of Fig. 1, the scale employed in Figs. 3 and 4 corresponding to that of Fig. 2.

The drawings exemplify the invention as applied to one of several internal combustion engines well known in the industry which are considered as more or less of an all-purpose design in that the same are adapted to use as the power head for sundry machines including that of an outboard motor. Salient to such engine design is the provision of a mounting base **10** through which a vertical extension **11** of the crank shaft projects, and having about the perimeter a plurality of circumferentially spaced bosses **12** vertically drilled for reception of mounting bolts **13**. Distinguished from engines which have been expressly engineered for use in outboard motors, the all-purpose power head here illustrated presents a side exhaust opening **14** exposed to view above the mounting base and which is tapped to receive a nipple on which a can muffler is commonly mounted. By reason of the comparatively low efficiency of this type of muffler with its attendant high noise level, and the added objection to above-water delivery of exhaust gases considered from the aspect of noxious fumes, such an exhaust is not practical in an outboard motor.

The power leg **15** employed in the present invention is or may be conventional, being a hollow structure with the interior closed excepting for an underwater exhaust opening. Said hollow interior carries exhaust gases to the underwater exhaust opening and will be hereinafter termed the tail passage. Introduced between this leg and the mounting base **10** is a blower housing **20**. The housing has somewhat of a bell shape, invertedly mounted so that the open mouth lies at the top, and has handles, as **21** and **22**, projecting fore and aft. A steering arm **23** is pivoted, as at **24**, to the forwardly extending handle. Bolts **25** secure the housing to the power leg, and the bolts **13** secure the same to the power head, the latter threading into upstanding bosses **26** which register with the bosses **12** and separate the housing from the leg so as to define a moderately wide interstice **28** therebetween. This interstice functions as the induction opening for an air blower **27** received within the housing. Eduction openings are denoted by **30** and occur at spaced intervals of the circumference in a flared portion of the housing wall exposed above the power leg. The blower is carried by a hub **31** which is keyed to the shaft extension **11** of the power head, and in the bottom of the hub is a spline socket receiving the splined upper end **32** of the power leg's vertical drive shaft **34**. A bearing for such upper end of the drive shaft is provided by a bushing **35** which is carried by the base wall of the blower housing, this base wall being otherwise imperforate in order that the interior of the blower housing will be completely isolated against access of fumes from the interior of the leg.

Said base wall, aft of the bearing, presents a ceiling pocket **36** exposed to the interior of the power leg. The side wall of the blower housing has a bored and counterbored horizontal opening **37** leading to this pocket in a

position parallel with and spaced below the engine's exhaust opening 14, and received through this opening is one branch 38 of a generally L-shaped tail pipe. The other branch 40 is arranged to depend into the power leg and is preformed with bends (see Fig. 1) necessary to follow the interior profile contour of the power leg while being spaced therefrom. As here shown the tail pipe has its two branches silver-soldered to a connecting elbow 42 but self-evidently could be preformed from a single length of pipe.

The outer end of the branch 38 connects by a flare fitting 43 with the lower end of a finned pot-radiator 44. An asbestos washer 45 received within the counterbore of the wall opening 37 acts with a fibre sleeve 46 to heat-insulate the branch 38. An exhaust nipple 47 having right and left hand threads upon its two ends connects the upper end of the pot-radiator with the exhaust opening 14.

It is thought that the invention will have been clearly understood from the foregoing detailed description of the now preferred illustrated embodiment. The pot-radiator substantially reduces the temperature of the exhaust gases before the same enter the interior of the power leg and this, acting in conjunction with direct radiation from the head end of the power leg to the air column which is blown downwardly around the same, and transfer of said heat by conduction to the air-cooled walls of the blower housing, effectively maintains the upper portion of the power leg at a moderate temperature. It will be seen that the interior chamber of the pot radiator depends somewhat below the outlet opening. Also, the tail pipe is moderately smaller than the engine's exhaust port, and considerably smaller than the pot-radiator. The result is to produce within the chamber of the pot-radiator a surge which operates like a baffle to momentarily suppress the gases and provide an added time interval in which to transfer heat through the walls of the radiator for dissipation from the radiation fins.

The carrying handles 21 and 22 are a constituted part of the blower housing and are hence little more than warm to the touch even though the motor is lifted immediately after stopping the engine.

No limitations are to be implied and it is our intention that the hereto annexed claims be given the broadest interpretation to which the language fairly admits.

What we claim is:

1. In an outboard motor, a power head providing an air-cooled internal combustion engine with a vertical extension of the engine's crank shaft exposed below said head, a hollow power leg carrying a propeller at the bottom end and having a drive shaft for said wheel extending upwardly through the interior with its upper end exposed, the hollow interior of said leg leading to an underwater exhaust opening, a blower housing rigid with the power leg and the power head in an intervening position between the same, a rotary blower in said housing, and means for passing the drive from said crank extension to the blower and to the upper end of the drive shaft, said blower being arranged and adapted to blow cooling air downwardly over said power leg, means being provided for delivering exhaust gases from the engine to the interior of the power leg.

2. In an outboard motor, a power head providing an air-cooled internal combustion engine with a vertical extension of the engine's crank shaft exposed below said head and having an exhaust opening at the side, a hollow power leg carrying a propeller at the bottom end and having a drive shaft for said propeller extending upwardly through the interior with its upper end exposed, the hollow interior of said leg leading to an underwater exhaust opening, a blower housing made rigid with said power leg and the power head in an intervening position between the same, a rotary blower in said housing, means for passing the drive from said crank extension to the blower and to the upper end of the drive shaft, said blower being arranged and adapted to blow cooling air downwardly over said power leg, and means lying outside the blower housing for carrying the exhaust gases from said exhaust opening of the engine into the hollow interior of the power leg.

3. Structure according to claim 2 in which the means last recited includes a muffler.

4. Structure according to claim 2 in which the means last recited includes a radiator presenting exterior fins exposed to the atmosphere.

5. Structure according to claim 2 in which the means last recited includes a pot-radiator presenting external fins and being formed interiorly with a chamber which connects at a point adjacent one end with an admission pipe which leads from the engine and connects at a point adjacent the other end with an emission pipe leading to said hollow interior of the power leg, the gases having a run of substantial length between said admission and emission pipes, the cross-section of said interior chamber being large by comparison with that of both the admission pipe and the emission pipe.

6. In an outboard motor, a propeller, a power leg supporting said propeller at its lower end and presenting a closed tail passage leading from the leg's upper end to an underwater exhaust opening, a power head surmounting said leg and providing an air-cooled internal combustion engine drive-coupled to the propeller, means piping exhaust gases from the engine to the upper end of said tail passage, and means driven from the engine and occupying a position between said engine and the leg for blowing a cooling column of air over the exterior surface of the power leg's upper end.

7. In an outboard motor, a propeller, a power leg supporting said propeller at its lower end and presenting a closed tail passage leading from the leg's upper end to an underwater exhaust opening, a power head surmounting said leg and providing an air-cooled internal combustion engine drive-coupled to the propeller, and means piping exhaust gases from the exhaust port of the engine to the upper end of said tail passage and including within the length thereof a radiator presenting exterior fins exposed to the atmosphere, the gas-conducting connection from the radiator to the tail passage comprising a pipe heat-insulated from the power leg.

8. In an outboard motor, a propeller, a power leg supporting said propeller at its lower end and presenting a closed tail passage leading from the leg's upper end to an underwater exhaust opening, a power head surmounting said leg and providing an air-cooled internal combustion engine drive-coupled to the propeller, a radiator located alongside the power head presenting a pot chamber of substantial length and having exterior fins exposed to the atmosphere, and gas-conducting connections leading from the exhaust port of the engine to the pot chamber and from the pot chamber to the upper end of the tail passage, the inlet opening to the pot chamber being located adjacent one end of said chamber and the outet opening being located in a position distal to the inlet opening and spaced from the other end of said chamber.

9. Structure according to claim 8, the connection from the engine to the pot chamber comprising an exhaust pipe formed with right and left hand threads upon opposite ends, the connection from the pot chamber to the tail passage comprising a tail pipe isolated from the walls of the power leg and attached to the radiator by a flare fitting.

10. In an outboard motor, a propeller, a power leg supporting said propeller at its lower end, providing a hollow interior open at the top and leading to an underwater exhaust, and having a drive shaft for the propeller extending upwardly through said hollow interior with its upper end exposed, a blower housing secured in surmounting relation to the power leg and so formed as to provide flared side walls which project upward and out-

wardly beyond the leg, the base portion of said blower housing providing a journal bearing for the upper end of the drive shaft and serving as a closure for the top opening of the power leg, said flared side walls having a plurality of openings therein spaced at intervals of the circumference, a blower having its hub fixed to the upper end of the drive shaft for rotation in the blower housing, a power head secured in surmounting relation to the blower housing and providing an air-cooled internal combustion engine drive-coupled to the hub of the blower, an opening at the top of the blower housing for introduction of air to the blower, the blower acting by its rotation to force said air downwardly and discharge the same through said wall openings about the head end of the power leg, and a connection for conducting exhaust gases located outside the blower housing and leading from the exhaust port of the engine into the hollow interior of the power leg.

11. Structure according to claim 10 having a carrying handle for the motor made an integral part of the blower housing.

12. Structure according to claim 10 in which said connection includes a pot-radiator presenting exterior fins exposed to the atmosphere.

13. The structure recited in claim 12 in which the pot-radiator provides means by which to suppress the exhaust gases in their passage through the radiator.

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