Aug. 10, 1943. T. JACKSON 2,326,224

OUTBOARD ENGINE CONSTRUCTION

Filed Jan. 31, 1942 6 Sheets-Sheet 1

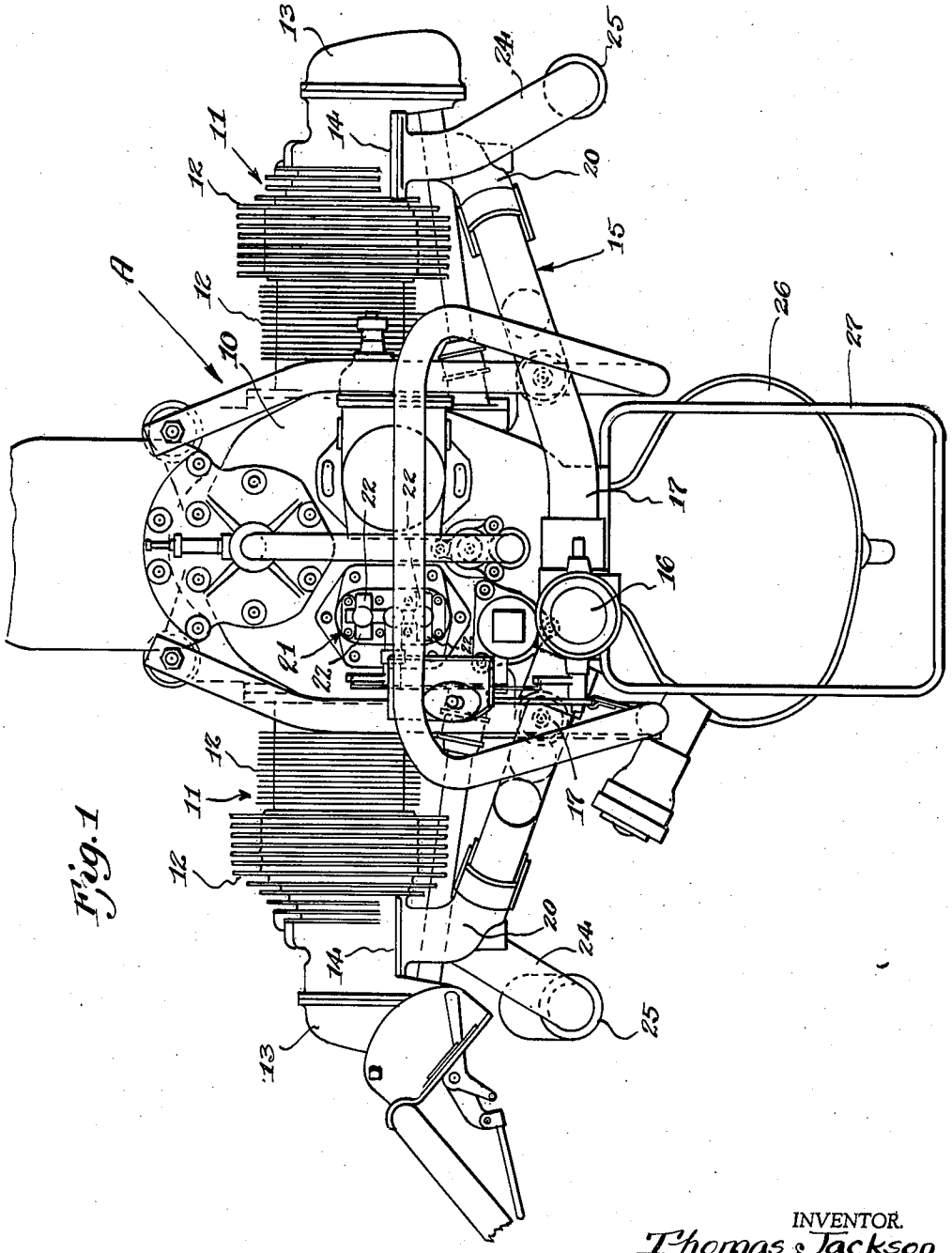


Fig. 1

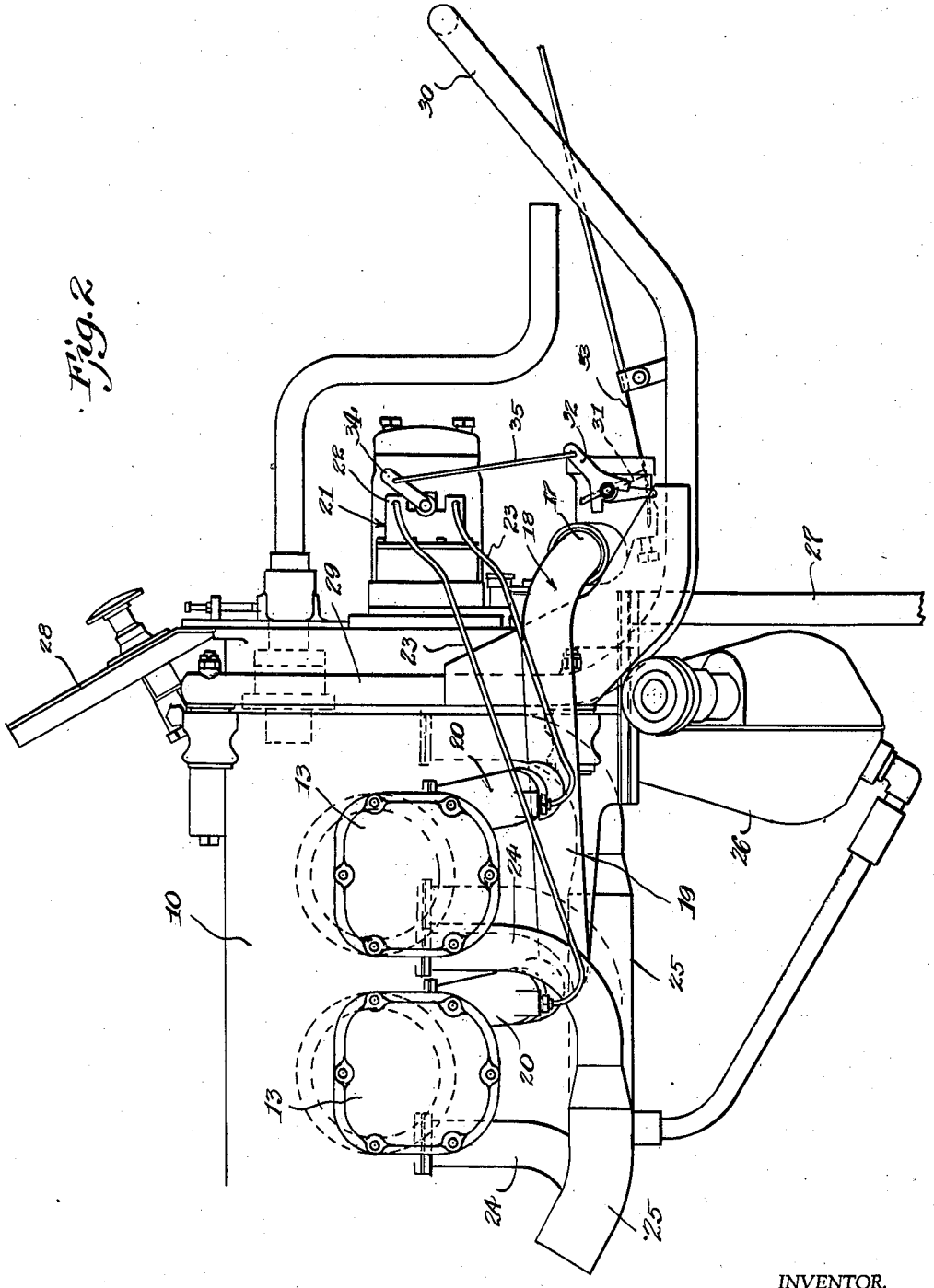
INVENTOR.
Thomas Jackson
BY
G. F. Hawke.
Attorney.

Aug. 10, 1943. T. JACKSON 2,326,224

OUTBOARD ENGINE CONSTRUCTION

Filed Jan. 31, 1942 6 Sheets-Sheet 2

Fig. 2



INVENTOR.
Thomas Jackson
G. F. Hauke.
Attorney.

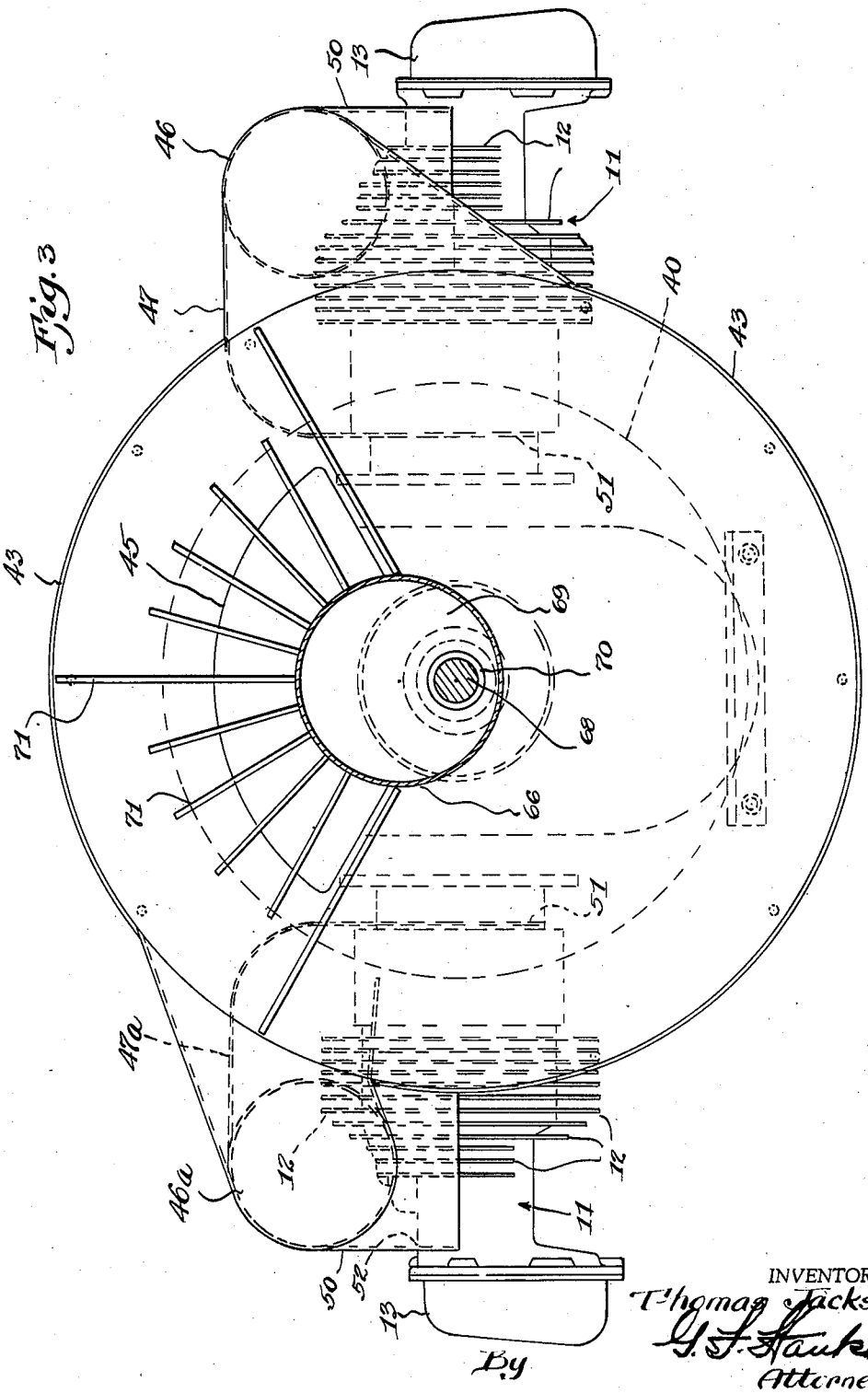
BY

Aug. 10, 1943. T. JACKSON 2,326,224

OUTBOARD ENGINE CONSTRUCTION

Filed Jan. 31, 1942 6 Sheets-Sheet 3

Fig. 3



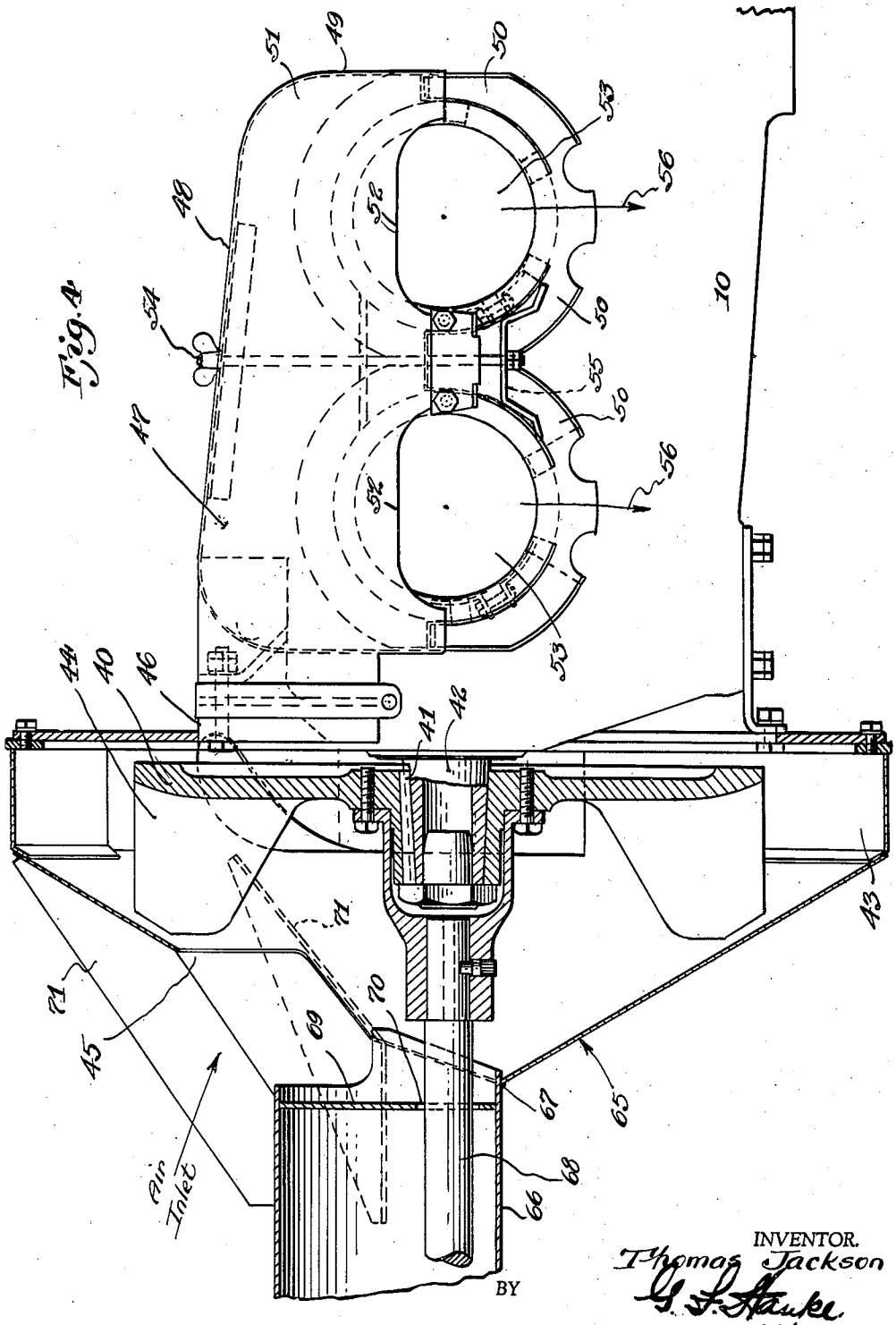
INVENTOR.
Thomas Jackson
By G. F. Hauke
Attorney.

Aug. 10, 1943. T. JACKSON 2,326,224

OUTBOARD ENGINE CONSTRUCTION

Filed Jan. 31, 1942 6 Sheets-Sheet 4

Fig. 4.



INVENTOR.
Thomas Jackson
BY
G. F. Hauke
Attorney

Aug. 10, 1943. T. JACKSON 2,326,224

OUTBOARD ENGINE CONSTRUCTION

Filed Jan. 31, 1942 6 Sheets-Sheet 5

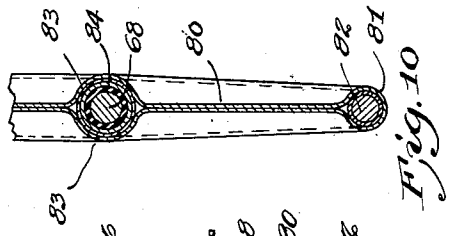


Fig. 10

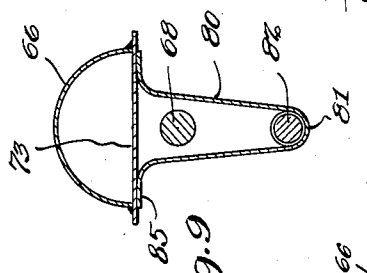


Fig. 9

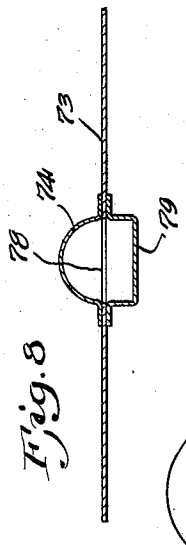


Fig. 8

Fig. 7

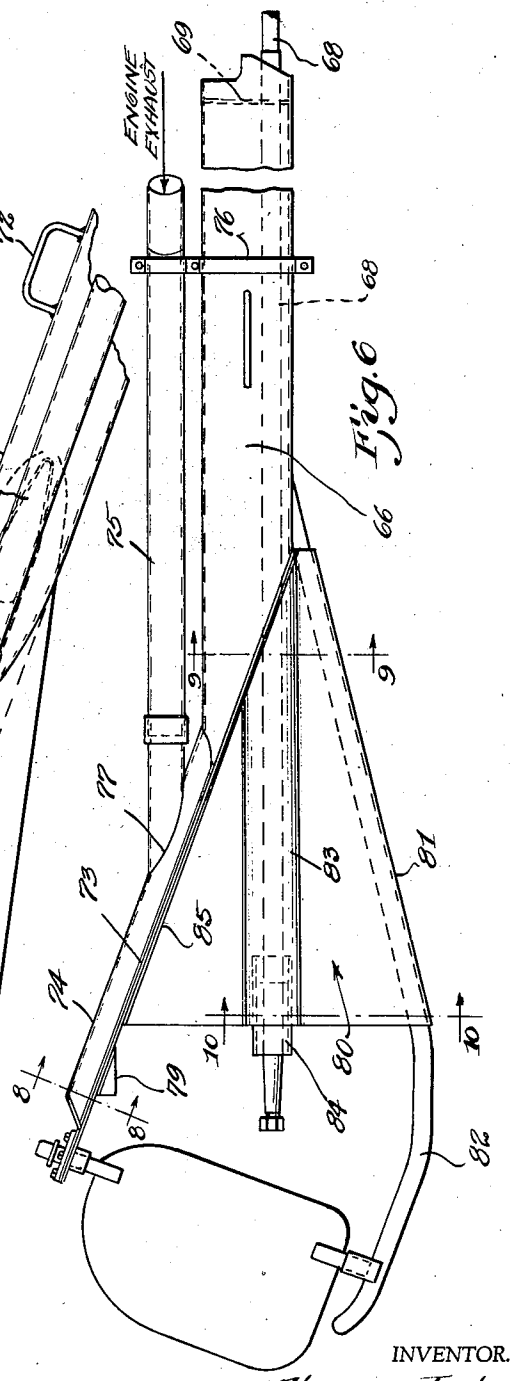


Fig. 6

INVENTOR.
Thomas Jackson
BY
G. F. Hauke
Attorney

Aug. 10, 1943. T. JACKSON 2,326,224

OUTBOARD ENGINE CONSTRUCTION

Filed Jan. 31, 1942 6 Sheets-Sheet 6

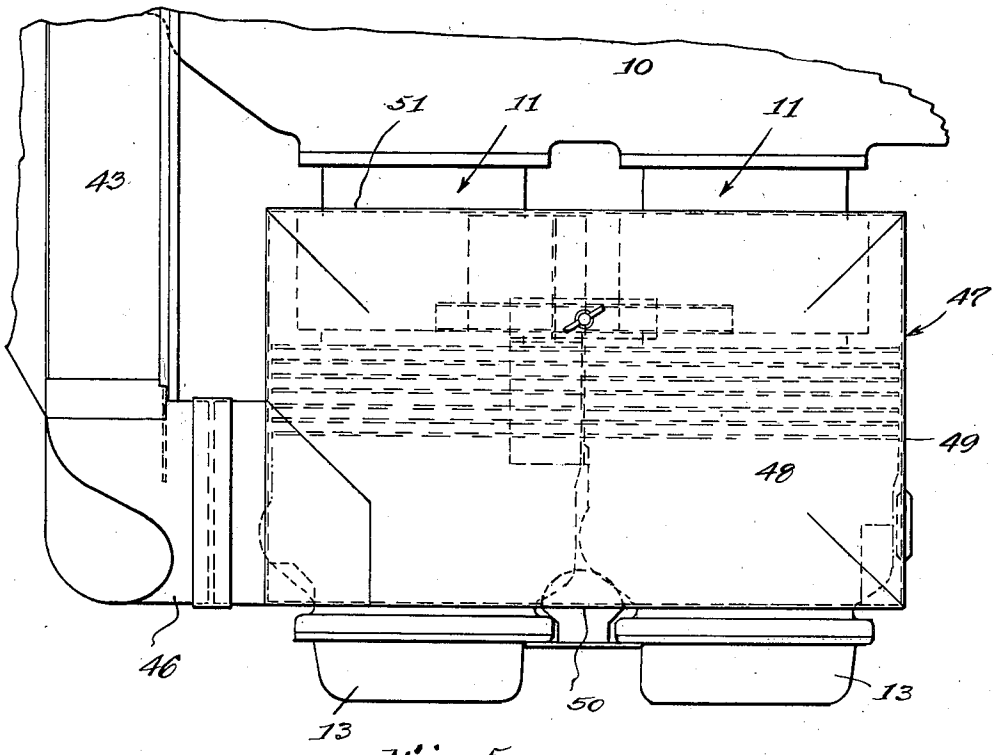
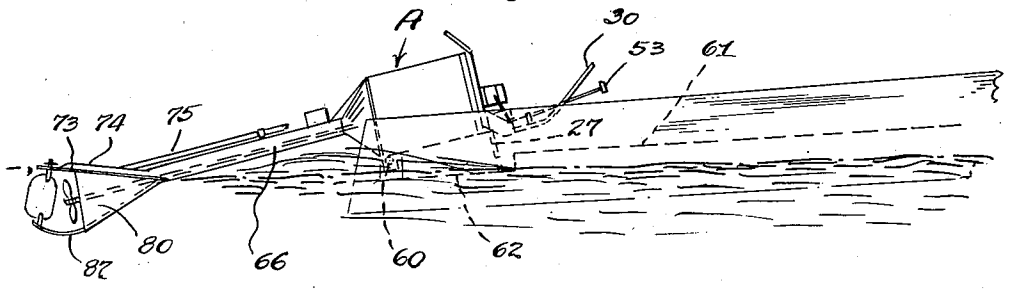


Fig. 5

Fig. 11



INVENTOR.
Thomas Jackson

BY

G. F. Hauke
Attorney.

Patented Aug. 10, 1943

2,326,224

UNITED STATES PATENT OFFICE

2,326,224

OUTBOARD ENGINE CONSTRUCTION

Thomas Jackson, North Muskegon, Mich., assignor to Continental Motors Corporation, Detroit, Mich., a corporation of Virginia

Application January 31, 1942, Serial No. 429,021

6 Claims. (Cl. 115—17)

My invention relates to an outboard internal combustion engine and more particularly to that type which embodies a plurality of horizontally opposed engine cylinders and which drives a rearwardly extending relatively long propeller shaft that is preferably coaxially aligned with the engine crankshaft.

Many difficulties have been encountered in the construction of an outboard engine of this general type, and more particularly many difficulties were had with the development of the induction system, the cooling system and the tail pipe construction and the combination of all these elements in a unit construction particularly serviceable for application with relatively large marine vessels capable of conveying a heavy cargo. The present construction is more particularly adaptable for application with a storm boat; that is, a boat used by the army primarily for transporting troops and munitions of war through shallow water as well as across medium sized bodies of water such as lakes and rivers.

One of the phases of my present invention relates more particularly to the engine induction system and is more particularly directed to a system applicable to an engine of the fuel injection type, and has for its object the construction of an improved engine by providing an air induction manifold cooperating with a fuel injector pump to provide an assembly particularly applicable with an outboard internal combustion engine of the character described.

Another phase of my invention relates to the cooling system for an air cooled internal combustion engine, and has for its object the construction of an improved engine of the aforesaid type by providing efficient means for distributing cooling air to the engine cylinders and more particularly for circulating cooling air uniformly over a plurality of horizontally opposed engine cylinders, said objects being more particularly accomplished by means which control the circulation of cooling air and direct same to flow around the engine cylinders in such a way as to provide a cooling system particularly applicable with an outboard internal combustion engine of the character described.

Another phase of my invention is related to the tail pipe construction and its assembly with the engine structure, and has for its object the construction of a tail pipe structure permanently secured or united to the engine structure to facilitate the construction of a suitable unit structure particularly applicable for an outboard internal combustion engine of the character described, more specifically, this tail pipe structure provides an improved propeller shaft having characteristics particularly applicable for operative relation or assembly with the engine exhaust system and embodying structural details which provide a rigid rearwardly projecting tail pipe structure cooperating with the engine to provide a unitary structure of improved design and of such a character as to provide a structure which is readily transported and portably assembled with a storm boat or other similar marine vessel.

For a more detailed understanding of my invention, reference may be had to the accompanying drawings illustrating various important features embodied in my invention and defined in the appended claims, wherein like characters refer to like parts throughout the drawings, and in which:

Fig. 1 is an end elevational view of an outboard internal combustion engine as viewed from the forward end thereof, and illustrating in general the construction of the engine induction system,

Fig. 2 is a side elevational view thereof,

Fig. 3 is a transverse sectional view illustrating the engine cooling system,

Fig. 4 is a fragmentary detail view illustrating the assembled air cooling system for an engine of the type described and showing parts thereof in section,

Fig. 5 is a fragmentary plan view of an engine of the type described and the cooling system embodied therewith,

Fig. 6 is a fragmentary side elevational view of the tail pipe structure,

Fig. 7 is a fragmentary plan view thereof,

Figs. 8, 9 and 10 are detail sectional views taken respectively on the lines 8—8, 9—9 and 10—10 of Fig. 6, and

Fig. 11 is a diagrammatic side elevational view illustrating somewhat diagrammatically the unit structure which embodies an engine structure and an attached tail pipe structure as assembled in a storm boat or other similar marine vessel.

The internal combustion engine illustrated in the accompanying drawings is of a type which is found to be particularly applicable for use as an outboard engine for storm boats or other similar marine vessels, and this engine "A" comprises in general, a crankcase 10 having a plurality of horizontally opposed engine cylinders 11, constructed with suitable cooling fins 12, each engine cylinder having a cylinder head 13 and

provided with intake port means 14. An engine induction system 15 is assembled with said engine and consists of an intake manifold structure which is generally U-shaped in plan and is provided with a valved air inlet 16 from which lead the oppositely extending lateral conducting portions 17, these lateral conducting portions extending generally upwardly from the air inlet 16 and turned at 18 to merge with the longitudinally extending intake manifold conducting portions 19.

Individual port runners 20 are connected with the longitudinal conducting portion 19 and with the individual engine cylinders, these port runners being fastened or otherwise secured to the cylinder structure and connected with the cylinder intake ports 14.

Mounted on the rear face of the engine structure is a fuel injector pump 21 which is provided with a plurality of outlet portions 22, to which are connected fuel lines 23, these fuel lines individually connecting a fuel injector pump outlet with each engine cylinder and preferably constructed to conduct liquid fuel directly into each port runner 20, substantially as shown, where said fuel is mixed with the air and atomized just prior to admission into the engine cylinders.

Each of the engine cylinders have exhaust port means connected with an exhaust manifold structure embodying exhaust port runners 24 connected with the rearwardly extending longitudinal exhaust pipes 25 located respectively on opposite sides of the engine structure.

The engine carries an oil sump 26 and a leg support 27 is secured preferably to the engine crankcase and serves to support the front end of the engine when mounted in the boat. A suitable instrument panel 28 is carried by the engine structure and a bracket 29 is also secured thereto which bracket extends rearwardly and upwardly to form a handle 30.

It will be further observed that the air inlet of the intake manifold 15 is provided with a conventional valve 31 at said air inlet 16, which is opened and closed by actuation of the lever 32 by means of a push and pull actuating link 33. The fuel metering valve of the fuel injector pump 21 is adjusted or controlled by the throttle lever 34, and said throttle lever 34 of the fuel injector pump and the lever 32, associated with the air valve, are connected by a link 35 so that the air supply of the engine may be proportionally increased as the fuel charge is increased. The air and fuel are thus controlled so that the proper amounts to maintain the desired uniform mixture may be had. It will be observed that the air intake control valve 31 is located to the rear of the engine crankcase and is positioned immediately below the fuel injector pump. This air intake is thus positioned so that pure air for the combustible mixture is obtained at all times and is so positioned as to eliminate the chances of any moist air or water spray finding its way into the engine intake.

The engine as described herein is particularly applicable for use with a storm boat or other marine vessel, and it will be observed that the engine cylinders are air cooled. A fly-wheel 40 which is preferably keyed or otherwise secured as at 41 to the tapered stub of the crankshaft 42 is housed within a flywheel housing 43. The flywheel carries fan blades 44 which provide for forced circulation of the cooling air through the flywheel housing, said cooling air being drawn into the flywheel housing through the air inlet 45 and discharged through the outlets 46 and 46a. The outlet 46 is connected with a box 47 enclosing one bank of engine cylinders while the outlet of 46a is connected with a box 47a enclosing the other bank of engine cylinders which are oppositely extended from the engine crankcase 10 with respect to the cylinders enclosed in box or jacket 47.

These cylinder boxes or jackets 47 and 47a are identical in construction and each comprise a structure having a sloping top wall 48 and end wall 49 and side walls 50 and 51. The near wall 51 is preferably cut out as at 53 to provide an opening which encircles the cylinders adjacent where said cylinders are fastened to the engine crankcase and the outer wall is preferably provided with a notch or recess 52 adapted to fit on the engine cylinder adjacent to the cylinder head. A bolt 54 serves to clamp these boxes or cylinder jackets to the engine cylinders and said bolt clamps the intermediate partition member 55 in such a way as to provide for air outlets 56 associated respectively with each engine cylinder. Thus the cooling air is circulated over the engine cylinders and thence downwardly around the engine cylinders and exhausted below the engine cylinders, the jacket having such a construction as to provide baffling means for cooling the flow of air in juxtaposition with the cylinders fins, whereby to affect efficient cooling of the engine.

The flywheel housing, which is located adjacent the rear end of the internal combustion engine is of such a size that it is sometimes immersed in the water when installed in the storm boat. In Fig. 11 it will be observed that the outboard engine assembly is mounted by pivoting same to a suitable bracket 60 carried adjacent the stern of the boat. The type of boat with which my engine is especially suited, is the type in which the floor or deck 61 of the boat is recessed or stepped in order to provide a well 62 at the stern. When the tail piece is dropped in the water by raising the engine about the pivot 60, by means of the handle 30, the water is splashed against the lower half of the fly wheel housing, and for this reason the lower half of the housing, and preferably more than a half thereof is closed or otherwise sealed so that no water can get into the flywheel housing.

The inlet opening 45 is provided in the upper half of the flywheel housing and is more particularly located in the frustro-conical portion 65 of the flywheel housing. The propeller shaft housing 66 is welded to the flywheel housing, as at 67, and is positioned off center so that the propeller shaft 68 extends longitudinally through the lower portion of the propeller shaft housing, that end of the propeller shaft housing adjacent to the flywheel housing having a partition 69 provided with an opening 70 through which the propeller shaft extends. The intake opening 45 has the radially extending fins 71 secured to the flywheel housing and to the propeller shaft housing as clearly illustrated in Figs. 3 and 4.

The propeller shaft housing is generally referred to as the tail pipe and this housing is provided on its side with handles 72 and is secured to the plane structure 73 at its rear end, which plane structure preferably extends obliquely to the axis of the propeller shaft housing and is welded thereto. The plane structure 73 has welded thereto a longitudinally extending central tunnel 74. A pipe structure 75 having forked

exhaust gas inlets 75a is positioned to extend longitudinally of the propeller shaft housing and is supported by brackets 76, suitable connections connecting this pipe with the exhaust pipes 25 of the engine, the exhaust from both banks of cylinders thus converging and flowing through the pipe 75, this pipe being openly connected with the tunnel 74 as at 77 into which the exhaust gases are discharged. The plane structure 73 is provided with a discharge opening 78 shielded by a baffle 79 in order that the exhaust gases may be thus exhausted under water. The tail pipe structure is further provided with a vertical fin 80 consisting of sheet metal formed by folding same along a longitudinally center line as at 81, the folded portions lying back to back as shown in Fig. 10. Preferably, a guard 82 is clamped in the fold 81 by this fin structure 80, and it will be observed that an intermediate portion is constructed to support the propeller shaft 68. These complementary fin portions are formed with longitudinal channels 83 through which the propeller shaft extends, and adjacent the rear edge thereof a resilient bushing 84 is mounted to support the propeller shaft. The upper edge of the fin structure 80 is provided with oppositely extending flanges 85 which are welded to the underside of the plane structure 73.

The entire tail pipe structure is constructed of sheet metal stampings and tubular sections, said elements preferably being permanently united together by welding in order to form a relatively light weight rigid tail pipe structure, that is readily secured to the engine structure to form a unit construction.

It will plainly be seen that I have provided an improved assembly embodying novel features of construction which result in the construction of a serviceable and practical outboard motor assembly, one which may be readily handled and which serves as a portable unit of particular utility in connection with powering storm boats and other marine vessels.

It will be apparent that although I have described various features of my construction in detail, and have elaborated on the various constructions and the manner in which same are assembled in some detail, it will be obvious to those skilled in the art to which my invention pertains that various modifications and changes may be made therein without departing from the scope of the appended claims:

I claim:

1. In an outboard engine assembly, an engine crankshaft, a flywheel directly driven by said crankshaft, a flywheel housing secured to the engine structure, and a tail piece assembly comprising a propeller shaft tubular housing secured directly to said flywheel housing, a propeller shaft extending longitudinally rearwardly of said engine and axially aligned with the engine crankshaft, said propeller shaft tubular housing axially positioned slightly off center relative to axis of said propeller shaft and flywheel housing whereby to house the propeller shaft substantially in the lower interior portion of said propeller shaft housing.

2. In an outboard engine assembly, an engine crankshaft, a propeller shaft directly driven by the crankshaft and extending coaxially therewith, a flywheel housing secured to the engine structure, and a tail piece assembly comprising a propeller shaft tubular housing secured directly to said flywheel housing, said flywheel housing having a frustro-conical rearwardly extending portion merging with and secured to the forward end of said propeller shaft housing, said propeller shaft housing provided with a transverse partition wall substantially closing the end of the propeller shaft housing adjacent to said flywheel housing, said partition wall having an opening in its lower half portion through which the propeller shaft is extended.

3. A propeller shaft tail piece assembly for an outboard internal combustion engine having a crankshaft, a propeller shaft driven by said crankshaft, and comprising a tubular propeller shaft housing, a plane structure secure to the rear end of said housing and inclined obliquely to the housing axis, a sheet metal vertical fin secured to said plane structure and provided with bearing means supporting the propeller shaft, and an engine exhaust gas tunnel secured on the top side of said plane structure and terminating at a point adjacent the rear edge of said plane structure, said plane structure having an exhaust gas outlet opening communicating with said tunnel to exhaust the gas under water underneath the plane structure.

4. A propeller shaft tail piece assembly for an outboard internal combustion engine having a crankshaft, a propeller shaft driven by said crankshaft, and comprising a tubular propeller shaft housing, a plane structure secured to the rear end of said housing and inclined obliquely to the housing axis, a sheet metal vertical fin secured to said plane structure and provided with bearing means supporting the propeller shaft, said vertical fin comprising a pair of vertically extending sheet metal plates having outwardly extending flanges along their top edges welded to the underside surface of said plane structure.

5. A propeller shaft tail piece assembly for an outboard internal combustion engine having a crankshaft and a coaxial propeller shaft directly driven by said crankshaft, and comprising a tubular propeller shaft housing, a plane structure secured to the rear end of said housing and inclined obliquely to the housing axis, a sheet metal vertical fin secured to said plane structure and provided with bearing means supporting the propeller shaft, said vertical fin comprising a pair of vertically extending sheet metal plates having outwardly extending flanges along their top edges welded to the underside surface of said plane structure, said plates having complementary longitudinally extending channels cooperating to provide a propeller shaft enclosure and carrying a propeller shaft bearing.

6. A propeller shaft tail piece assembly for an outboard internal combustion engine having a crankshaft and a coaxial propeller shaft directly driven by said crankshaft, and comprising a tubular propeller shaft housing, a plane structure secured to the rear end of said housing and inclined obliquely to the housing axis, a sheet metal vertical fin secured to said plane structure and provided with bearing means supporting the propeller shaft, said vertical fin comprising a sheet metal stamping folded along its center-line to provide a pair of vertically extending sheet metal plates having outwardly extending flanges along their top edges welded to the underside surface of said plane structure, said plates having complementary longitudinally extending channels cooperating to provide a propeller shaft enclosure and carrying a resilient yielding bushing for supporting said propeller shaft.

THOMAS JACKSON.