United States Patent [19]

North et al.

[11] **3,759,041**

[45] **Sept. 18, 1973**

[54] **EXHAUST WATER SEPARATOR FOR MARINE ENGINES**

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[22] Filed: **Jan. 17, 1972**

[21] Appl. No.: **218,315**

[52] **U.S. Cl.** **60/310**, 60/311, 55/DIG. 30

[51] **Int. Cl.** **F01n 3/02**

[58] **Field of Search** 60/310, 311; 55/DIG. 30

[56] **References Cited**

UNITED STATES PATENTS

2,763,982	9/1956	Dega	60/310
3,263,413	8/1966	Vactor	60/310
3,495,385	2/1970	Glass	60/310
3,541,786	11/1970	Sarra	60/310

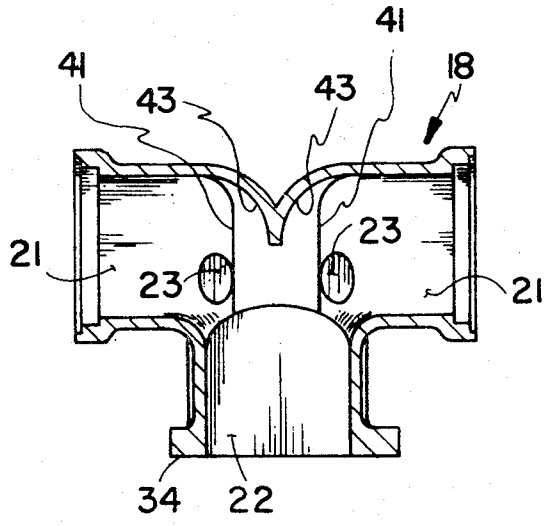
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[57] **ABSTRACT**

A water separator for a marine propulsion system. Arcuate exhaust elbows are provided which force cooling water in the exhaust to the outside by centrifugal action. This water is removed and expelled through the transom.

10 Claims, 4 Drawing Figures



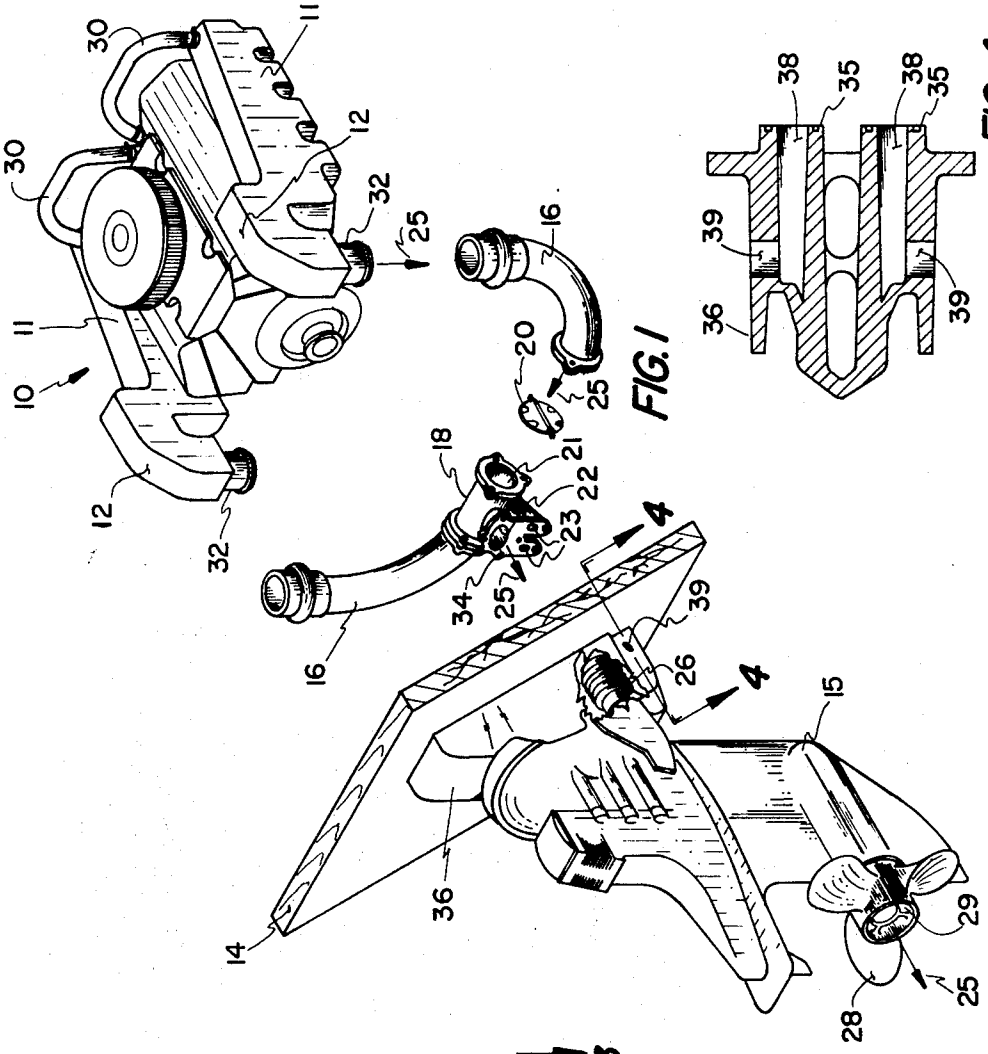


FIG. 1

FIG. 4

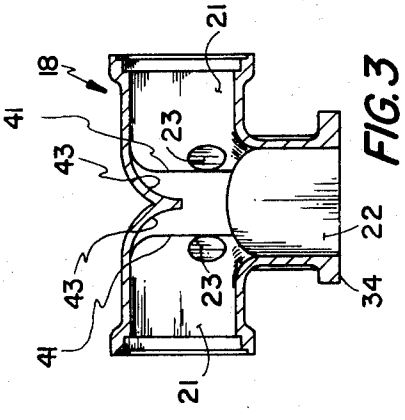


FIG. 3

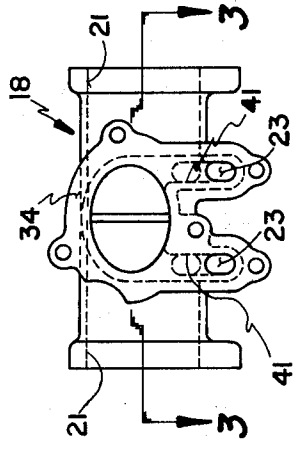


FIG. 2

EXHAUST WATER SEPARATOR FOR MARINE ENGINES

BACKGROUND OF THE INVENTION

This invention relates to a cooling system for a marine propulsion system wherein cooling water is discharged into the exhaust.

In constructions heretofore employed, cooling water has been forced to completely follow the path of the engine exhaust. In an effort to relive the resultant back pressure on the engine, pressure relief holes have been provided to allow early escape of the water and exhaust mixture.

It has been found that the flow characteristics of the exhaust may vary between systems and at different speeds of a single system. As a result, often primarily exhaust gases escape through the pressure relief holes and effectiveness in relieving back pressure is reduced.

SUMMARY OF THE INVENTION

The present invention provides means for removing and expelling a substantial portion of the water from the exhaust system which is effective at any speed. There is provided an arcuate exhaust elbow which causes the water to be thrown to the outside of the elbow by centrifugal force. A water separator is provided at the end of the arcuate elbow which removes and expels the water flowing along the outside of the elbow. Thus, it is assured that the majority of the water is removed and not forced through the outboard drive unit.

BRIEF DESCRIPTION OF THE DRAWING

The accompanying drawing illustrates the best mode presently contemplated for carrying out the invention.

In the drawing:

FIG. 1 is a perspective exploded view of the propulsion system of this invention with parts in section.

FIG. 2 is an enlarged elevation of the water separator.

FIG. 3 is a section view along lines 3—3 of FIG. 2.

FIG. 4 is an enlarged section view generally along lines 4—4 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, there is shown a marine internal combustion engine **10** having exhaust manifolds **11** and manifold elbows **12.** The engine is carried in a boat, the transom of which is indicated by **14.** An outboard drive unit **15** is also carried by the boat transom **14** and is drivingly connected in a conventional manner to the engine **10.** Two exhaust elbows **16** are provided, each being attached to the respective manifold elbow **12.** The exhaust elbows **16** are arcuate in shape and are attached at one of their ends by a water separator **18.** Interposed between the end of each exhaust elbow **16** and the water separator **18** is a flapper valve **20** which serves to prevent back flow of water through the exhaust system.

The water separator **18** includes exhaust inlet passages **21,** an exhaust outlet passage **22,** and water outlet passages **23.** The rear face **34** of the water separator **18** is connected in a conventional manner to the front face **35** of the bottom portion of the gimbal housing **36** such that water passage **23** in the water separator **18** align with water passages **38** in the gimbal housing **36.** Water passages **38** are in turn connected to a water outlet **39** which expels the water back into the lake.

Passage means for passing exhaust gases from the engine to an exhaust outlet are provided which are formed through the elbows **16,** valve **20,** separator **18,** bellows **26,** drive unit **15,** and propeller **28.** The direction of travel of the exhaust is indicated by arrows **25.** Exhaust flows from the engine into the manifold **11,** through the manifold elbows **12,** the exhaust elbows **16,** the flapper valves **20,** the exhaust inlet passages **21,** the exhaust outlet passage **22,** the exhaust bellows **26,** internal exhaust passages (not shown), in the outboard drive unit **15,** through the propeller **28,** and out the exhaust outlet **29** in the propeller **28.**

Water is dumped from the engine block through hoses **30** into cooling passages (not shown) in the exhaust manifolds. The cooling water is then mixed with the exhaust at or near the outlet **32** of the manifold elbows **12** in general accordance with the description in U.S. Pat. No. 3,541,786 entitled "Inboard Marine Engine Cooling System." The exhaust is sufficiently cooled by the water to prevent damage to the flexible material of the exhaust elbows **12,** the flapper valve **20,** the exhaust bellows **26,** and the flexible hub of the propeller **28.**

However, it has been found that forcing the water and exhaust gas mixture through the rather tortuous path of the exhaust bellows **26,** the exhaust passages in the outboard drive unit **15,** and the hub of the propeller **28** creates undesirable back pressure on the exhaust of engine **10.** Thus, it is desirable to remove as much of the water as possible prior to the bellows **26** and the outboard drive unit **15.** It has been found that the mere provision of an exhaust relief outlet is not completely satisfactory to accomplish this purpose, since at some engine speeds the water may flow through the exhaust passage means in an area away from the exahust relief. This results in primarily exhaust escaping through the relif and is not as effective for relieving back pressure.

In the present invention there are provided arcuately formed exhaust elbows **16** which result in the water being forced by centrifugal action to the outside wall of the elbows **16.** The water which is forced to the outside of the exhaust elbows **16** is collected at the bottom of the water separator **18** by the combined effects of centrifugal action and gravity. The water meets a raised wall portion **41** in the water separator **18** and is forced through water passage **23** into water passages **38** and expelled through water outlets **39.**

The water separator **18** includes a pair of arcuate internal walls **43** to aid in turning the exahust at right angles and promote smooth flow of the exhaust gases.

It is apparent that many modifications and variations of the invention as hereinbefore set forth may be made without departing from the scope and spirit hereof.

What is claimed is:

1. In a marine device having a water cooled internal combustion engine, passage means for passing exhaust from the engine to an exhaust outlet, and means for injecting cooling water from the engine into the exhaust passage means, the improvement comprising a water separator in the passage means downstream from the injecting means and upstream from the exhaust outlet, said separator including a water passage means in communication with the exhaust passage means in an area of primarily water flow for separating and expelling a substantial portion of the water from the passage means

without substantially interfering with exhaust flow, said separator being operable without regard to engine speed.

2. The improvement of claim 1, wherein said separator includes a raised wall portion to aid in water separation.

3. The improvement of claim 1, including an arcuate member which forms part of the exhaust passage means such that the water is forced to the outside of said member by centrifugal action, said member being upstream from and connected to said water separator.

4. The improvement of claim 3, wherein said separator includes a raised wall portion to aid in water separation.

5. The improvement of claim 3, wherein said arcuate member is generally vertically disposed and connected to the engine at the top such that water is forced to the outside of said member by the additional affects of gravity.

6. The improvement of claim 1, wherein said passage means are formed in part by an arcuate exhaust elbow connected at one end to said engine such that water is

forced to the outside of said elbow by centrifugal action and said separator is connected to the other end of said elbow, said water passage means being positioned to pick up and expel the water flowing on the outside of said elbow.

7. The improvement of claim 6, wherein said separator includes a raised wall portion to aid in water separation.

8. The improvement of claim 6, wherein said arcuate member is generally vertically disposed and connected to the engine at the top such that water is forced to the outside of said member by the additional affects of gravity.

9. The improvement of claim 3, wherein said arcuate member is generally vertically disposed and connected to the engine at the top such that water is forced to the outside of said member by the additional affects of gravity.

10. The improvement of claim 9, wherein said separator includes a raised wall portion to aid in water separation.

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