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Water Cooling System for Outboard Motors

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WATER-COOLING SYSTEM FOR OUTBOARD MOTORS.

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Fig. 2 is an end elevation, looking toward the right in Fig. 1;
Fig. 3 is an enlarged detail view, partly in section;
Figs. 4 and 4a are sections on line 4—4 of Fig. 1; and
Figs. 5 and 5a are sections on line 5—5 of Fig. 1.

The water cooling system comprises, in general, a rudder 1 provided with a passage 2, a tube 3, a water jacket 4, and an outlet connection 5 from the water jacket, the tube 3 providing a connection between passage 2 and water jacket 4.

The inlet end of passage 2 may comprise two inlet passages 6 and 7 which terminate adjacent to the propeller 8, so that the blades 9 and 10 thereof force water into the inlet passages 6 and 7 upwardly through passage 2 and tube 3 to water jacket 4.

The rudder 1 may be pivotally mounted to the transmission housing 11 by means of pins 12 which pass through lugs 13 cast integrally with the housing, and are positioned with their centers in line with the center of tube 3. The rudder may thereby be swung about pins 12 and tube 3.

The lower end of tube 3 fits snugly into a seat 14 pressed into rudder 1 at the outlet end of passage 2, and rests upon a shoulder 15 with which seat 14 is provided, as shown in Fig. 3.

A sleeve 16, slidable on tube 3, is pressed into the lower end of a tiller yoke 17 for movement therewith.

The upper end of tube 3 passes loosely through a suitable bracket 18 secured to housing 11 by bolts 19 or other suitable means.

A spring 20 is compressed between bracket 18 and a suitable clamp 21 fixed to tube 3. Spring 20 thereby acts upon clamp 21 to urge tube 3 downwardly at all times so that a close fit is always maintained between the lower end of the tube and shoulder 15 of seat 14, to prevent leakage of water at the seat.

A second spring 22 is arranged between clamp 21 and sleeve 16 to urge tiller yoke 17 downwardly to hold the same in interlocked engagement with rudder 3.

The lower end of tiller yoke 17 is provided with a recess 23 to interlock with a tongue 24 formed on the upper end of rudder 3 at the outlet end of passage 2.
The upper end of tiller yoke 17 is pivotally mounted on the lower portion of a Y-connection 25 soldered or otherwise connected to the upper end of tube 3, so that the Y-connection is, in effect, a part of the tube.

The two branches 26 and 27 of Y-connection 25 are connected to the water jackets 28 and 4 of the cylinders by pipes 29 and 30, respectively.

The tiller yoke 17 and sleeve 16, fixed for movement therewith, may be slid vertically upon tube 3 and Y-connection 25 against the action of spring 22, until tongue 24 is out of interlocking engagement with recess 23. Rudder 1 may then be swung upon pins 12 and Y-connection 25 independently of tiller yoke 17, through an angle of about 180 degrees.

When the tiller yoke is then released, spring 22 returns it to its former position and locks the rudder in position alongside or housing 11. Rudder 1 may thereby be folded out of the way and locked in position to facilitate transportation of the motor.

This interlocking engagement of tiller yoke 17 with rudder 1, to permit folding of the rudder out of the way, is described and claimed in my Patent No. 1,524,857 of Feb. 3, 1925, and is only shown and described in this application with sufficient clearness to show the manner in which it may be embodied in connection with the improved water cooling system.

Spring 20 is stiffer than spring 22 and is compressed between bracket 18 and clamp 21 so that it occupies substantially the entire space between the bracket and clamp, as shown in Figs. 1 and 3. The downward force exerted upon clamp 21 by spring 20 is therefore greater than the upward force exerted on the clamp by spring 22, so that the lower end of tube 3 is always held in its position against shoulder 15 of seat 14.

When tiller yoke 17 is raised vertically, spring 22 is compressed to some extent, but not enough to overcome the downward force of spring 20 upon clamp 21.

Connection 30 is connected to water jacket 4 at substantially a right angle to the wall of the cylinder, so that the water in passing upward through the connection will be divided into two streams as indicated by arrows in Fig. 1, and pass upwardly around the cylinder in both directions and then out through connection 5. Connection 29 is connected to water jacket 28 in the same manner. A more even distribution of water around the cylinders is thereby effected.

An outlet connection 31, similar to connection 5, is provided for water jacket 28.

The entrance to inlet opening 7 is cut at an angle, as shown in Fig. 4, so that when the rudder is turned in a clockwise direction, the entrance to the inlet passage will be normal to the direction of flow of the water from blades 9 and 10, as indicated by arrows in Fig. 4.

The entrance to inlet opening 7 is cut at an angle, as shown in Fig. 5, so that when rudder 1 is turned in a counter-clockwise direction the entrance to the inlet opening 7 will be normal to the direction of flow of the water from blades 9 and 10, as indicated by arrows in Fig. 5.

In turning to port, as indicated in Fig. 4a, the entrance to inlet opening 6 will be normal to the flow of water from blades 9 and 10, while the entrance to inlet opening 7 will not be. More water will then be forced through inlet opening 6, while less water will be forced through inlet opening 7.

In turning to starboard, as indicated in Fig. 5a, the entrance to inlet opening 7 will be normal to the flow of water from blades 9 and 10, while the entrance to inlet opening 6 will not be. More water will then be forced into inlet opening 7, while less water will be forced through inlet opening 6.

The average amount of water entering both inlet passages 6 and 7, however, will be substantially the same in any position of the rudder.

A cooling system is thereby provided which is just as efficient in coming about as in proceeding ahead, by cutting the entrances to inlet passages 6 and 7 at angles to make either passage conform substantially to the pitch of the propeller blades when the rudder is in either extreme position.

Bracket 18 may be provided with a stop 32 arranged to engage with a lug 33 formed integrally with tiller yoke 17, as shown in Fig. 3, to prevent vertical movement of the tiller yoke to a position where the upper end thereof will engage branches 26 and 27 of Y-connection 25 and lift the lower end of tube 3 from its proper position in seat 14.

The outlet connections 5 and 31 extend downwardly and terminate in coils 34 and 35, respectively. The coils 34 and 35 are arranged so that the outlet ends 36 and 37 thereof are positioned a short distance above the level of the water, and are not submerged.

Rods 38 may be arranged in parallel relation across the entrances to inlet passages 6 and 7, as shown in Figs. 1, 4 and 5, to prevent solid matter from entering the passages.

The rudder may be cast from any suitable metal such as aluminum and the passages 2, 6 and 7 bored therein.

The operation of the water cooling system is as follows:

The action of propeller blades 9 and 10 forces water into inlet passages 6 and 7 upwardly through passage 2, tube 3, connections 29 and 30 to water jackets 4 and 28, and thence through outlet connections 5 and 31 and coils 34 and 35.
The weight and velocity of the water in coils 34 and 35 tend to maintain the flow of water through the system, so that a comparatively slight rotation of the propeller is sufficient to cause the water to circulate.

A water cooling system is thereby provided which operates efficiently when the motor is running at low speed, by providing the coils 34 and 35 at the lower ends of outlet pipes 5 and 31. By providing the rudder with inlet passages 6 and 7 having their inlet openings arranged adjacent to the propeller blades and leading toward a common passage 2, more even circulation of water is effected.

There are no valves to wear and decrease the efficiency of the system, the only wear being at the end of tube 3. Any wear at the end of tube 3 caused by the movement of seat 14 is compensated for by spring 20, which holds the lower end of the tube in close engagement with the seat, as explained more fully above. The efficiency of the water cooling system is therefore in no way affected by the action of sandy, muddy or salt water.

When the motor stops the water drains from water jackets 4 and 28 through connections 29 and 30 and tube 3. The water also drains freely from outlet connections 5 and 31 and coils 34 and 35. The water cooling system is thereby self-draining, so that there is no danger of water freezing in the jackets or connections.

Various changes of structure and arrangement of the parts may be adopted without departing from the spirit of the invention or the scope of the claims.

The invention claimed is:

1. In a water cooling system for outboard motors, in combination, a housing, a propeller supported at the lower end of said housing, said propeller being provided with a passage having the inlet end thereof arranged adjacent to said propeller, a water jacket supported by said housing, a tube connecting said water jacket with the outlet end of said passage, and an outlet connection leading from said water jacket.

2. In a water cooling system for outboard motors, in combination, a housing, a propeller supported at the lower end of said housing, a rudder pivotally mounted to said housing, said rudder being provided with a passage having the inlet end thereof formed to comprise two inlet passages terminating adjacent to the blades of said propeller and cut at angles to make each conform substantially to the pitch of said blades when said rudder is in either extreme position, a water jacket supported by said housing, a tube connecting said water jacket with the outlet end of said passage, and an outlet connection leading from said water jacket.

3. In a water cooling system for outboard motors, in combination, a housing, a propeller supported at the lower end of said housing, a rudder pivotally mounted to said housing, said rudder being provided with a passage having the inlet end thereof formed to comprise two inlet passages terminating adjacent to the blades of said propeller and cut at angles to make each conform substantially to the pitch of said blades when said rudder is in either extreme position, a water jacket supported by said housing, a tube connecting said water jacket with the outlet end of said passage, and an outlet connection leading from said water jacket.

4. In a water cooling system for outboard motors, in combination, a housing, a propeller supported at the lower end of said housing, a rudder pivotally mounted to said housing, said rudder being provided with a passage having the inlet end thereof arranged adjacent to said propeller, a water jacket supported by said housing, and a tube supported by said housing and arranged to connect said water jacket with the outlet end of said passage, said tube providing a pivotal connection for said rudder to said housing.

5. In a water cooling system for outboard motors, in combination, a housing, a propeller supported at the lower end of said housing, a rudder pivotally mounted to said housing, said rudder being provided with a passage having the inlet end thereof arranged adjacent to said propeller, a water jacket supported by said housing, a tube connecting said water jacket with the outlet end of said passage, and an outlet connection leading from said water jacket.

6. In a water cooling system for outboard motors, in combination, a housing, a propeller supported at the lower end of said housing, a rudder pivotally mounted to said housing, said rudder being provided with a passage having the inlet end thereof arranged adjacent to said propeller, a water jacket supported by said housing, a tube connecting said water jacket with the outlet end of said passage, and an outlet connection leading from said water jacket.
end of said tube being fitted to said seat, a spring arranged to hold the lower end of said tube in operative position in said seat, a tiller yoke supported for movement with respect to said rudder and for interlocking engagement therewith, and a second spring arranged to hold said tiller yoke and said rudder in interlocking engagement.

8. In a water cooling system for outboard motors, in combination, a housing, a propeller supported at the lower end of said housing, a water jacket supported by said housing, connections arranged to provide a passage leading from a point adjacent said propeller to said water jacket, and an outlet connection leading from said water jacket, the outlet end of said outlet connection being provided with a coil.

9. In a water cooling system for outboard motors, in combination, a housing, a propeller supported at the lower end of said housing, a rudder pivotally mounted to said housing, said rudder being provided with a passage having the inlet end thereof arranged adjacent to said propeller, a water jacket supported by said housing, a tube connecting said water jacket with the outlet end of said passage, and an outlet connection leading from said water jacket, the outlet end of said outlet connection being provided with a coil arranged so that the outlet end thereof will be positioned above the level of the water when the motor is in use.

10. In a water cooling system for outboard motors, in combination, a housing, a propeller supported at the lower end of said housing, a rudder pivotally mounted to said housing, said rudder being provided with a passage having the inlet end thereof arranged adjacent to said propeller, a water jacket supported by said housing, and a tube supported by said housing and arranged to connect said water jacket with the outlet end of said passage, the outlet end of said outlet connection being provided with a coil arranged so that the outlet end thereof will be positioned above the level of the water when the motor is in use.

11. The combination with an outboard motor having a cooling jacket, a depending shaft and a propeller mounted thereon, of a rudder mounted to the rear of said propeller and provided with a passage connected to said cooling jacket at one end and arranged at its other end to receive a portion of the water forced rearwardly by said propeller.

12. The combination with the propeller and water jacket of a marine engine, of a rudder mounted to the rear of said propeller and provided with a passage communicating with said water jacket and arranged to receive a portion of the water forced rearwardly by said propeller.

13. The combination with an outboard motor provided with a water cooling jacket having inlet and outlet openings, means for conducting water from a point to the rear of the propeller into said jacket through said inlet opening, and a coiled pipe attached to said outlet opening for the discharge of water from said jacket, said coiled pipe acting to sustain the flow of water through said jacket for varying propeller speeds.

14. The combination with an outboard motor having a propeller and a water cooling system including a water jacket and a rudder provided with a passage arranged to receive water forced rearwardly by said propeller, of a rigid tube connecting said passage to said water jacket whereby water is caused to flow through the latter upon operation of said propeller.

15. The combination with an outboard motor having a propeller and a water cooling system including a water jacket and a rudder pivotally connected to said motor and provided with a passage arranged to receive water forced rearwardly by said propeller, of a tube connecting said passage to said water jacket whereby water is caused to flow through the latter upon operation of said propeller, the longitudinal axis of said tube being coincident with the axis of rotation of said rudder.

16. The combination with an outboard motor having a propeller and a water cooling system including a water jacket and a rudder pivotally connected to said motor and provided with a passage arranged to receive water forced rearwardly by said propeller, of a rigid tube connecting said passage to said water jacket whereby water is caused to flow through the latter upon operation of said propeller, said tube also acting to pivotally connect said rudder to said motor.

17. The combination with a water-jacketed marine engine having an intake pipe extending below the water line and adapted to receive water forced rearwardly by the propeller and to conduct the same upward into said water jacket, of an outlet conduit leading from said jacket and terminating above the water line and being formed to materially increase the distance of travel of the water in its flow from said jacket to the outlet end of said conduit to thus sustain the flow of said water over an increased range of propeller speeds.

18. The combination with a water-jacketed marine engine having an intake pipe extending below the water line and adapted to conduct water from the propeller upwardly into said water jacket, of an outlet connection leading from said jacket and means associated therewith to sustain the flow for varying propeller speeds, said means comprising a coil interposed in said outlet connection.
19. The combination with the water jacket of a marine engine, of a rudder having a passage formed therein and arranged to receive water upon forward movement of the boat, and means connecting said passage to said water jacket.

20. The combination with an outboard motor having a water jacket and a propeller, of a rudder supported adjacent to said propeller and having a passage formed therein, said passage being arranged to receive a portion of the water forced in one direction by said propeller, and means connecting said passage to said water jacket whereby said portion of the water is caused to flow through said water jacket.

21. The combination with an outboard motor having a water jacket and a propeller, of a rudder supported adjacent to said propeller and having a passage formed therein, said passage being arranged to receive a portion of the water forced in one direction by said propeller, and a rigid tube connecting said passage to said water jacket whereby said portion of the water is caused to flow through said water jacket.

In witness whereof I hereto affix my signature.

OLE EVINRUDE.
19. The combination with the water jacket of a marine engine, of a rudder having a passage formed therein and arranged to receive water upon forward movement of the boat, and means connecting said passage to said water jacket.

20. The combination with an outboard motor having a water jacket and a propeller, of a rudder supported adjacent to said propeller and having a passage formed therein, said passage being arranged to receive a portion of the water forced in one direction by said propeller, and means connecting said passage to said water jacket whereby said portion of the water is caused to flow through said water jacket.

21. The combination with an outboard motor having a water jacket and a propeller, of a rudder supported adjacent to said propeller and having a passage formed therein, said passage being arranged to receive a portion of the water forced in one direction by said propeller, and a rigid tube connecting said passage to said water jacket whereby said portion of the water is caused to flow through said water jacket.

In witness whereof I hereto affix my signature.

OLE EVINRUDE.

Certificate of Correction.

It is hereby certified that in Letters Patent No. 1,567,127, granted December 29, 1925, upon the application of Ole Evinrude, of Milwaukee, Wisconsin, for an improvement in "Water-Cooling Systems for Outboard Motors," an error appears in the printed specification requiring correction as follows: Page 3, lines 42 and 43, after the word "housing" insert the words "a rudder pivotally mounted to said housing;" and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 26th day of January, A. D. 1926.

[SEAL.]

WM. A. KINNAN,
Acting Commissioner of Patents.
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[Seal]

WM. A. KINNAN,
Acting Commissioner of Patents.