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REVERSIBLE OUTBOARD MOTOR WITH
UNDERWATER EXHAUSTFinn T. Irgens, Wauwatosa, Wis., assignor to Out-
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4 Claims. (Cl. 115-17)

This invention relates to improvements in reversible outboard motors with under water exhaust.

In reversing an outboard motor having under water exhaust, particularly if the exhaust is carried down into the propeller slip stream, there is in most types of reversible outboards a tendency for the exhaust gases to produce cavitation in the propeller during its reverse operation, and there is also a tendency, after the boat gets under way in a reverse direction, for the water to back into the exhaust passage, thereby creating objectionable back pressure and potentially stopping the engine altogether.

The object of the present invention is to provide for all such motors a separate exhaust outlet or cut-out to be used in reversing, and a valve controlling the direction of discharge and connected with the reversing control in such a way as not only to relieve back pressure in the exhaust conduit, but also positively to stop the conduit against the possibility of discharging gases to create cavitation in the propeller during reverse operation.

In the drawing:

Figure 1 is a side elevation of an outboard motor embodying the present invention, a portion of its exhaust manifold being broken away to expose the cut-out valve.

Figure 2 is a fragmentary detail taken in section in the plane indicated at 2-2 in Figure 1.

Like parts are identified by the same reference characters throughout the several views.

The outboard motor chosen for the purpose of illustrating the application of the invention in practice is one in which reversing is accomplished by adjusting the pitch of the propeller blades from a forward propelling position through a neutral position of substantially no pitch to a reverse position of negative pitch.

The transom bracket 3 pivotally carries a swivel bearing 4 in which the entire motor assembly turns for steering under control of a tiller handle 5 which, for the purposes of the reverse control, may be fulcrumed to the crank case 6 by a pin 7. The usual shaft housing (not shown) extends from crank case 6 through the swivel bearing 4 to the lower unit 8 to transmit the steering movements of the tiller 5 to the lower unit as well as to the engine. Through the shaft housing and lower unit extends a conventional drive shaft (not shown) which is operatively connected through conventional means in the lower unit to operate the propeller 9, the blades 55 or flukes 10 of which are controlled as to pitch

by the conventional slip collar 11 and shifting fork 12 on bell crank 13. These parts are too well known in the art to require further illustration.

The bell crank 13 is actuated by a control rod 15 at 16 to the rear end of tiller handle 5. The various possible positions of the tiller handle with reference to reverse and neutral and forward propeller blade positions are indicated on the drawing.

From the cylinders 17 the exhaust gases enter the accumulator chamber 18 and pass thence through the exhaust manifold 19 to the submerged outlet at 20 which, in forward propulsion, is directed rearwardly to discharge the gases in the path of the propeller slip stream. It will be noted that the location of discharge of the exhaust gases is materially submerged, being below the anti-cavitation plate 21.

With the exhaust gas discharge at this point, the reversing of the direction of propulsion will mean that the reversed slip stream will impel the water under considerable pressure into the exhaust outlet and may completely prevent discharge, either stopping the engine or doing considerable damage.

Accordingly I have provided at 25 a series of cut-out ports which may be progressively opened and closed by a rotary valve at 26 mounted between a pair of heads 27, one of which has a crank pin 28 connected by link 29 with the pintle 16 at the stern end of the tiller rod 5.

When the tiller is in its reverse position as shown in Fig. 1, the manifold below the cut-out valve ports will be completely closed by the cut-out valve 26 and all of the exhaust gases will necessarily be discharged through the ports 25. The complete closure of the exhaust manifold below the cut-out wholly prevents the discharge of gases into the reversely operating propeller in such a way as would otherwise produce cavitation therein.

When the tiller handle is in its neutral position the valve 26 will be oscillated slightly and will close some of the exhaust cut-out ports 25 and will open the lower end of the manifold. With the parts in this position any back pressure which may be developed in the lower end of the manifold due to the fact that the device is at rest, will be relieved by discharge through ports 25, but the gases will be free to discharge under water if the back pressure does not prevent.

As the propeller blade pitch is gradually increased to a maximum for forward propulsion, the cut-out ports 25 will be closed and all exhaust will take place under water.

There are so many possible modifications of the present invention with reference particularly to the form of the relief valve, that the disposition of the outlet used in reverse operation, and the means of directing the exhaust gases to one outlet or the other, that the foregoing illustration will be understood to be merely typical of the possibilities in these regards.

I claim:

1. The combination with a reversible outboard motor having a propeller and means for reversing the direction of propeller thrust, of an exhaust conduit having a submerged outlet and a relief outlet, a valve controlling both of said outlets and movable between extreme positions in which alternate outlets are completely closed, and means self-operable in the reverse of said motor for actuating said valve between said positions respectively corresponding to reverse and forward propulsion of said motor.
2. The combination with an outboard motor having a propeller, a means for reversing the direction of propeller thrust, and an exhaust gas conduit leading below the normal water level to a point immediately behind the propeller and normally adjacent the propeller slip stream, a relief port above normal water level opening outwardly from said conduit, and valve means controlling said port and controlling said conduit beyond said port, a control part connected with said reversing means and movable in the reversal of said motor from forward through neutral to rearward propulsion and vice versa, and a connection between said part and said valve means adapted substantially to close said conduit and open said relief port in the reverse operation of the motor to leave both ports partly open in neutral position, and substantially to close said relief port and open said conduit in the forward operation of the motor.
3. In an outboard motor, the combination with a propeller, driving means including mechanism for reversing the direction of propeller thrust, and an exhaust passage leading to a point immediately behind said propeller below normal water

level in the use of the motor, said passage being ported above water level to provide for exhaust relief, valve means controlling the flow of exhaust gases through said passage and associated with the ported portion thereof to progressively open and close the relief port and progressively to close and open inversely the passage beyond said port, a lever operatively connected to control said mechanism, and a link operatively connecting said lever with said valve means for the positive adjustment of said valve means in accordance with the movement of said lever, said lever and link and the connection of said valve means therewith being arranged to open the relief port and close the passage in the reverse position of said mechanism, to leave the relief port and the passage both open at the intermediate position of said mechanism and to close the relief port and open the passage in the forward propulsion position of said mechanism.

4. An outboard motor comprising the combination with a propeller, means operating through neutral to reverse the direction of thrust of the propeller, and an exhaust pipe leading below normal water level to a point immediately behind the propeller and adjacent the propeller slip stream during the normal forward propulsion, of a cylindrical enlargement in said pipe provided with relief port means, a cylindrical valve rotatable in said enlargement and adapted in one position to close said pipe beyond said enlargement and in other positions progressively to open said pipe and move across said relief port means, a lever operatively connected with said propeller reversing means, and means connecting said lever with said valve for the positive actuation thereof in accordance with the operation of said reversing means, the said connection being such as to maintain said pipe closed beyond said enlargement in the reverse operation of the propeller and to maintain said relief port means closed during the forward propulsion by said propeller.

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