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PIVOTALLY MOUNTED UNDERWATER EXHAUST

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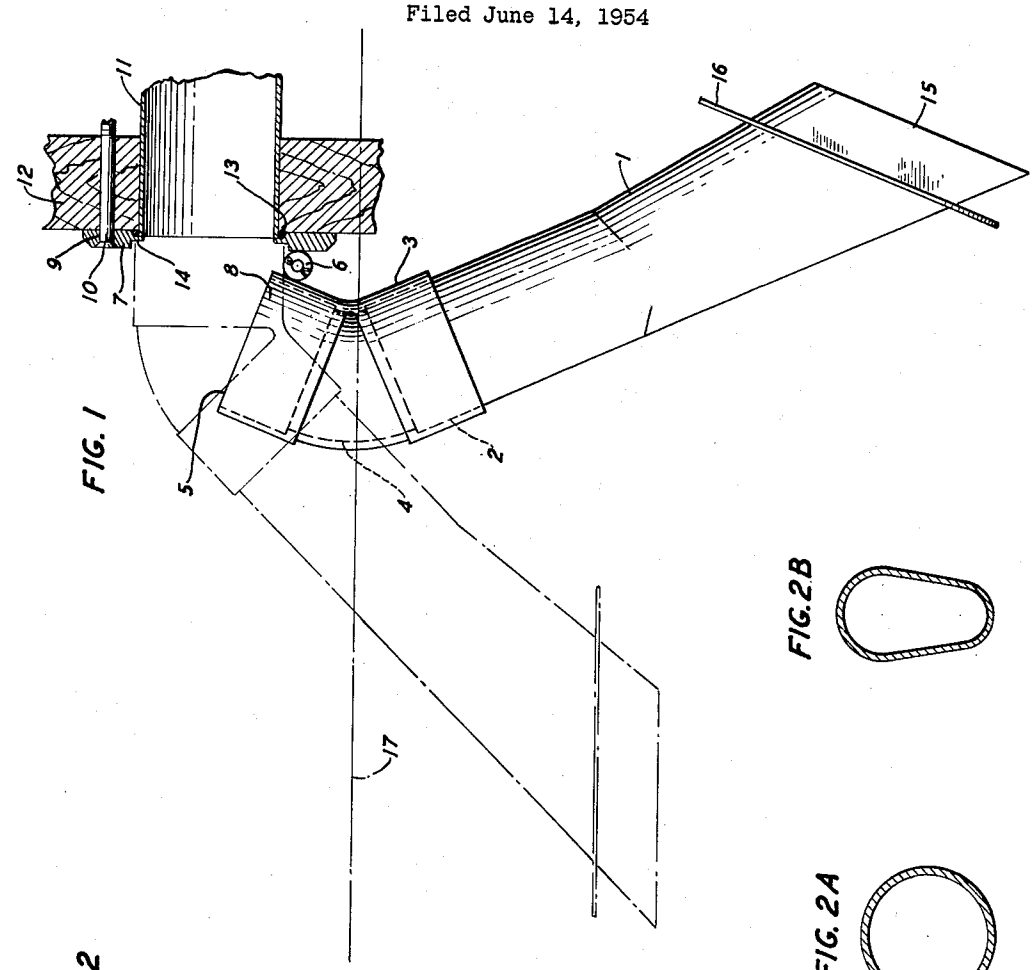


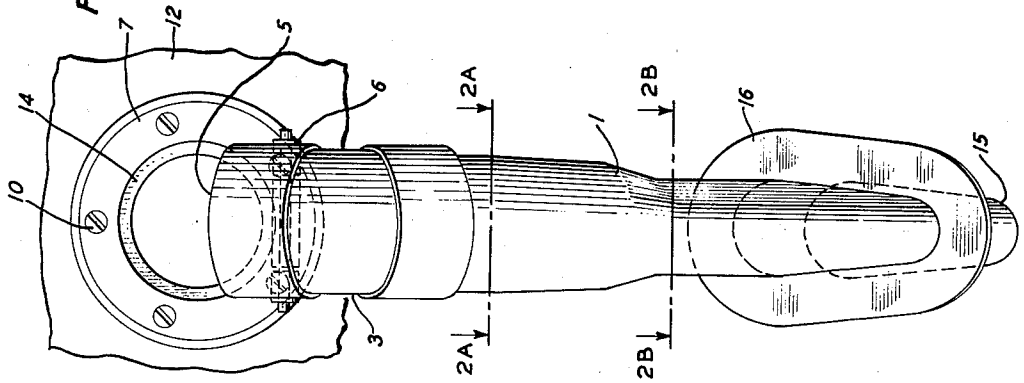

FIG. 1



FIG. 2B



FIG. 2A

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# PIVOTALLY MOUNTED UNDERWATER EXHAUST

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7 Claims. (Cl. 115—.5)

The instant invention relates to marine engine exhausts and more particularly to an exhaust adapted to be attached to the exhaust line of an internal combustion engine.

An object of the invention is to provide an exhaust discharging the exhaust fumes and gases of marine engines below the water line on forward motion of the vessel.

A further object of the invention is to provide an underwater exhaust arrangement adapted readily to be affixed to the usually substantially horizontally directed exhaust pipe outlet at the stern of the vessel.

Still a further object of the invention is to provide an exhaust arrangement adapted when the vessel is at rest, or backing up, to permit overwater expulsion of the exhaust products and when the vessel is moving forwardly, or with a forward component, for example as in turning, to expel the exhaust products under water.

Still a further object of the invention is to provide an underwater exhaust of which the portion adapted to be at or below the water line is streamlined to minimize drag.

Still another object is to provide an underwater exhaust into which water does not enter to be passed therethrough into the marine engine at any time.

Still another object is to provide an underwater exhaust provided with an automatic relief above the water line for ready observation on starting the marine engine of its performance as judged by the sound made by, and the appearance of, the exhaust products.

I accomplish the foregoing, and other, objects of my invention by forming a tube member of metal of substantially ovaloid or tear drop cross-section at its lower region with the blunter surface of the ovaloid or tear drop in the direction of forward motion of the vessel. Integral with the upper, circularly cross-sectioned, end portion of the tube, I provide a metal elbow which is pivoted at its lower forward end region to a ring fitting adapted to be bolted, or otherwise affixed, in vertical position about the end of the horizontal exhaust tube extending through the stern of the vessel, with such intervening packing as may be required. The ring fitting is recessed so as snugly to receive the forward end region of the elbow when the elbow with its integral tube is pivoted to closure upon the ring seat. To assure tight closure of the forward end region of the elbow with the recessed disk, I provide a vane at such an angle to and about a lower portion of the tear drop section end region of the tube member that, on forward motion of the vessel, it will ride below the water line in a horizontal position, tilting the tube and elbow clockwise and maintain the forward end of the elbow tightly in the recessed seat in the ring fitting.

The invention will be readily understood from the following detailed description of an illustrative embodiment thereof in connection with the accompanying drawing in which:



Figure 1 is a vertical elevational section of the underwater exhaust of my invention;

Figure 2 is an end elevational view thereof looking in the direction toward the vessel stern;

Figure 2A shows the tube section on 2A—2A of Figure 2; and

Figure 2B shows the tube section on 2B—2B of Figure 2.

The metal tube **1**, for example of 2½" or 3" pipe, has its upper end within and affixed airtight, by any means, for example brazing, into the metal pipe elbow **3**. The upper end region of the tube **1** is of circular cross-section, while its intermediate and lower end regions are of increasing ovaloid or tear drop shape, the major axis thereof being parallel to the bow to stern axis of the vessel and its blunter surface preferably in the direction of forward travel of the vessel, for example to the right as shown in Figure 1. Elbow **3** has its upper arm **4** extending in the direction of forward travel of the vessel, and at its lower external portion near its end face **5** is pivotable by means of hinge **6** to and away from the ring fitting **7**. The end face **5** of the elbow extends a distance, such as indicated at **8**, beyond the hinge so that such elbow end region may be unobstructed by the hinge in its engagement with a recessed seat in fitting **7**. Fitting **7** is adapted, for example, by means of bolt holes **9** extending therethrough to be bolted by a plurality of bolts **10**, about the engine exhaust pipe **11** extending through the stern **12** of the vessel to such stern. The end ring which, as a rule, terminates the exhaust pipe **11** is first removed and replaced by the ring fitting **7**. At its face which is to abut the vessel stern, the fitting **7** is somewhat recessed to fit about and receive the end of tail pipe **11** and a packing ring **13** thereabout to assure a watertight seal between the fitting, the exhaust pipe and the stern. In its face toward the elbow end face **5**, the ring fitting **7** has a stepped seat **14** adapted to receive such elbow end face and its adjacent portion of the elbow and form a tight seal therewith, the elbow end region and the stepped seat being accurately fitted to each other, if need be by accurate machining of the engaging end and cylindrical surfaces. The internal diameters of the elbow **4**, the upper end region of tube **1**, and the ring fitting **7**, are each equal to the internal diameter of the vessel exhaust tail pipe **11**.

It will be noted, as shown in the full lines of Figure 1, that with my underwater exhaust installed, and the vessel at rest, the weight thereof is such that tube **1** will so hang with the elbow pivoted about hinge **6** that the elbow end region **5** is away from its seat **14**, thus leaving a substantial gap therebetween. With the vessel not in motion then, on starting the engine the operator can thus readily hear whether the engine is operating correctly and can also judge thereof from the exhaust products of which now the greater portion is ejected through the gap, and make proper engine adjustments.

The lower end **15** of tube **1** is inclined at an angle of some 45 degrees to the central axis of tube **1** so that the smallest length of the tube wall is in the forward direction of vessel propulsion. Somewhat above the lower tube end **15**, I provide an ovaloid or tear-drop shaped vane **16** integrally about the exterior of tube **1**, the vane being of metal of sufficient thickness to be rigid at all times and with its blunter surface forward in the direction of vessel motion. Since as indicated in Figure 1, tube **1** is of such length that the major portion thereof is below the surface **17** of the water, the pressure flow of the water against the forward portions of the tube and vane will pivot tube **1** and elbow **4** about the hinge **6** to close the elbow end region **5** against its seat **14**. The gap is thus sealed and all of the exhaust products pass through elbow **3** and tube **1** into the water

below its surface. In so exhausting the exhaust products, the exhaust is substantially silenced and the fumes cannot be blown back over the vessel.

In one practical embodiment of the underwater exhaust of my instant invention, the weight of the tube **1** and elbow **3** is such that they will swing about pivot **6**, with the vessel at rest, to leave an angular gap of some 45 degrees between ring fitting **7** and elbow end face **5**. The depth of the seat **14** is about ⅛", while distance **8** is some ⅜". The internal diameter of engine exhaust tail pipe **11**, elbow **4**, and cylindrical upper portion of tube **1** is 2½", while the length of tube **1** extending from elbow **3** at its maximum (and rearwardly in the direction of forward vessel propulsion) region is 15½" but 12½" at its minimum (and forwardly) region. The lower end **15** of tube **1** has a major axis of 4½" parallel to the direction of forward vessel motion, and a minor axis of some 1¾" at its forward region and of some 1¼" at its rearward region.

When the vessel is at rest, the underwater exhaust is positioned as shown by the solid lines in Figure 1, as has been above stated. As the vessel moves forwardly, it is obvious that the elbow and tube take on the position shown by the dashed lines in Figure 1, thus tightly seating elbow end region **5** on its seat **14** and causing all the products of combustion to be ejected underwater.

Various modifications will undoubtedly suggest themselves to the skilled worker in the art on the illustrative embodiment of the underwater exhaust of my invention. I stress that the embodiment shown and described is not by way of limitation and that it is my intention to be limited only to the extent that the prior art may require.

What I claim is:

1. In combination with a marine vessel having an engine and a tail pipe therefor extending through the stern of the vessel and terminating adjacent the stern and above the water line, a tail pipe extension connected to the tail pipe at said stern, comprising a hollow body of such length that its lower region is always below the level of the water, an angle member integral with the upper region of the body, an annular fitting attached to the stern of the vessel and surrounding the tail pipe, a seat in the annular fitting for the free end region of the angle member, and means pivotally supporting the angle member on the annular fitting in such manner that on forward motion of the vessel the free end region of the angle member tightly engages the seat while with the vessel both at rest and while moving rearwardly the free end region is away from the seat.

2. A tail pipe extension according to claim 1 in which the hollow body is of circular cross-section at its upper end region and of ovaloid cross-section at its intermediate and lower regions.

3. A tail pipe extension according to claim 1 in which the hollow body has a rigid external vane parallel to its lower end and spaced axially therefrom at such distance that it is in the region of the body under water at all times and on motion of the vessel in the forward direction assumes a position parallel to the surface of the water.

4. A tail pipe extension according to claim 1 in which the hollow body is of circular cross-section at its upper end region and of increasing ovaloid cross-section from its intermediate region to its lower region with the major axis of the ovaloid cross-section parallel to the direction of forward and rearward movement of the vessel, and has a rigid vane extending from the external surface of the lower end region below the water at all times of ovaloid shape with its major and minor axes parallel to those of the hollow body lower end region and on motion of the vessel in the forward direction assumes a position parallel to the surface of the water.

5. A tail pipe extension according to claim 1 in which the hollow body lower end region has an external vane of substantially uniform width thereabout in the region thereof below the surface of the water at all times and substantially parallel to the lower end face of the hollow body, and the lower end face of the hollow body is inclined to the longitudinal axis of the body upwardly in the direction of forward motion of the vessel, the vane assuming a position substantially parallel to the surface of the water on forward motion of the vessel.



6. A tail pipe extension according to claim 1 in which the hollow body is of circular cross-section at its upper end region and of increasing ovaloid cross-section from its intermediate region to its lower end with the major axis of the ovaloid cross-section parallel to the direction of forward and rearward movement of the vessel and its maximum minor axis forwardly in the direction of forward motion of the vessel, a rigid vane of substantially uniform width and ovaloid periphery extends from the external surface of the hollow body lower end region at a portion thereof always below the surface of the water and with its major and minor axes parallel to those of the hollow body lower end region, the vane being substantially parallel to the hollow body lower end face and assuming a position substantially parallel to the surface of the water on forward motion of the vessel, and the lower end face of the hollow body is inclined to the longitudinal axis of the body upwardly in the direction of forward motion of the vessel.

7. In combination with a marine vessel having an engine and a tail pipe therefor extending through the stern of the vessel and terminating adjacent the stern and above the water line, a tail pipe extension connected to the tail pipe at said stern, comprising an annular plate having an internal diameter adapted to receive the tail pipe end, a packing between the tail pipe and the plate, means affixing the plate on the tail pipe end and against the packing and the vessel stern to make a watertight seal, a pair of extensions spaced from each other extending from the face of the annular plate away from the stern at a lower region of the plate, a horizontal shaft rotatably mounted in the pair of extensions, a stepped seat in the face of the plate from which the extensions project, a hollow angle bend having an internal diameter equal to that of the tail pipe end and an external diameter fitting into the stepped seat, a lug extending from a lower portion of the angle bend, an aperture through the lug through which the shaft passes to permit rotation of the angle bend toward and away from the seat, the remote end of the angle bend being directed downwardly, a hollow body of such length that its lower end region extends below the surface of the water and having its upper end within and affixed to the downwardly extending portion of the angle bend, the hollow body having a circular cross-section at its upper end region of an internal diameter substantially equal to that of the angle bend and the tail pipe end, and an increasing ovaloid cross-section from its intermediate region to its lower end of which the major axis is parallel to the direction of forward and rearward motion of the vessel and its maximum minor axis is forward in the direction of forward motion of the vessel, the lower end of the hollow body being inclined upwardly relative to the longitudinal axis of the hollow body in the forward direction of motion of the vessel, the inclination being such that on movement of the vessel in the forward direction the lower end assumes a position substantially parallel to the surface of the water, and a vane of an ovaloid periphery parallel to and spaced from the lower end of the hollow body in the region thereof always under the surface of the water.


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