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EXHAUST TUBE FOR INTERNAL COMBUSTION ENGINES

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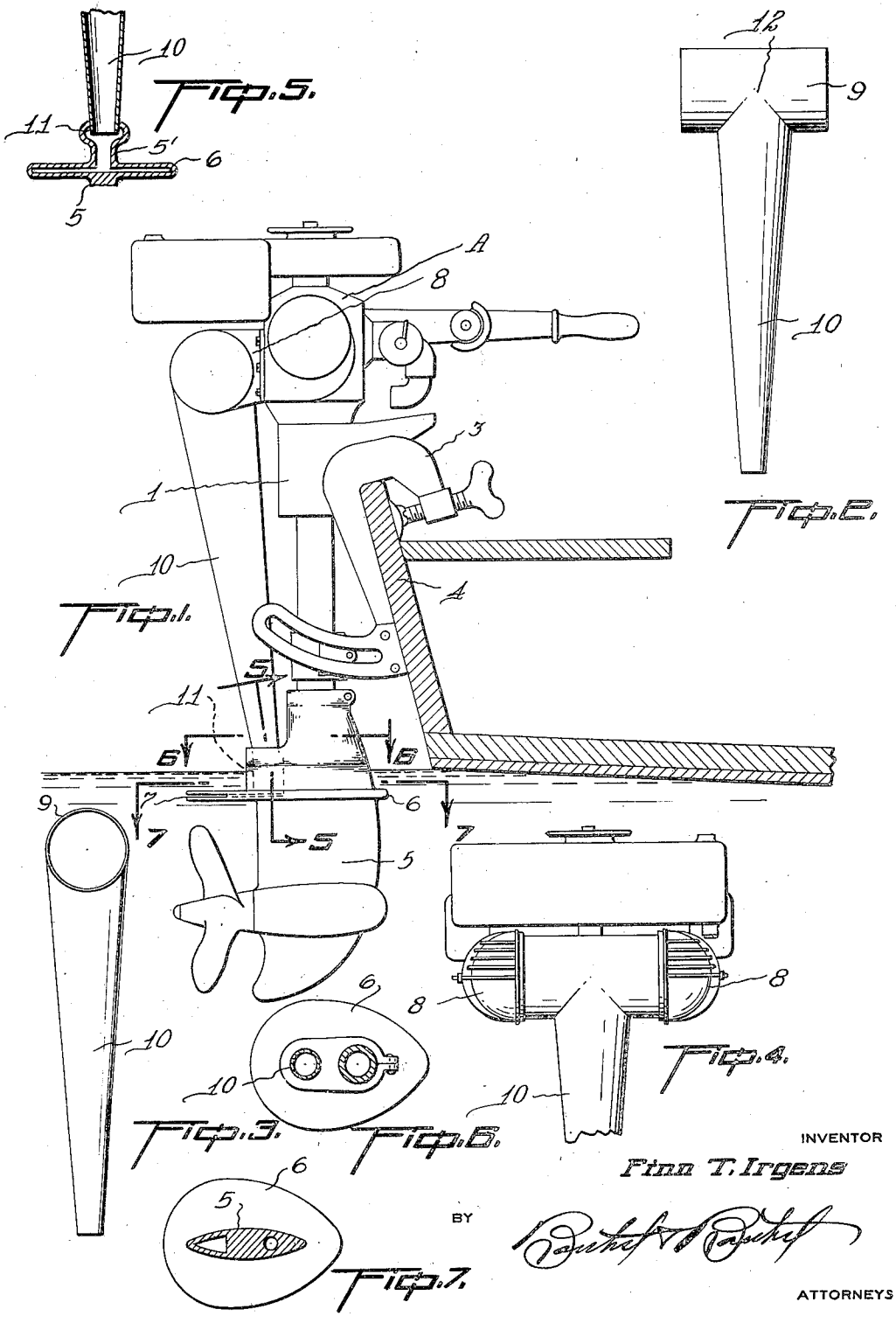


Fig. 5.

Fig. 2.

Fig. 1.

Fig. 4.

Fig. 3.

Fig. 6.

Fig. 7.

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EXHAUST TUBE FOR INTERNAL COMBUSTION ENGINES

Application filed October 17, 1929. Serial No. 400,218.

The present invention pertains to a novel exhaust tube for an internal combustion engine, particularly in relation to an outboard motor of the opposed two cylinder, two-cycle type.

It is well known that a two-cycle engine, such as that used in outboard motors, exhausts and admits simultaneously, so that there is only a very slight pressure tending to discharge the exhaust. Consequently, if a straight exhaust pipe is used, a very heavy pulsation is set up therein, resulting in back pressure, particularly if the pipe is restricted. Such pulsation and back pressure cause a material drop in power.

In outboard motors where the exhaust takes place under water for the purpose of silencing, it is necessary to have an expansion chamber between the head of the engine and the submerged exhaust outlet. The present invention provides an effective expansion chamber in this position.

The principal objects of the invention are to increase the volume of the expansion chamber and to eliminate the pulsations which are set up in a straight exhaust pipe and which have a material effect on the power developed by the engine. This object is attained by tapering the pipe from the inlet end to the outlet end thereof, the inlet end being of larger cross section than in the case of a straight pipe. It has been found by test that a pipe of this character eliminates the above mentioned pulsations and also increases the volume of the exhaust expansion chamber.

The invention is fully disclosed by way of example in the following description and in the accompanying drawing, in which—

Figure 1 is a vertical elevation of an outboard motor equipped with the invention and applied to a boat which is shown in section;

Fig. 2 is a front or rear elevation of the exhaust tube;

Fig. 3 is an elevation at right angles to Figure 2;

Fig. 4 is a fragmentary rear elevation of the motor, showing the upper end of the exhaust tube; and

Figs. 5, 6 and 7 are sections on the lines 5—5, 6—6 and 7—7 respectively of Figure 1.

Reference to these views will now be made by use of like characters which are employed to designate corresponding parts throughout.

The numeral 1 indicates in general the usual motor structure which has a clamp 3 adapted for attachment to the transom 4 of a boat. The adjustments of this assembly are conventional and therefore need not be described here.

At the lower end of the motor structure is the usual propeller shaft housing 5 on which is formed an anti-cavitation plate 6, preferably as an integral part of the housing and of ovoid cross section.

The rear or trailing end of the plate is formed with a mouth 7 beneath its upper and lower surfaces. The details of this plate are described in the co-pending application of King and Lockwood, Serial No. 290,306, filed July 5, 1928 and allowed April 15, 1929.

To the cylinders of the engine is applied an exhaust manifold 8 which in turn communicates with the exhaust tube now to be described. The tube is of an approximate T-shape in elevation, as shown in Figure 2, and comprises a head 9 which is secured between and in communication with the ends of the exhaust manifold 8.

Due to the necessity of an expansion chamber as already outlined and the compact design of an outboard motor, it is not possible to provide such a chamber of comparatively large volume directly at the cylinder exhaust outlet. Nevertheless, there is considerable space between the power head A of the motor and the propeller shaft housing 5. This space is utilized to accommodate an expansion chamber of proper size, as will presently appear.

The tube proper is a tapered member 10 extending from the center of the head 9 to the propeller shaft housing, as indicated by the numeral 11, and communicating with the mouth 7 of the plate 6 through a passage 5′ in the housing. The tube 10 tapers from the head 9 to the casing 5, or in the direction of flow, and the ratio of the upper end area to

the lower end area may vary from 4:1 to 36:1. In a given construction for example, the upper end of the tube has a diameter of 4½ inches at the point 12 where it merges into the center of the head 9, and a diameter of 1$\frac{13}{16}$ inches at the lower end.

The unit is in its best running condition when the anticavitation plate 6 is submerged about one inch, in which case the water line is between the plate and the lower extremity of the tube 10 as illustrated in Figure 1. This condition is realized by properly building the boat and properly mounting the motor thereon. The device will of course operate if more deeply immersed, but in such case the heavier parts of the propeller shaft housing and the exhaust tube will be submerged. Inasmuch as these parts are not stream line, as illustrated in Figure 6, the resistance will be increased.

As already indicated, it has been found that this type of tube eliminates the pulsations which occur in a straight exhaust pipe and further increases the volume of the exhaust expansion chamber.

Although a specific embodiment of the invention has been illustrated and described, it will be understood that various alterations in the details of construction may be made without departing from the scope of the invention, as indicated by the appended claims.

What I claim is:—

1. The combination with a marine engine having an exhaust port, of a tapered exhaust pipe connected with said port and leading to a point beneath the surface of the water, said pipe having a submersible outlet movable in accordance with the operation of said engine and directed rearwardly with reference to its path of movement, whereby to eliminate back pressure from said pipe, the tapering form of said pipe being adapted to destroy its resonance to pulsation frequencies.

2. The combination with a two-cycle, two-cylinder engine having exhaust ports, of a manifold member connected with the respective ports, and an exhaust pipe leading from said manifold member and of such dimensions as to be resonant to the frequencies of pulsations occasioned therein by engine exhaust through said ports, said pipe having a tapered form destructive to said pulsations.

3. In an outboard motor having a submersible lower unit provided with a rearwardly directed exhaust discharge port, the combination of a two-cylinder, two-cycle engine, and a tapered exhaust pipe leading from the cylinders of said engine through the rearwardly directed discharge port of said lower unit, whereby to relieve back pressure and destroy frequency pulsations.

In testimony whereof I affix my signature.

FINN T. IRGENS.