July 18, 1961 L. A. HEINTZELMAN ET AL 2,992,686

PROPELLER ATTACHMENT MOUNTING MEANS

Filed May 26, 1960

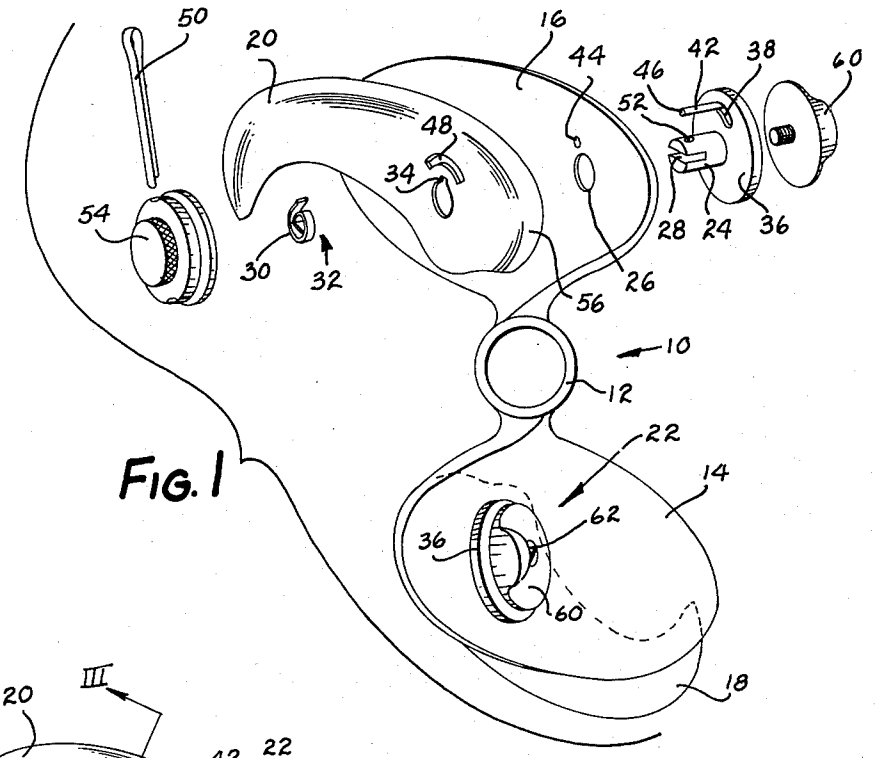


FIG. 1

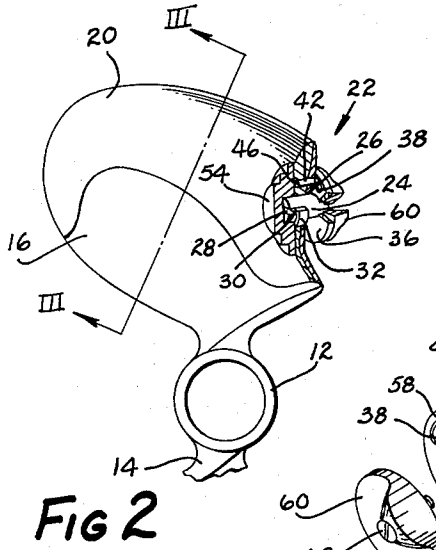


FIG 2

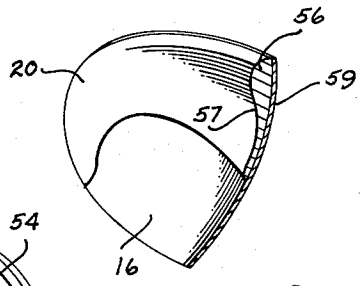


FIG. 3

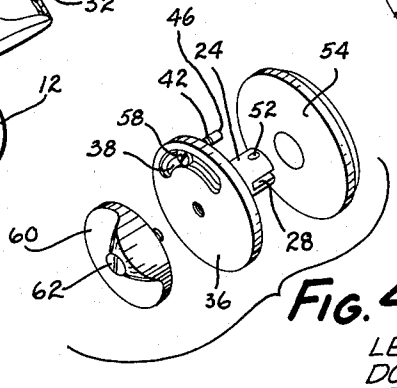


FIG. 4

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United States Patent Office 2,992,686 Patented July 18, 1961

2,992,686

PROPELLER ATTACHMENT MOUNTING MEANS

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Filed May 26, 1960, Ser. No. 32,035
6 Claims. (Cl. 170—160.11)

This invention relates to attachments for automatically increasing the effective area of marine propellers at high speeds, and more particularly to improved mounting means for mounting such attachments on propeller blades.

It has previously been proposed to provide attachments for propeller blades including auxiliary or extension blades which can be pivotally mounted on each propeller blade and which are normally forced into snug engagement with the propeller blade by a spring. In that condition, the extension blades are ineffective, and the drag of the propeller is exclusively determined by the effective (i.e. water-engaging) area of the propeller blades themselves. With the extension blades retracted, the drag or motion resistance of the propeller is comparatively small, and the propeller can therefore be accelerated fairly quickly. As the propeller gains speed, however, the centrifugal force or the hydrodynamic forces acting on the extension blade, or both, overcome the power of the spring and cause the extension blade to move outwardly beyond the perimeter of the propeller blade into extended or complementary position. In this position, the area of the extension blade is added to the area of the propeller blade, thus increasing the effective area of the propeller. In this condition, the drag of the propeller is increased, and hence the water displacement at a given propeller speed is also increased. This permits the vessel to be propelled at a greater speed for a given propeller r.p.m. than was possible without the attachment. The general purpose of this arrangement is to permit operation of the motor at its most efficient speed. The provision of such an attachment itself does not form a part of the present invention, and will therefore not be discussed any further herein.

One of the problems encountered in the manufacture of such attachments for installation by boat owners was the proper rotary positioning of the extension blade shaft, to which one end of the spring was attached, so as to assure proper tensioning of the spring. Another problem of proper positioning of the shaft arose mainly in connection with the dynamic balancing of the propeller after the attachment was mounted thereon. In order to achieve perfect dynamic balancing of the blade with the attachment, it was necessary that the axes of the shafts on each propeller blade were exactly equispaced from the axis of the propeller hub at their closest point thereto, even assuming that all parts were manufactured to close weight tolerances. Still another problem arose from the fact that previous embodiments of the attachment imposed no limits on the pivotal movement of the extension blade, so that the extension blade sometimes wedged against the propeller blade at the retracted end of its travel, and separated entirely from the propeller blade at the extended end of its travel.

The present invention solves these problems by providing a mounting device for attachments of this type which limit the pivotal movement of the extension blade, permit its dynamic balancing, and provide for more positive action of the extension blade by curving its outside or trailing edge away from the propeller surface. In addition to being fully adjustable for dynamic balancing, the mounting means of this invention are also adjustable to balance the tension of the spring so as to assure synchronous movement of the extension blades on each blade of the propeller.

It is the primary object of this invention to provide a mounting means for extension blade attachments which permit installation of the attachments by unskilled personnel and require a minimum of tooling.

It is a further object of this invention to provide stop means for limiting the pivotal movement of the extension blade.

It is another object of this invention to provide means for easy and effective dynamic balancing of the attachment after installation.

It is a still further object of this invention to provide a curved extension blade for increased efficiency.

These and other objects of this invention will be readily perceived from a perusal of the following specification taken in connection with the accompanying drawings in which:

FIG. 1 is a partly exploded perspective view of a marine propeller carrying an extension blade attachment and showing the mounting means of this invention;

FIG. 2 is a cutaway detail perspective of the mounting means of this invention in its assembled condition;

FIG. 3 is a section along line III—III of FIG. 2; and

FIG. 4 is an exploded perspective view of the mounting means similar to that of FIG. 1 but seen from the opposite side.

Basically, the present invention relates to mounting means for extension blade attachments for marine propellers. The mounting means consist of a slotted shaft which provides the pivotal mounting for the extension blade. The shaft is secured in position by an enlarged head or end plate, and by a cap which is slipped over the other end of the shaft and is removably attached thereto. The slot in the shaft engages the inner end of a bias means, such as a coil spring, whose outer end is operatively associated with the extension blade so as to bias the extension blade into retracted position. The shaft is prevented from turning by a pin secured to the end plate adjacent the shaft. This pin at the same time serves as a stop means cooperating with a recess or aperture formed in the extension blade to limit its movement. The pin is adjustably mounted on the end plate so that the shaft can be turned to tighten or loosen the spring which urges the extension blade into its recessed position. A weight is adapted to fit over the end plate. This weight can be rotated with respect to the end plate for dynamic balancing purposes. Extension of the blade is facilitated by the curvature of the outside edge of the extension blade in a direction away from the propeller surface.

Referring now to the drawings, the propeller equipped according to this invention is generally shown at **10**. The propeller **10** has a hub **12** and a pair of propeller blades **14**, **16**. Extension blades **18**, **20** are pivotally mounted on the propeller blades **14**, **16** by mounting means generally designated as **22**. In the drawings, blade **18** is shown in the extended position, and blade **20** in the retracted position. The mounting means **22** consist of a shaft **24** which extends through a bore **26** formed in both the propeller blade **16** and the extension blade **20**. The shaft **24** is provided with a longitudinal slot **28** which receives the flat inner end **30** of a spring **32**. The spring **32** is coiled around shaft **24**, and its other end is received in a notch **34** formed in the extension blade **20**. At its right-hand end, the shaft **24** terminates in an end plate **36**. The end plate **36** has formed therein an arcuate guide **38** concentric with the axis **40** of the shaft **24**. A pin **42** is fastened in the guide **38** and can be moved back and forth therein for adjustment of the tension of spring **32**. The pin **42** extends normally from end plate **36** through an opening **44** formed in the propeller blade **16** parallel to bore **26**. The left-hand end **46** of pin **42** engages a recess or aperture **48** formed in the extension blade **20** so as to limit the pivotal movement of blade **20**

about shaft 24. Although element 48 is shown in the drawings as an aperture for clarity, it is to be understood that an arcuate groove or recess formed in the right-hand face (in FIG. 1) of blade 20 may be preferable for hydrodynamic reasons; and the term "recess" as used hereinafter is intended to cover both a groove and an aperture. The shaft 24 is secured against longitudinal movement by a cotter pin 50 extending through the cotter pin hole 52 and the cap 54.

As appears most clearly from FIG. 3, the outside edge 56 of the extension blades 18, 20 may be curved away as at 57 from the surface 59 of the propeller blades 14, 16 to supply the hydrodynamic force necessary for pivoting the extension blades 18, 20 about their pivot points.

Operation

When it is desired to install an extension blade attachment by means of the mounting means disclosed herein, the position of shaft 24 is first located in accordance with the manufacturer's specifications, and the bore 26 is then carefully drilled at the location determined. The location of opening 44 is then determined, also in accordance with the manufacturer's specifications, and the opening 44 is also drilled. The shaft 24 is then inserted through the bore 26, and the pin 42 is inserted through opening 44, as far as end plate 36 will permit them to go. The extension blade 20 is then equipped with the spring 32 and is slipped over the free end of shaft 24, care being taken that the flat end 30 of spring 32 becomes inserted in slot 28 of shaft 24. The recess 48 in blade 20 should fit over the free end 46 of pin 42. Cap 54 is next slipped over the free end of shaft 24, and cotter pin 50 is inserted through the cotter pin hole 52 and spread out to secure shaft 24 in place. The tension of spring 32 can now be adjusted in accordance with the manufacturer's specifications by loosening the screw 58 which holds pin 42 on end plate 36, and turning end plate 36 until spring 32 has the required tension. The screw 58 is then tightened, and the adjustment of the tension of spring 32 is thus maintained. Next, the weight 60 is mounted on the end plate 36 by means of the screw 62. Dynamic balance tests as necessary may now be performed on the completed assembly, and any misadjustments of the dynamic balance may be compensated for by rotating the eccentric weight 60 to shift its location with respect to the axis of hub 12. When the proper adjustment is reached, screw 62 can be tightened and the assembly is then balanced and ready for operation.

It will be seen that we have provided simple and effective mounting means for an extension blade attachment, which make it possible to mount an extension blade attachment on a marine propeller with a minimum of skill and tools, and to easily adjust the attachment after it is mounted. Obviously, many embodiments of this invention are possible above and beyond the one shown herein as a matter of illustration, and it is therefore not desired to limit the invention except by the scope of the following claims.

We claim:

1. A blade extending attachment for a marine propeller, comprising: an extension blade positioned adjacent each blade of said propeller and retractable into snug engagement with said propeller blade on one side thereof; mounting means for mounting said extension blade pivotally with respect to said propeller blade, bias means for biasing said extension blade into its retracted position, said bias means being overcome upon rotation of said propeller to allow said extension blade to extend beyond the perimeter of said propeller blade to increase the effective area thereof, said mounting means including an end plate, a cylindrical shaft secured to said end plate and extending normally therefrom, said propeller blade having a wholly cylindrical bore formed therethrough to receive said shaft, a pin spaced from said shaft and also extending normally from said end plate, said pin cooperating with an opening formed through said propeller blade to prevent said end plate and shaft from turning, and said pin protruding through said propeller blade and into a recess formed in said extension blade to limit the pivotal movement of said extension blade.

2. In a blade extending attachment for a marine propeller comprising an extension blade associated with each blade of said propeller and pivotally movable between a retracted position adjacent said propeller blade and an extended position complementary thereto, the improvement comprising pivotal mounting means for said extension blade, said mounting means including a shaft, a weight eccentrically positioned with respect to said shaft, and means for adjusting the position of said weight with respect to said propeller blade.

3. In a blade extending attachment for a marine propeller comprising an extension blade associated with each blade of said propeller and pivotally movable between a retracted position adjacent said propeller blade and an extended position complementary thereto, the improvement comprising pivotal mounting means for said extension blade, said mounting means including an end plate, a shaft mounted on said end plate and extending normally thereto for pivotally supporting said extension blade, and a weight mounted on said end plate for rotary movement coaxially with said shaft, said weight having a center of gravity spaced from the axis of said shaft.

4. A blade extending attachment for a marine propeller, comprising: an extension blade positioned adjacent each blade of said propeller and retractable into snug engagement with said propeller blade on a side thereof; mounting means for mounting said extension blade pivotally with respect to said propeller blade, a spring for biasing said extension blade into its retracted position, said spring being overcome upon rotation of said propeller to allow said extension blade to extend beyond the perimeter of said propeller blade to increase the effective area thereof, said mounting means including an end plate, a cylindrical shaft secured to said end plate and extending normally therefrom, said propeller blade having a wholly cylindrical bore formed therethrough to receive said shaft, a pin spaced from said shaft and also extending normally from said end plate, said pin cooperating with an opening formed through said propeller blade to prevent said end plate and shaft from turning, said pin protruding through said propeller blade and into a recess formed in said extension blade to limit the pivotal movement of said extension blade, an end of said spring being connected to said shaft and the other to said extension blade, and said pin being adjustably mounted on said end plate for movement concentrically about said shaft to permit adjustment of the tension of said spring.

5. A blade extending attachment for a marine propeller, comprising: an extension blade positioned adjacent each blade of said propeller and retractable into snug engagement with said propeller blade on one side thereof; mounting means for mounting said extension blade pivotally with respect to said propeller blade, a spring for biasing said extension blade into its retracted position, said spring being overcome upon rotation of said propeller to allow said extension blade to extend beyond the perimeter of said propeller blade to increase the effective area thereof, said mounting means including an end plate, a cylindrical shaft secured to said end plate and extending normally therefrom, said propeller blade having a wholly cylindrical bore formed therethrough to receive said shaft, a pin spaced from said shaft and also extending normally from said end plate, said pin cooperating with an opening formed through said propeller blade to prevent said end plate and shaft from turning, said pin protruding through said propeller blade and into a recess formed in said extension blade to limit the pivotal movement of said extension blade, an end of said

spring being connected to said shaft and the other to said extension blade, said pin being adjustably mounted on said end plate for movement concentrically about said shaft to permit adjustment of the tension of said spring, and a weight mounted on said end plate generally parallel therewith for rotary movement coaxially with said shaft, said weight having a center of gravity spaced from the axis of said shaft.

6. In a blade extending attachment for a marine propeller comprising an extension blade associated with each blade of said propeller and pivotally movable between

a retracted position adjacent said propeller blade and an extended position complementary thereto, the improvement comprising, said extension blade having a substantially thickened ridge along its outside edge.

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