United States Patent [19]

Lorenz

[11] **3,709,634**

[45] **Jan. 9, 1973**

[54] **FOLDING BLADE PROPELLER**

[75] Inventor: **Eldon L. Lorenz,** Grand Rapids, Mich.

[73] Assignee: **Michigan Wheel Corporation,** Grand Rapids, Mich.

[22] Filed: **Jan. 20, 1971**

[21] Appl. No.: **108,000**

[52] **U.S. Cl.** **416/142**

[51] **Int. Cl.** **B63h 1/24**

[58] **Field of Search** 416/142, 140

[56] **References Cited**

UNITED STATES PATENTS

3,255,826	6/1966	Beck	416/142 X
3,591,311	7/1971	Butler	416/142

FOREIGN PATENTS OR APPLICATIONS

26,090	11/1909	Great Britain	416/142
154,495	12/1920	Great Britain	416/142

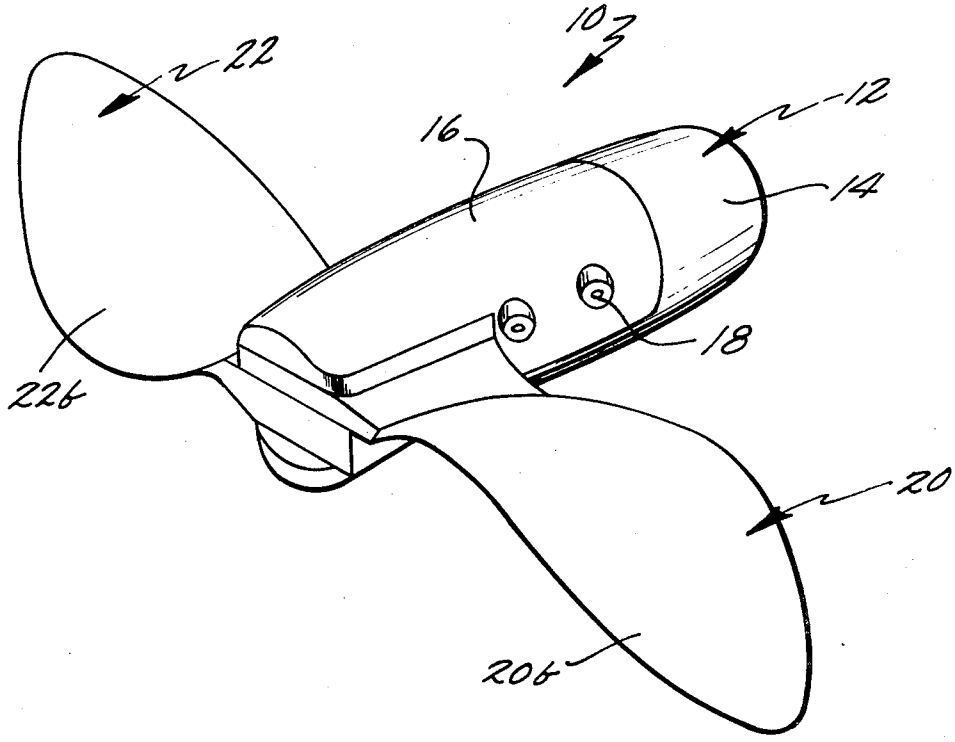
Primary Examiner—Everette A. Powell, Jr.

Attorney—Price, Heneveld, Huizenga & Cooper

[57] **ABSTRACT**

A foldable marine propeller assembly is disclosed having a pair of interengaged housing members that are releasably secured together by fasteners, locking the blade mounting swivel pin in blind sockets when so fastened, and that cooperatively define a recess for the securement nut to a drive shaft extending into the housing, the nut being retained against rotation.

4 Claims, 11 Drawing Figures



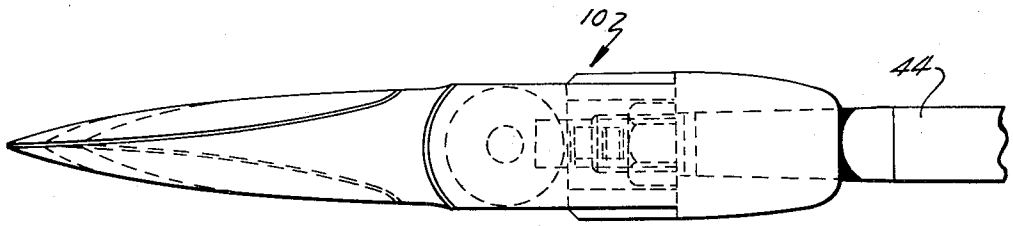


FIG. 1

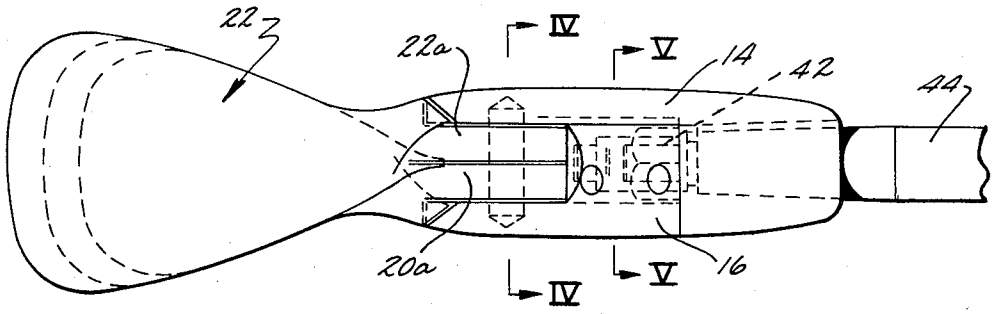


FIG. 2

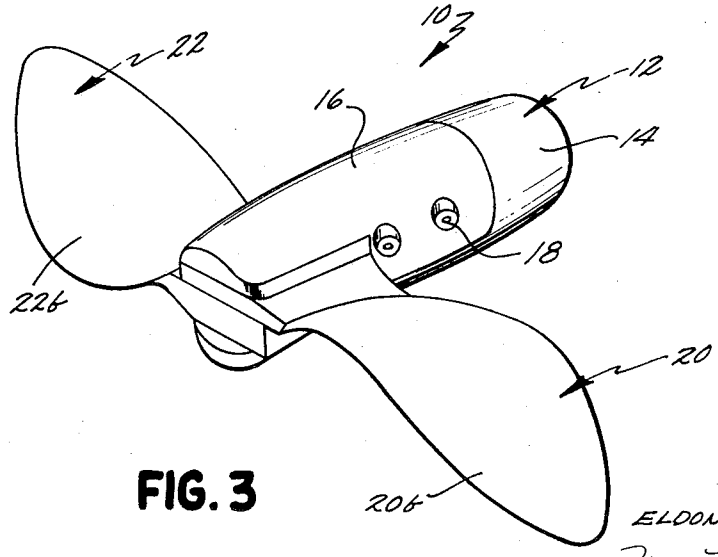


FIG. 3

INVENTOR
ELDON L. LORENZ
Price, Heneveld
Huizenga & Cooper
BY
ATTORNEYS

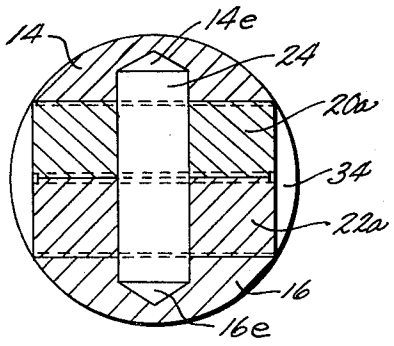


FIG. 4

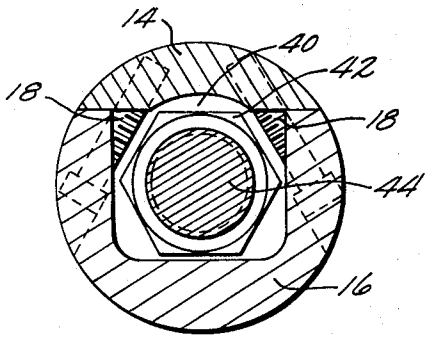


FIG. 5

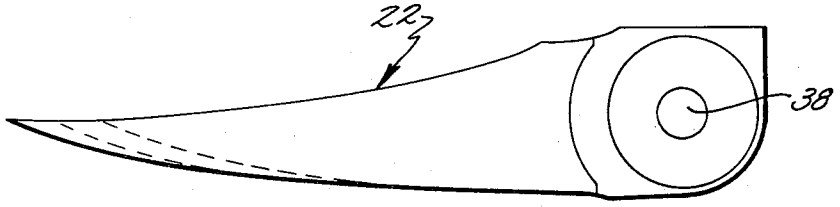


FIG. 6

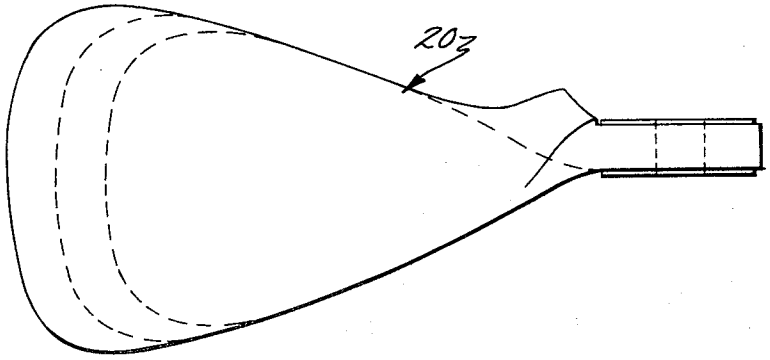


FIG. 7

INVENTOR
ELDON L. LORENZ

BY Price, Heneveld, Huizenga & Cooper.

ATTORNEYS

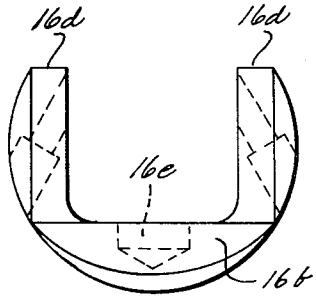


FIG. 11

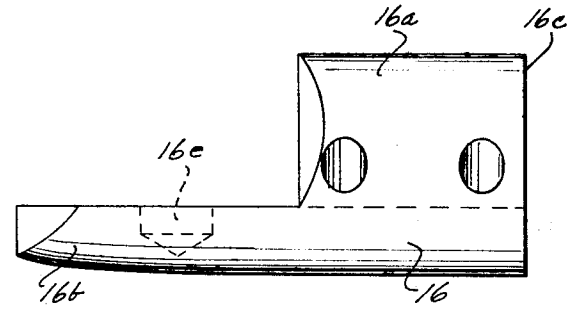


FIG. 10

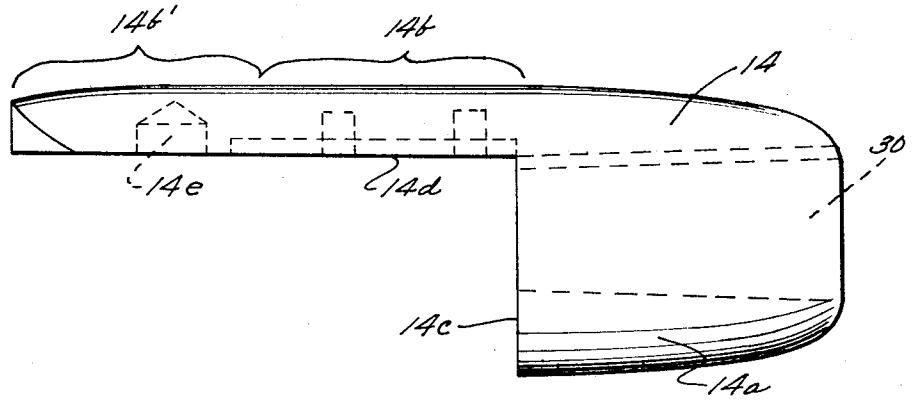


FIG. 8

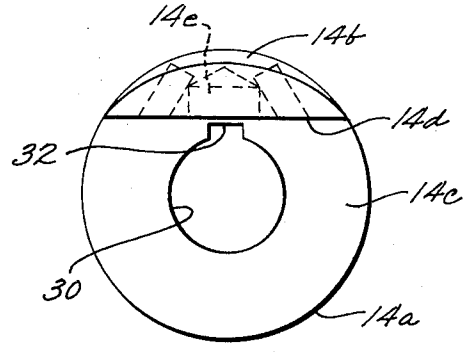


FIG. 9

INVENTOR
ELDON L. LORENZ
Price, Heneveld
Huizenga & Cooper

BY

ATTORNEYS

FOLDING BLADE PROPELLER

BACKGROUND OF THE INVENTION

This invention relates to marine propellers, and more particularly to a foldable marine propeller assembly.

Foldable marine propellers, as known for decades, employ a pair of blade elements that swivel between a radially protruding functional position and a trailing, axially oriented collapsed position. The principle is relatively simple. The difficulties arise in creating such an assembly which can be effectively secured to an engine drive shaft, which has the blades mounted securely, which enables rapid simple blade change, but which is yet streamlined in configuration, and has only a few simple parts to manipulate when blade changing is attempted. Known foldable prop assemblies are commonly characterized by their ineffectiveness in achieving all of these desirable characteristics in one assembly. Rather, the conventional housing is complex, bulky, and irregular, and/or the swivel pin for the blades is secured by troublesome cotter keys or pins or annular wedge rings, and/or the drive shaft securement is complex and unwieldy and often itself secured by cotter keys or pins, and other troublesome factors.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a novel foldable marine propeller assembly that does in fact provide all the noted sought-after features in the same unit. It can be effectively secured to a drive shaft, yet has a simple securement nut arrangement not employing cotter keys. The blades are mounted securely, without any cotter keys or the like, and also can be changed easily and quickly. It has only a few simple parts that can be readily manipulated. The housing is not bulky, but is thin and streamlined. The swivel pin mounting the blade elements is specially retained by the blind sockets in a pair of interengaged housing members. The cooperative elongated housing members are releasably secured together by fasteners, retaining the nut that attaches to the drive shaft from rotating relative to the housing.

These and other related objects, advantages, and features will be apparent upon studying the following specification along with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the novel foldable marine propeller assembly;

FIG. 2 is an elevational view of the assembly in FIG. 1, but shown with the blade in collapsed trailing condition;

FIG. 3 is a plan view of the assembly in FIG. 2;

FIG. 4 is a sectional view taken on plane IV–IV of FIG. 2;

FIG. 5 is a sectional view taken on plane V—V of FIG. 2;

FIG. 6 is a plan view of one of the blade elements;

FIG. 7 is an elevational view of the blade element in FIG. 6;

FIG. 8 is an elevational view of one housing member;

FIG. 9 is an end elevational view of the member in FIG. 8;

FIG. 10 is an elevational view of the second housing member; and

FIG. 11 is an end elevational view of the member in FIG. 10.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now specifically to the drawings the complete marine foldable propeller assembly **10** basically includes a housing subassembly **12** composed of a pair of housing members **14** and **16** which are secured together by a plurality of fasteners **18**, and two propeller blade elements **20** and **22** attached to the housing by a swivel pin **24**. The assembly also includes other elements and features described in detail hereinafter.

Housing **12** is axially elongated, being formed of the two cooperative housing members **14** and **16**. Housing member **14** has a nose portion **14*a*** (FIG. **8**) of generally annular cross-sectional configuration, and integrally attached rearwardly extending portions **14*b*** and **14*b'*** that form a chordal segment of the rear portion of the housing. The remainder of the annular central section of the housing is formed by housing member **16**, and particularly portion **16*a*** thereof. Member **16** also includes a rearwardly extending chordal segment **16*b*** integral with portion **16*a***. Thus, the central section of housing member **14**, i.e., portion **14*b***, cooperates with portion **16*a*** of member **16** to form a generally annular central portion of the total housing **12**. This occurs when the front transverse face **16*c*** of member **16** is abutted against the rearward transverse face **14*c*** of portion **14*a*** and the upper edges **16*d*** of portion **16*a*** are engaged against the chordal face **14*d*** of portion **14b**.

The forward portion **14*a*** of housing member **14** defines an axially extending, rearwardly converging, tapered, elongated socket **30** for receiving the rear terminal end of a drive shaft **44** from an engine (not shown). This socket includes an axially extending key slot **32** to keep the housing from rotating relative to the drive shaft. At the opposite axial end of the housing, members **14** and **16** define a slot **34** which extends clear through the opposite surfaces of the housing, between portions **16*b*** and portions **14*b'***. Each of housing members **14** ad **16**, and specifically portions **14*b'*** and **16*b*** thereof, defines a blind pin receiving socket **14*e*** and **16*e*** respectively. These sockets are open toward slot **34**, inwardly of the housing, are aligned with each other, and do not extend through the outer surface area of the housing members. Swivel pin **24** has its end received in and retained by the dead end or blind sockets (FIG. **4**).

Mounted on swivel pin **24** are the two blade elements **20** and **22**. More specifically, pin **24** extends through the aligned openings **39** of the flattened bosses **20*a*** and **22*a*** of blade elements **20** and **22**. These blade elements can swivel from an operative position where the blade **20*b*** and **22*b*** extend radially and opposite to each other transversely of the axis of the housing and drive shaft, to a second trailing position, with the blades in engagement with each other, axially to the rear of the housing as in FIGS. **2** and **3**. Pivotal movement of the blade elements back from this folded condition to the extended radial operative condition is limited by engagement of bosses **20*a*** and **22*a*** with the forward end of slot **34** of the housing.

At the inner end of the axially extending, drive shaft receiving socket **30** is an enlarged recess **40** formed by cooperative housing members **14** and **16** to receive a securement nut **42** that attaches to the rear terminal threaded end of drive shaft **44**. This nut is prevented from rotating, once the housing is assembled, by a plurality of Allen socket screws **18** which also secure the two housing members together, and by the recess configuration. These screws **18** extend diagonally adjacent the faces of this hexagonal nut **42**. The heads of the screws are recessed into housing member **16**, with the threaded inner ends of the screws extending into threaded sockets in member **14**.

Assuming the assembly is complete and is mounted to a drive shaft **44** as in FIGS. **2** and **3**, dis-assembly is as follows. Socket screws **18** are threadably removed, enabling housing member **16** to be separated from the assembly. This exposes one terminal end of swivel pin **24**, allowing its removal as well as removal of either or both of blade elements **20** and **22**. The blades can thus be readily substituted by another set of blades, or the like, followed by return of the housing member **16** to its position and reattachment of screws **18**. If it is desired to remove the assembly from drive shaft **44**, this is done by readily loosening nut **42** to back it off its engagement with the annular shoulder formed by face **14*c*** at the inner end of socket **30**, removing the nut from the drive shaft, and sliding the housing off the end of the drive shaft.

Mounting of the structure on a drive shaft is just as simple. Specifically, housing member **14** is slid over the drive shaft rear terminal end with the drive shaft key inserted in key slot **32**, nut **42** is threadably attached to the drive shaft and tightened against shoulder **14*c***, pin **24** and a pair of blades are inserted into member **14** with one end of the pin placed in blind socket **14*e***, and member **16** is positioned with its blind socket **16*e*** over the second end of pin **24** and screws **18** are attached. The unit is ready for operation. Powered rotation of shaft **44** causes the blade elements to pivot outwardly into operative position by a combination of centrifugal force and water thrust on the rear faces of the blades. Removal of power from shaft **44**, when under operation for example, causes the blades to automatically fold to the collapsed streamlined position to the rear.

Anyone familiar with this art will be able to readily appreciate the simplicity and functional capabilities of this novel structure. It is conceivable that certain minor details of this construction could be modified to suit a particular type of situation, while employing the concept set forth. Hence, it is intended that the invention is to be limited only by the scope of the appended claims and reasonable equivalents thereto, rather than by the details of the structure set forth as illustrative of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A foldable marine propeller assembly comprising:

a pair of blade elements, each having a blade on one end and a fattened boss with a swivel opening on the opposite end; a swivel pin extending through said blade element openings; said blade elements being configurated and arranged to swivel on said swivel pin from a collapsed position adjacent each other to a functional position protruding away from each other;

the improvement comprising:

a pair of elongated housing members configurated to be interengaged to form an elongated housing having a streamlined outer surface area, and two axial ends; said housing members cooperatively defining a drive shaft receiving socket extending through one axial end of said housing, and defining an enlarged, drive shaft securement nut receiving recess at the inner end of said socket; a nut abuttment shoulder at the juncture of said socket and said enlarged recess; said housing members cooperatively defining a slot extending through said housing at the second end thereof, and receiving said flattened bosses; each of said housing members having a blind socket oriented transversely of said slot and transversely of said housing axis; said blind sockets being aligned with each other, opening into said slot, receiving the ends of said swivel pin, and being unexposed to said housing outer surface area; and fastener elements releasably securing said housing members in cooperative engagement to retain said swivel pin and blade elements.

2. The foldable marine propeller in claim **1** including a drive shaft securement nut in said receiving recess, locked against rotation therein.

3. The foldable marine propeller in claim **2** wherein said fastener elements are recessed into said housing outer surface area.

4. A foldable marine propeller assembly comprising:

a pair of blade elements, each having a blade on one end and a flattened boss with a swivel opening on the opposite end; a swivel pin extending through said blade element openings; said blade elements being configurated and arranged to swivel on said swivel pin from a collapsed position adjacent each other to a functional position protruding away from each other;

the improvement comprising:

a pair of elongated housing members configurated to be interengaged to form an elongated housing having a streamline outer surface area, and two axial ends; said housing members cooperatively defining a drive shaft receiving socket extending through one axial end of said housing; said housing members cooperatively defining a slot extending transversely of the housing at the second end thereof, and receiving said flattened bosses; each of said housing members having a blind socket oriented transversely of said slot and transversely of said housing axis; said blind sockets being aligned with each other, opening into said slot, receiving the ends of said swivel pin, and being unexposed to said housing outer surface area; and fastener means releasably securing said housing members in cooperative engagement to retain said swivel pin and blade elements.

* * * * *