May 8, 1962 O. L. BIHLMIRE 3,033,293

BOAT PROPELLER

Filed Oct. 20, 1958

FIG. 1

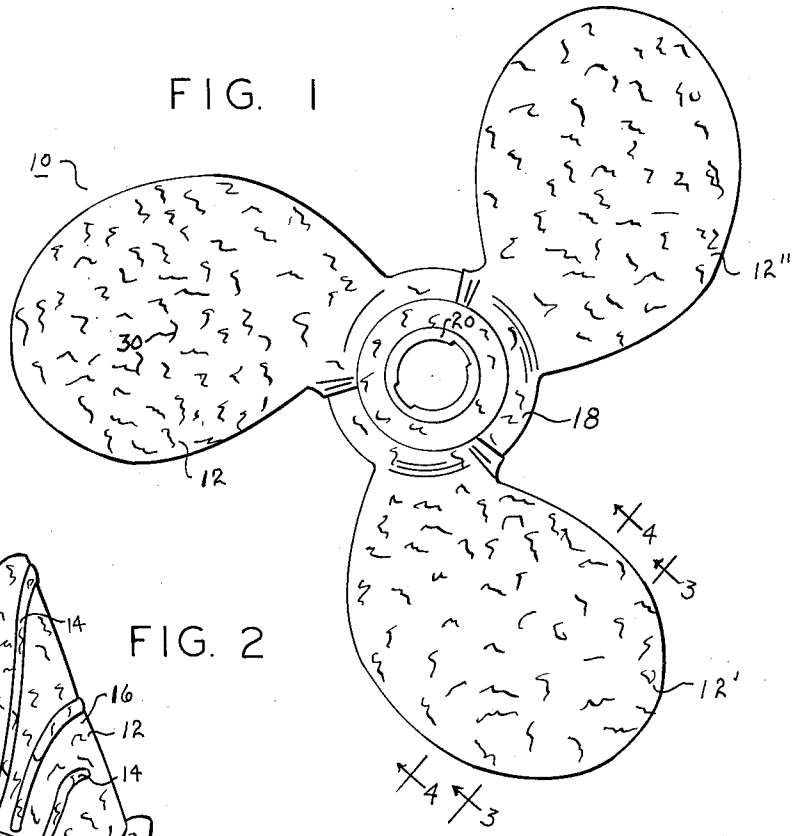
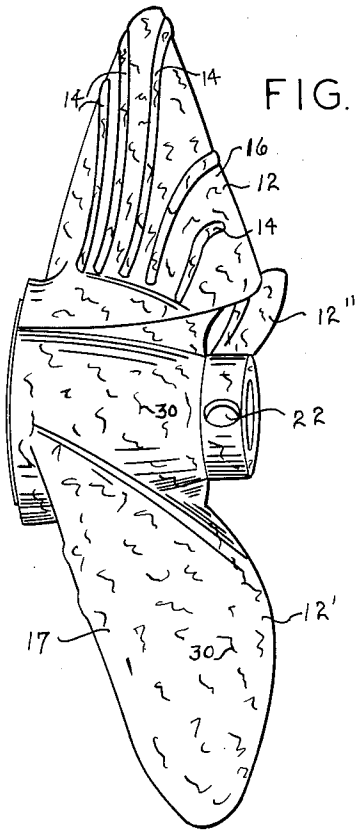


FIG. 2



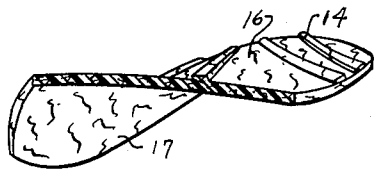


FIG. 3

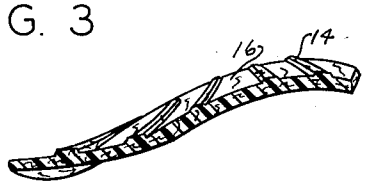


FIG. 4

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BOAT PROPELLER

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The present invention relates to propellers and more particularly to boat propellers and to a composition therefor.

One of the principal objects of the present invention is to provide a propeller for inboard and outboard motor boats, which varies the pitch of its blades in accordance with the torque resistance encountered and adapts itself automatically to varying conditions under which the boats are operated.

Another object of the invention is to provide a boat propeller which will not become bent, nicked nor dented as easily as the conventional propellers presently being used as standard equipment on small motors and boats.

Still another object of the invention is to provide a durable, unbreakable propeller which will withstand attack from salt water and abrasion from entrained foreign materials in the water.

A further object is to provide a rugged boat propeller requiring a minimum amount of service and having a long life under all normal operating conditions and treatment.

Another object of the invention is to provide a boat propeller having a plurality of blades which yield under pressure created by high power output of the boat motor, to change the pitch thereof, and which return fully to original position when the pressure is relieved.

Another object is to provide a composition for a propeller imparting thereto the foregoing characteristics.

Additional objects and advantages of the present invention will become apparent from the following description and the accompanying drawing, therein:

FIGURE 1 is a rear elevational view of my propeller constructed of special propeller composition;

FIGURE 2 is a side elevational view of the propeller shown in FIGURE 1;

FIGURES 3 and 4 are enlarged cross sectional views of one of the propeller blades, taken on lines 3—3 and 4—4, respectively, of FIGURE 1.

Referring more specifically to the drawing, numeral **10** designates a propeller for a conventional outboard motor having three blades **12**, **12'** and **12''** of substantial pitch and with a plurality of reinforcing ribs **14** on the forward surface **16** of each blade, the rear surface **17** being smooth and unobstructed. The blades are formed integrally with a hub **18** of the same material which preferably is provided with a bushing or sleeve **20** which slips onto and firmly grips the drive shaft from the motor. A hole **22** is provided in the rear end of the hub and bushing for the usual shear pin. For the purpose of the present invention the particular design and detailed construction of the propeller may be considered as conventional and the one described herein is for the purpose of illustration. The propellers to which the invention is applicable may vary in size over a wide range and may have two, three or more blades. They may be smooth on the forward surface as well as on the rear surface, and the shape, pitch and construction of the blades may vary from one propeller to another.

The present invention is primarily concerned with boat propellers constructed of a nylon base material impregnated with fibre-glass throughout both the hub and blades, as illustrated by the small curved lines **30** shown on the surface of the views in the four figures of the drawings. The amount of fibre-glass intermixed with the nylon has been found to be a rather narrow critical range falling between about fifteen percent (15%) and thirty percent (30%) by weight with the optimum properties being present in nylon base propellers impregnated with approximately eighteen to twenty-five percent (18%–25%) of fibre-glass by weight. A specific composition of nylon impregnated with twenty percent (20%) by weight fibre-glass provides a propeller having all the desirable properties and characteristics. It has been found that nylon propellers impregnated with less than about fifteen percent (15%) have sufficient strength but the moisture absorption and flexibility are too high for satisfactory performance and durability. Nylon base material with thirty percent (30%) and over while having acceptable water absorption characteristics is too rigid and susceptible to breakage from sudden impact. The flexibility of the propeller blades constructed of a nylon base with over about thirty percent (30%) is insufficient for satisfactory performance of the present propeller. Percentages of fibre-glass between about ten and forty-five percent (10%–45%) will give some of the desirable properties and characteristics, including varying degrees of water absorption, flexibility and ductility; however, percentages less than about fifteen percent and more than about thirty percent do not give satisfactory degrees for all the desired properties. The moisture absorption of the nylon decreases with an increase of fibre-glass impregnation, thus increasing the life of the propeller under normal operating condition. However, as the fibre-glass is increased above about thirty percent the flexibility is too low and the brittleness too high to permit the propeller to perform and last satisfactorily.

One of the important features of the present boat propeller constructed of nylon and fibre-glass in amounts between about fifteen and thirty percent, is its ability to automatically vary the pitch of the blades with variations in power output of the motor, particularly at the high power output encountered in starting and rapid acceleration. When the propeller is placed under high torque output during starting and high power output, the blades flex, turning slightly throughout their length from the forward edge to the rear edge and reducing the effective pitch of the blades. The degree of flexibility of the blades is highly critical since no significant variation in pitch is desriable during normal cruising or gradual acceleration in the cruising range. Immediate and substantially complete return of the blades to their original pitch takes place when the boat reaches the desired speed and the torque resistance on the propeller is diminished to that present in the normal cruising range. The blades constructed of the present nylon-fibre-glass material can be subjected to repeated pitch variations without losing their ability to return fully to their original pitch. The variable pitch characteristics of the present integral blade and hub propeller construction are not found in either metal propellers, the blades of which are rigid and when distorted remain in the deformed condition, or rubber, the blades of which are inherently so flexible that they distort during normal cruising of the boat and power output of the motor.

The present propellers are molded from the nylon-fibre-glass material using standard materials readily available on the market, and molds in convential plastic fabricating equipment. The propellers formed of nylon impregnated with fifteen to thirty percent by weight of fibre-glass have in addition to the variable pitch characteristics excellent resistance to chemicals and foreign matter in water normally causing severe corrosion and disintegration of metal propellers, and will resist bumps, shock and impact from foreign objects, and consequently will not become nicked, scratched or broken as readily as the conventional metal propellers.

In the foregoing description of a specific example of the present invention, only nylon and fibre-glass have been referred to as the materials from which my propeller is made. However other plastic and fibrous materials can be used which provide at least some of the durable characteristics of the nylon-fibre-glass material.

While a number of variations in my propeller have been mentioned herein, other changes and modifications can be made without departing from the scope of the present invention.

I claim:

1. A flexible boat propeller adapted to operate fully submerged in water, consisting essentially of a nylon base material having about twenty percent by weight of fibre-glass thoroughly dispersed therein.

2. A flexible boat propeller adapted to operate fully submerged in water, consisting essentially of a nylon base material having thoroughly dispersed therein between about eighteen to twenty-five percent by weight of fibre-glass.

3. A flexible boat propeller adapted to operate fully submerged in water, composed of a nylon base having between about fifteen to thirty percent by weight of fibre-glass dispersed therein.

4. A flexible boat propeller adapted to operated fully submerged in water, composed of a nylon base having between ten and forty-five percent by weight of fibre-glass dispersed therein.

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