April 17, 1956 R. E. GASTON 2,742,097

HUB MOUNTING FOR AN ADJUSTABLE PITCH PROPELLER

Filed Dec. 30, 1953

2 Sheets-Sheet 1

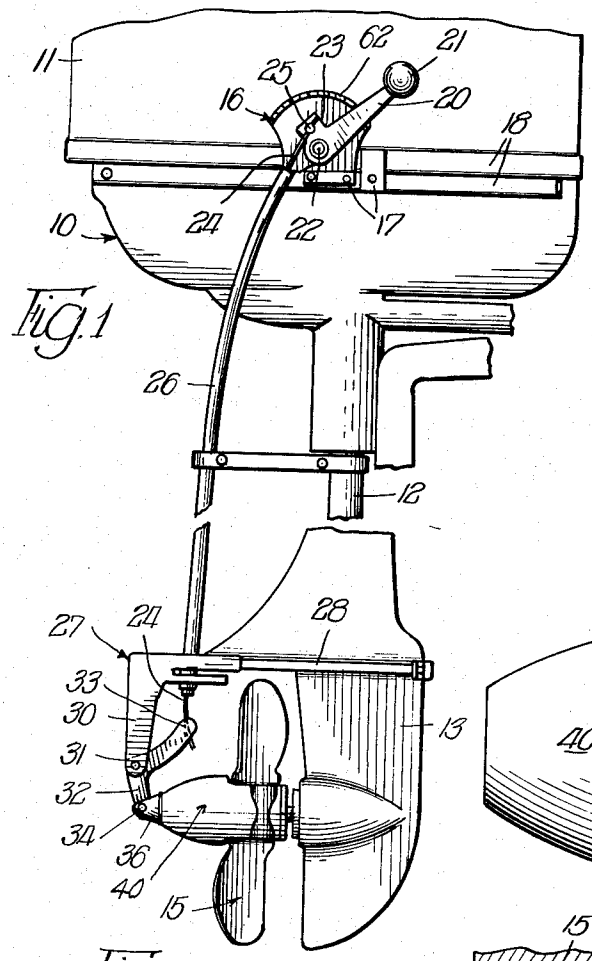


Fig. 1

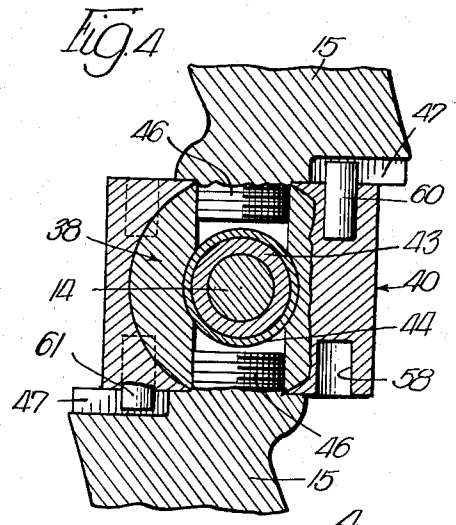


Fig. 4

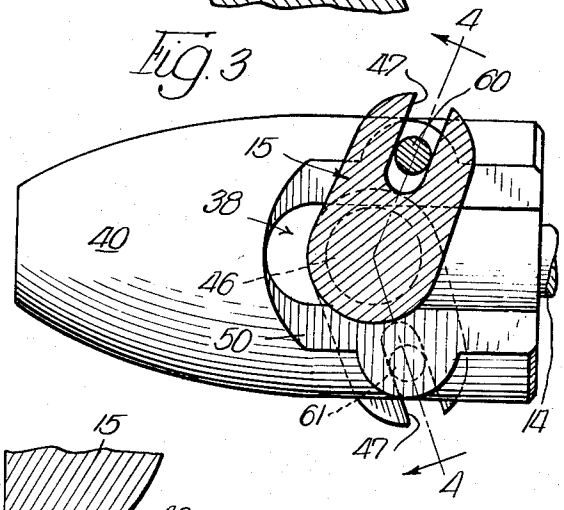


Fig. 3

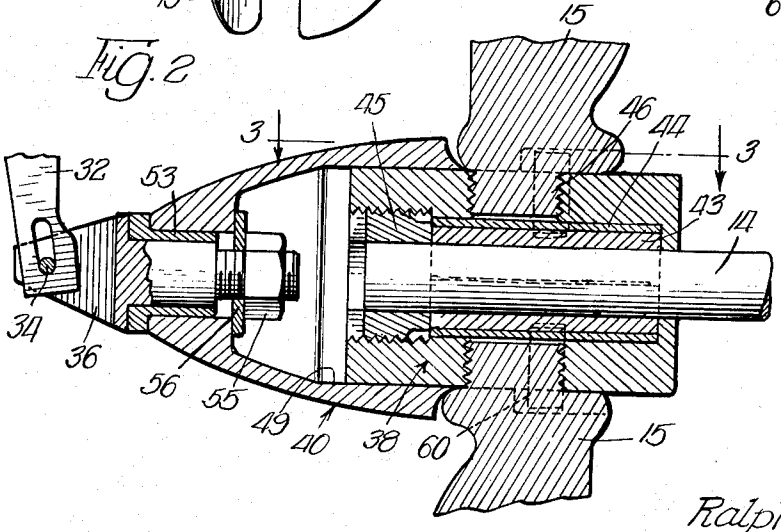


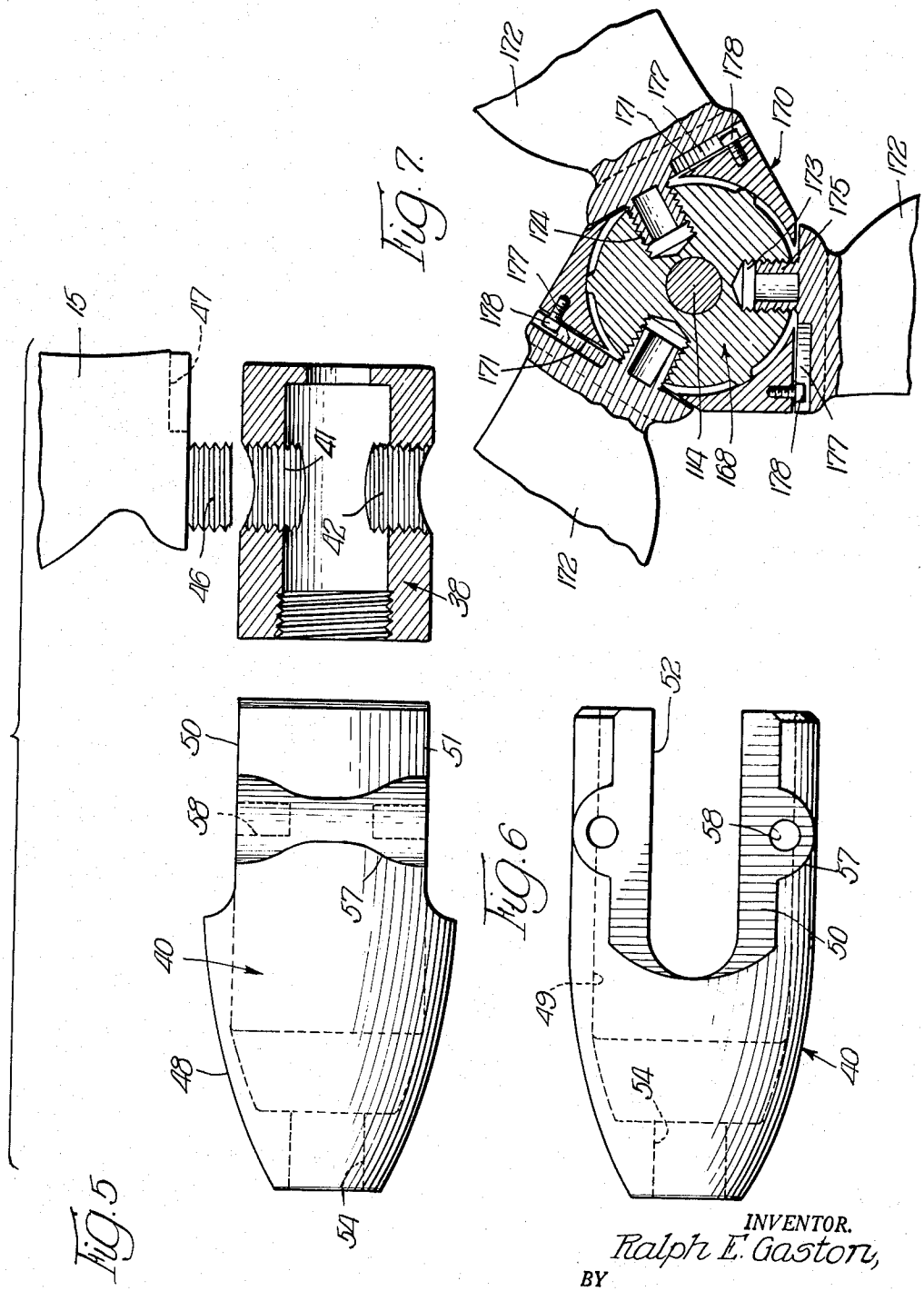
Fig. 2

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HUB MOUNTING FOR AN ADJUSTABLE PITCH PROPELLER

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1 Claim. (Cl. 170—160.54)

The invention relates to variable pitch propellers and has reference in particular to improved propeller mechanism of the variable pitch type incorporating features rendering the same especially adaptable for use with outboard motors.

Among the objects of the invention is to provide variable pitch propeller mechanism for an outboard motor which will be capable of remote adjustment for changing the pitch of the propeller blades whereby to vary the speed of the boat, to provide such variable pitch propeller mechanism which will be simple in design, rugged in construction, efficient and positive in operation, and to provide variable pitch mechanism as described which can be applied to outboard motors of the conventional type without requiring radical structural changes.

Another object of the invention resides in the provision of pitch adjusting mechanism for the propeller blades of an outboard motor, wherein the pitch of the blades may be adjusted between the maximum and minimum limits of forward travel by oscillating movement imparted to the blades through a pin and slot connection, and wherein the adjustment is such as to permit reversing of the blades for reverse travel.

Another object is to provide a pitch adjusting mechanism of the character described wherein the propeller blades are threaded to a hub in a manner permitting rotation with the hub and oscillation relative thereto, and wherein said oscillating movement is effected by a sleeve having telescoping relation with the hub.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings which illustrate an embodiment of the device and wherein like reference characters are used to designate like parts—

Figure 1 is a side elevational view illustrating a conventional type of outboard motor equipped with the variable pitch mechanism of the invention;

Figure 2 is a longitudinal sectional view taken through the variable pitch mechanism of Figure 1 to illustrate the constructional details of the same;

Figure 3 is a sectional view taken substantially along line 3—3 of Figure 2;

Figure 4 is a sectional view taken substantially along line 4—4 of Figure 3;

Figure 5 is a view showing the actuating sleeve, the hub and a propeller blade in separated relation;

Figure 6 is a top plan view of the actuating sleeve; and

Figure 7 is a transverse sectional view illustrating a modified form of variable pitch mechanism coming within the invention.

Since the device of the invention is primarily adapted for use with outboard motors, the drawings disclose a conventional outboard motor such as **10**, which is illustrated as including a motor portion **11**, a drive shaft housing such as **12**, having depending relation with the motor portion **11**, and a skeg unit **13** with which the propeller blades are associated in the usual manner, being driven by the motor portion **11** through the conventional motor shaft and gearing, not shown. The drive shaft **14** extends aft from the skeg **13** and the propeller blades **15** are adapted to rotate with said shaft, said blades being mounted on the shaft through the instrumentality of the variable pitch mechanism to be presently described in detail.

In providing control means for the variable pitch mechanism a control handle is located for actuation on the motor portion **11**, being conveniently accessible to the operator. The control bracket **16** is suitably secured as at **17** to one or more band clamps **18** having encircling relation with the motor portion **11** and being secured thereto. The control handle **20** having the knob **21** is pivotally mounted as at **22** to said control bracket **16**. The lateral arm **23**, provided by handle **20**, has the upper end of a Bowden wire **24** fixedly secured thereto as at **25**, which wire is enclosed by the casing **26** and is adapted to have movement relatively thereto in a longitudinal direction. The top end of the casing is fixed to the control bracket **16**, with the bottom end of the casing being similarly fixed to yoke **27**. Clamping mechanisms **28**, consisting of two studs, a formed flanged clamp, and nuts, are employed to secure the yoke **27** to skeg **13** and it will be observed that said yoke has a downwardly directed leg **30** to which is pivotally fastened, as at **31**, the bell crank lever **32**. The upper leg of the bell crank lever has connection as at **33** with the Bowden wire **25**, whereas, the lower leg of said lever is pivotally secured at **34** to the swivel bolt **36**, forming part of the variable pitch mechanism for the propeller blades **15** and which will now be described in detail.

The mechanism by which the pitch of the propeller blades can be varied essentially consists of a propeller hub **38** fixedly secured to drive shaft **14** so as to rotate therewith, and an actuating sleeve **40** having telescoping relation with the propeller hub and which is moved relative thereto by means of motion imparted to the actuating sleeve through the Bowden wire and connecting linkage. The propeller hub **38** is best shown in Figure 5, wherein it will be observed that the same is a substantially hollow open ended cylinder having diametrically opposed, internally threaded openings, such as **41** and **42**, formed therein. Both threaded openings have the same direction threads. This structure is necessary in order to insure proper oscillating movement of the individual propeller blades **15** for adjusting their pitch. The propeller hub **38** may be mounted on drive shaft **14** by means of rubber sleeve **43** and the adapter sleeve **44**. The plug **45**, threaded in the aft end of the hub, allows the proper amount of pressure to be applied to the rubber sleeve **43** such that normal running torque can be resisted, yet sudden collision type torque or impact will not be resisted and the shaft **14** will be allowed to rotate in relation to the propeller mechanism, thus minimizing damage to the propeller mechanism. The adapter sleeve **44** restricts the rubber sleeve **43** when the same is under compression, preventing the rubber material thereof from entering threaded openings **41** and **42**. It may be advisable in some installations to employ a shearing pin for securing the hub to shaft **14**. Such a shearing pin, however, is not illustrated since the same is a conventional element for use in structures of this type.

The propeller blades **15** are mounted in the hub so as to rotate therewith and, additionally, each propeller blade is mounted so as to have oscillating movement in a manner to vary the pitch of the blade. For this purpose each blade has a depending threaded extension such as **46** and the bottom surface of each blade is formed to provide a radial slot such as **47**. The depending extensions **46** are

threaded so as to coact with the threaded openings 41 and 42, respectively, and when said blades are properly associated with hub 38, it will be observed from Figure 4 that the slots 47 therein are disposed laterally with respect to the axis of oscillation of the blades.

The actuating sleeve 40 is also essentially a cylinder having a streamlined conical exterior 48 so that the sleeve simulates a half-section of a torpedo in exterior shape and said sleeve has an internal bore 49, the diameter of which is just slightly in excess of the diameter of the hub 38 so that the actuating sleeve may telescope the hub. Figure 2 shows the parts in proper telescoping relation. In order to permit this telescoping relation of the parts the sleeve is cut away at 50 and 51 to form diametrically opposed flat surfaces and this end of the sleeve is also slotted as at 52 with the slot being in radial alignment with said flat surfaces. Said flat surfaces accommodate the flat bottoms of the propeller blades, and the slot 52 is provided to receive the threaded extensions 46 when the sleeve telescopes the hub.

The swivel bolt 36 is associated with a bushing 53 which is adapted to enter the opening 54 in the forward end of the sleeve 40. The threaded end of the bolt 36 receives the securing nut 55 and which bears against the washer 56 for holding the swivel bolt to the actuating sleeve. The body portion of the sleeve is exteriorly formed with lateral protuberances such as 57 and which have openings 58 formed therein for receiving pins such as 60. The pins are thus carried by the actuating sleeve and said pins are adapted to move with the sleeve when the same has telescoping action relative to the hub. Accordingly, since the pins have location within the slots 47 formed in the propeller blades, the result of said telescoping action is to cause oscillating movement of said propeller blades in a manner to vary their pitch.

Referring to Figure 3, it will be seen that, whereas the top propeller blade 15 has its slot 47 disposed to the right for coaction with pin 60, the bottom propeller blade has its slot 47 disposed to the left for coaction with a similar pin such as 61. Movement of the actuating sleeve in a direction away from the hub will effect oscillating movement of the propeller blades, the top blade oscillating counterclockwise, Figure 4, whereas the bottom blade will oscillate clockwise. As a result the pitch angle of the blades is decreased. As shown in Figure 1, the handle 20 has been moved to locate the actuating sleeve toward the propeller hub so as to effect an oscillated position of the propeller blades where their pitch is increased and which approaches the maximum pitch for the blades.

The modification of Figure 7 is similar in its basic respects to the variable pitch mechanism above described, the only difference consisting in the provision of three propeller blades disposed in one hundred and twenty degree angular relation with each other. The motor shaft 114 has the propeller hub 168 fixedly secured thereto by any conventional means such as by a shearing pin, for example, so that the hub is adapted to rotate with the driven shaft. The actuating sleeve 170 has telescoping relation with hub 168 and said sleeve in this modification is designed to provide three surfaces such as 171 angularly disposed at approximately one hundred and twenty degrees to each other and flat throughout their extent for accommodating the flat bottom surface of its respective propeller blade 172. The openings 173, formed in the hub 168, are threaded as at 174 for receiving the threaded extensions 175 projecting from the bottom surface of each

propeller blade 172. The radial slot 177, formed in each propeller blade, is adapted to receive a pin 178 carried by the actuating sleeve 170 and by means of the pin and slot connection thus formed, the telescoping movement of the sleeve effects oscillating movement of the propeller blades to vary their pitch.

During operation of the outboard motor, as shown in Figure 1, the operator has control of the variable pitch mechanism through the control handle 20. The hub 38, blades 15, and sleeve 40 all rotate as a unit with the drive shaft 14. The sleeve is accordingly journalled by the swivel bolt 36 and bushing 53, and to maintain the parts properly lubricated the bushing 53 and washer 56 may well incorporate some graphite or similar lubricant in their composition. The reactive forces against the blades 15 are such as to oscillate the blades into their minimum pitch position. Therefore some means must be provided to securely hold and lock the control handle in all adjusted positions. This can be accomplished in a simple manner by forming ratchet teeth 62 on the bracket 16 and with which the control handle is caused to engage by spring means or by the inherent resiliency of the handle itself.

The invention is not to be limited to or by details of construction of the particular embodiment thereof illustrated in the drawings, as various other forms of the device will of course be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claim.

What is claimed is:

In a variable pitch propeller mechanism, the combination with the drive shaft of an outboard motor, of a hub member mounted on said shaft, said hub member being bored longitudinally and having a pair of threaded openings therein extending into and communicating with the longitudinal bore, a pair of propeller blades, a threaded extension depending from each blade and adapted to have threaded relation in one of said openings, whereby each propeller blade is mounted in the hub member in a manner permitting rotative movement to vary the pitch of the blades, and means for mounting the hub member on the shaft including a sleeve of resilient material located on the shaft and disposed between the same and the inside surface of the longitudinal bore formed in the hub member, a pressure plug maintaining the resilient sleeve under compression, and a metal adapter of cylindrical shape having a location within the longitudinal bore in telescoping relation with the resilient sleeve whereby to direct the pressure of the sleeve onto the shaft and to prevent the compressed sleeve from entering the threaded openings and interfering with the rotative movements of the propeller blades.

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