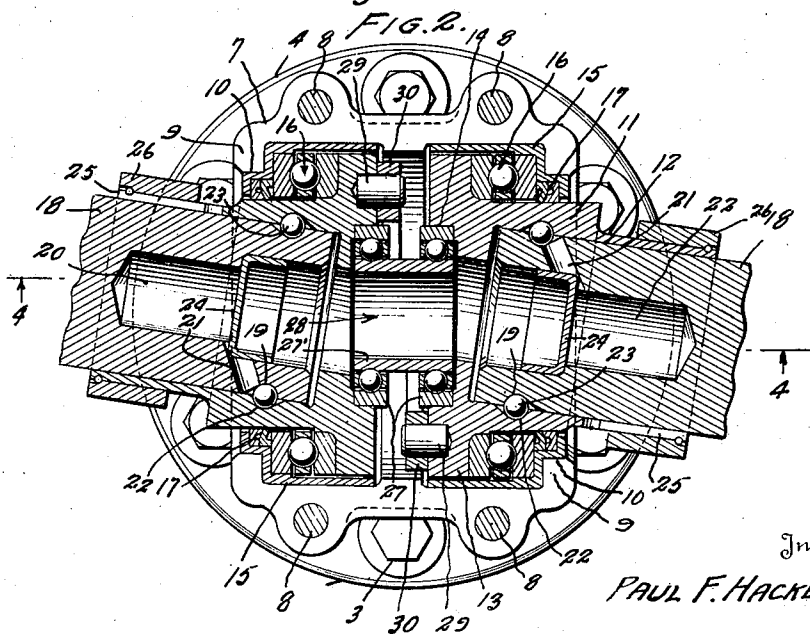


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FIG. 3.

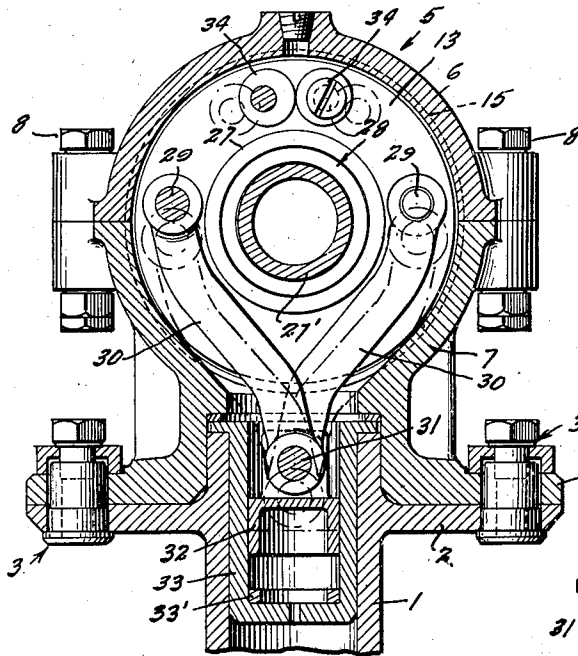


FIG. 5.

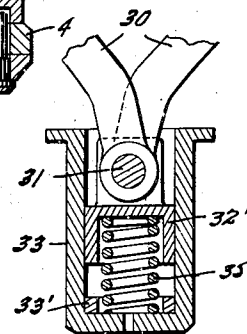
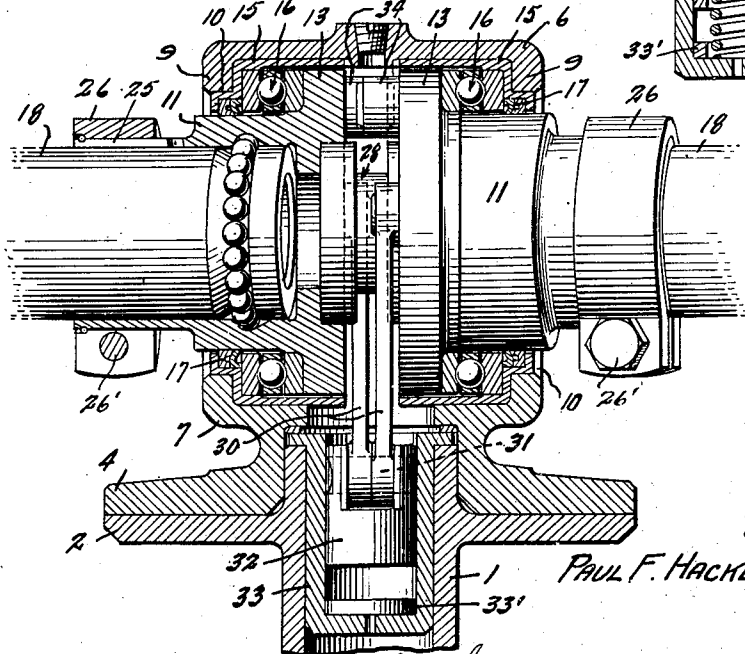


FIG. 4.



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FIG. 7.

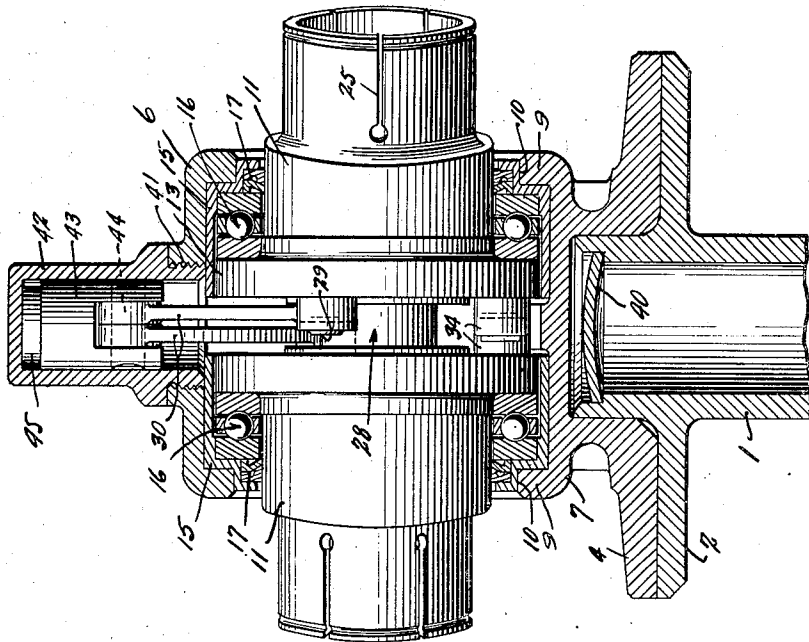
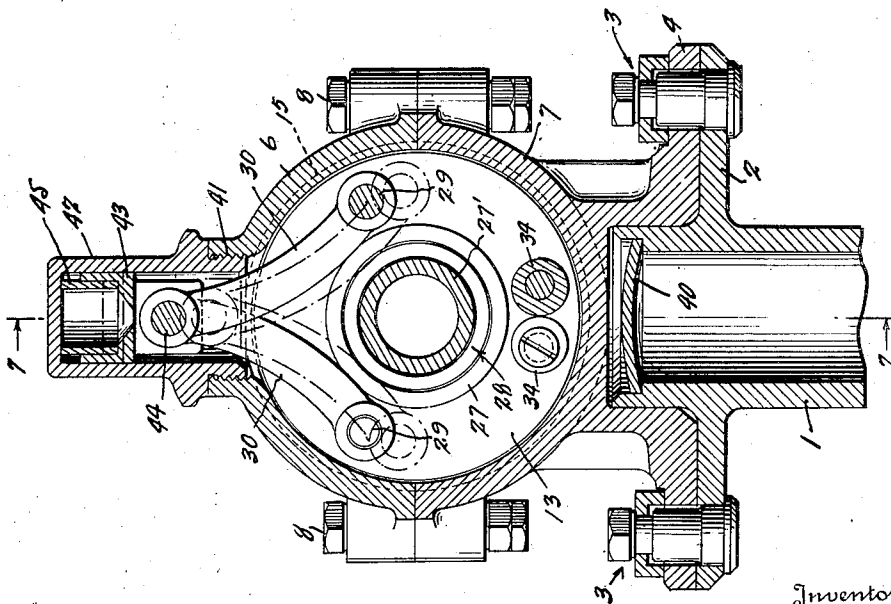


FIG. 6.



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HUB CONSTRUCTION FOR PROPELLERS

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Application March 26, 1942, Serial No. 436,361

9 Claims. (Cl. 170-162)

Generically the present invention relates to hub constructions for mounting propeller blades and the like and more specifically it has reference to a hub whereby automatic variable pitch propeller blades may be mounted to aircraft of the type employing a flanged crankshaft.

It has been customary in connection with power plants of low horse power which employ a flanged crankshaft to attach wooden blades to the shaft. By means of the present invention, however, there is provided a novel hub that will enable variable pitch propeller blades to be used in conjunction with power plants of this character.

An object of the present invention is to provide a hub construction that can be mounted to a flanged type crankshaft which is simple in construction and operation, which can be manufactured at a relatively low cost and which comprises few essential working parts.

And another object of the present invention is to provide a hub of the character described wherein means are provided to synchronize the pitch change of the propeller blades.

Yet a further object of the present invention is to provide a hub construction wherein a novel arrangement is employed to lock each propeller blade in the blade sleeve.

To achieve these objects the invention comprises the broad concept of mounting a casing to the flange provided on the outer end of the crankshaft. Supported within the casing are sleeve members for each propeller blade and each sleeve is provided with means that coact with complementary means formed on the propeller blade to lock each blade in the sleeve at an angle to the axis of the hub against longitudinal displacement. In addition, the respective sleeves are operatively connected in a manner to effect synchronization of the pitch change movement of the blades.

In the drawings, wherein like reference characters designate the same part:

Figure 1 is a view in side elevation showing my novel hub construction mounted to a flanged crankshaft.

Figure 2 is a sectional view taken along the line 2-2 of Figure 1 looking in the direction of the arrows.

Figure 3 is a sectional view taken along the line 3-3 of Figure 1 looking in the direction of the arrows.

Figure 4 is a sectional view taken along the line 4-4 of Figure 2 looking in the direction of the arrows.

Figure 5 is a detail sectional view showing a modified type of cylinder which may be employed in conjunction with the means whereby the pitch change of the blades may be synchronized.

Figure 6 is a transverse sectional view of a modified type of hub construction that may be employed.

Figure 7 is a sectional view taken along line 7-7 of Figure 6 looking in the direction of the arrows.

Referring to the drawings and in particular to Figure 1, I have illustrated a crankshaft 1 having an annular flange 2 adjacent to its upper end and removably secured thereto by locking members 3. An annular flange 4 is provided on my novel hub member designated generally 5. The hub 5 is a split type casing and includes an upper section 6 and a lower section 7 which are secured together by bolts or the like 8. Each end of the hub is formed with an internal flange 9 to provide a somewhat reduced aperture 10 through which extends a sleeve 11 that is bored at an angle to its longitudinal axis as indicated by the numeral 12. Each sleeve is provided with an exterior annular flange 13 and an annular socket 14. When the hub is assembled, it is adapted to securely hold a pair of internally flanged collars or the like 15. Each collar 15 contains an assembly, as clearly illustrated in Figure 2 which comprises combined radial and thrust bearing 16 and an oil packing ring 17 which surround the sleeve 11 between the flange 13 and the flange of the collar 15.

Each propeller blade which is shown by the numeral 18 is formed with an annular groove 19 which communicates with a stepped bore 20 formed in the shank of the blade by means of a diagonal passageway 21. The sleeve 13 is made with a similar annular groove 22 and as shown in Figure 2, the grooves 19 and 22 coact to hold therebetween a series of balls 23. In order to introduce the balls 23 into the grooves they are disposed within the stepped bore 20 from whence they move through the passageway 21 into the grooves. After the desired number of balls 23 are in the grooves, a plug 24 frictionally engages the walls of the stepped bore 20 and closes the lower end of the passageway 21. It can be seen that when the propeller blade is in the position shown in Figure 2, the passageway is slightly removed laterally from the radius of the grooved section and as a result, there is no danger of the balls reentering the passageway 21. By virtue of the foregoing, it will be appreciated that each propeller blade 18 is locked positively against any

longitudinal movement in its sleeve 11 which, of course, is a highly desirable characteristic. To lock the blade 18 in its correctly adjusted position, it will be observed that the outer extremity of each sleeve 11 is provided with a plurality of longitudinally extending slots 25. A clamping ring 26 surrounds the slotted area of the sleeve and, of course, by proper manipulation of bolt 26', the ring 26 will be tightened around the slotted end of the sleeve to maintain the blade 18 in position. Mounted within the annular socket is an outer race 27 of a ball bearing indicated 28. Inner race 27' is an elongated sleeve and forms the race for each of the outer races 27. It is believed obvious that the ball bearing 28 in conjunction with the thrust bearing 15 will provide a cantiliver support for the propeller blade 18.

To synchronize the pitch change of the blades 18 attention is called to Figures 2 and 3 wherein it will be noted that the inner face of each sleeve 13 has secured thereto a button 29. Suitably attached to each button 29 is a link 30 that are secured at their lower extremities, as indicated at 31, to a piston 32 which is adapted to reciprocate in cylinder 33 mounted suitably within the upper end of the crankshaft 1. In order to limit the extent of the downward movement of the piston 32 and consequently the pitch change movement of the blades in one direction, a washer or the like 33' may be disposed within the cylinder 33 and seated adjacent the bottom of the cylinder 33 as clearly shown in the drawings. A limit button 34 is mounted eccentrically on each flange 13 in such a manner that they are capable of adjustment. These buttons are adapted to contact each other upon movement of the sleeve to limit the amount of pitch change of the blade in the opposite direction.

In operation, when the pitch of one of the blades 18 is changed, the movement thereof will be transmitted to the link 30 and by virtue of the fact that the other link is attached by a common member to the piston 32, the movement of the piston will cause a corresponding movement to the other propeller blade.

By reference to Figure 5, it will be noted that I have provided a somewhat modified type of piston and cylinder that may be employed. In this particular form a helical spring 35 is disposed between the lower end of the piston 32' and the bottom wall of the cylinder whereby the spring will return the links 30 to their original position when pressure on the piston is relieved.

A somewhat modified form of my basic concept illustrated in Figures 1 to 5 is shown in Figures 6 and 7. It will be observed that the upper end of the crankshaft 1 is sealed by a cap or the like 40 and that the upper section 6 of the casing 5 is formed with a threaded aperture 41. A cap 42 which also provides a cylinder is threaded into the aperture 41 and the free end of each link 30 is secured to a piston 42 as shown at 44 for reciprocatory movement in the cylinder 42. The piston has mounted therein a sleeve 45 acting as a limit stop for the pitch change movement of the blades 18. In view of the fact that the operation of this embodiment is substantially the same as that previously described, it is not thought necessary to elaborate further.

By virtue of the present invention, it is possible to operatively connect automatic variable pitch propeller blades to a flanged type crankshaft. Moreover, I have provided a mechanism whereby the pitch change of the blades is synchronized

and in addition my novel hub assembly will effect a locking of the blade in its sleeve.

While I have shown and described the preferred embodiment of my invention, I wish it to be understood that I do not confine myself to the precise details of construction herein set forth by way of illustration, as it is apparent that many changes and variations may be made therein, by those skilled in the art, without departing from the spirit of the invention, or exceeding the scope of the appended claims.

I claim:

1. In a hub construction for operatively attaching automatic variable pitch propeller blades to a flanged propeller shaft, a semi-cylindrical base portion, a flanged radial extension thereon adapted to be attached to the flanged propeller shaft, an internal shoulder at each longitudinal end of said base, a semi-cylindrical cap portion adapted to be attached to the semi-cylindrical base portion to form a hub, an internal shoulder at each longitudinal end of said cap, and a pair of opposed blade assemblies disposed in the hub, each of said blade assemblies comprising an internally flanged sleeve adapted to be coaxially clamped between said semi-cylindrical base and cap and in engagement with said shoulders, an externally flanged sleeve concentrically mounted for rotary movement in said internally flanged sleeve, anti-friction bearing means concentrically disposed between said sleeves and between said internal and external flanges, and a propeller blade adjustably secured in each of said externally flanged sleeves.

2. In a hub construction for operatively attaching automatic variable pitch propeller blades to a flanged propeller shaft, a semi-cylindrical base portion having a flanged radial extension thereon adapted to be operatively attached to the flanged propeller shaft, an internal shoulder at each longitudinal end of said base, a semi-cylindrical cap portion adapted to be attached to the base to form a hub, an internal shoulder at each longitudinal end of said cap, a pair of opposed blade assemblies disposed in the hub, each of said blade assemblies comprising an internally flanged sleeve adapted to be coaxially clamped between said base and cap and in engagement with said shoulders, an externally flanged sleeve concentrically mounted for rotary movement in said internally flanged sleeve, anti-friction bearing means concentrically disposed between said sleeves and between said flanges, a propeller blade adjustably secured in each of said externally flanged sleeves, and a swiveling spacing member in operative engagement with each of said externally flanged sleeves.

3. In a hub construction for operatively attaching automatic variable pitch propeller blades to a flanged propeller shaft, a semi-cylindrical base portion, a flanged radial extension thereon adapted to be attached to the flanged propeller shaft, a semi-cylindrical cap portion adapted to be attached to the semi-cylindrical base portion to form a hub and a pair of opposed blade assemblies disposed in the hub, each of said blade assemblies comprising an internally flanged sleeve adapted to be coaxially clamped between said semi-cylindrical base and cap, an externally flanged sleeve concentrically mounted for rotary movement in each of said internally flanged sleeves, anti-friction bearing means concentrically disposed between said sleeves and between said internal and external flanges, a propeller blade adjustably secured in each of said externally

flanged sleeves, means within said hub and interconnecting said externally flanged sleeves for synchronizing rotary movement thereof, and a circular abutment member eccentrically attached for rotary adjustment to adjacent faces of each of said external flanges, said eccentric abutment members adapted to abut each other for limiting the rotary pitch changing movement of the blades to a variably predetermined amount.

4. In a hub construction for operatively attaching automatic variable pitch propeller blades to a propeller shaft, a semi-cylindrical base portion, a cylindrical radial extension thereon for attaching the base to the propeller shaft, a semi-cylindrical cap portion adapted to be attached to the base portion to form a hub, a pair of opposed coaxial sleeves non-rotatably supported between the base portion and the cap portion, a blade socket member rotatably mounted in each sleeve, anti-friction bearing means interposed between said socket member and sleeve an annular flange on each blade socket member, a propeller blade adjustably secured in each socket member, a link pivotally connected to each of said flanges, an anchor member mounted for axial movement within said radial extension, and means for conjointly pivoting the free ends of said links to the anchor member whereby pitch changing movement of the blades is synchronized.

5. In a hub construction for operatively attaching automatic variable pitch propeller blades to a propeller shaft, a semi-cylindrical base portion, a cylindrical radial extension thereon for attaching the base to the propeller shaft, a semi-cylindrical cap portion adapted to be attached to the base portion to form a hub, a pair of opposed coaxial sleeves non-rotatably supported between the base portion and the cap portion, a blade socket member rotatably mounted in each sleeve, anti-friction bearing means interposed between said socket member and sleeve an annular flange on each blade socket member, a propeller blade adjustably secured in each socket member, a link pivotally connected to each of said flanges, an anchor member mounted for axial movement within said radial extension, means for conjointly pivoting the free ends of said links to the anchor member whereby pitch changing movement of the blades is synchronized, and resilient means cooperating with the links normally to effect a reducing pitch rotational movement of said blade socket members.

6. In a hub construction for operatively attaching automatic variable pitch propeller blades to a propeller shaft, a semi-cylindrical base portion, a cylindrical radial extension thereon for attaching the base to the propeller shaft, a semi-cylindrical cap portion adapted to be attached to the base portion to form a hub, a pair of opposed coaxial sleeves non-rotatably supported between the base portion and the cap portion, a blade socket member rotatably mounted in each sleeve, anti-friction bearing means interposed between said socket member and sleeve an annular flange on each blade socket member, a propeller blade adjustably secured in each socket member, a link pivotally connected to each

of said flanges, an anchor member mounted for axial movement within said radial extension, means for conjointly pivoting the free ends of said links to the anchor member whereby pitch changing movement of the blades is synchronized, and an abutment fixedly positioned in the path of movement of the anchor member for limiting the rotational movement of the blade sockets.

7. In a hub construction for operatively attaching automatic variable pitch propeller blades to a propeller shaft, a semi-cylindrical base portion, a cylindrical radial extension thereon for attaching the base to the propeller shaft, a semi-cylindrical cap portion adapted to be attached to the base portion to form a hub, a pair of opposed coaxial sleeves non-rotatably supported between the base portion and the cap portion, a blade socket member rotatably mounted in each sleeve, anti-friction bearing means interposed between said socket member and sleeve an annular flange on each blade socket member, a propeller blade adjustably secured in each socket member, a link pivotally connected to each of said flanges, an anchor member mounted for axial movement within said radial extension, means for conjointly pivoting the free ends of said links to the anchor member whereby pitch changing movement of the blades is synchronized, resilient means cooperating with the links normally to effect a reducing pitch rotational movement of said blade sockets in one direction, and an abutment member attached to each of said flanges, said abutment members cooperating to limit the rotational movement of the blade sleeves in the opposite direction.

8. In a hub construction for operatively attaching automatically variable pitch propeller blades to a propeller shaft, a cylindrical blade mounting element, a cylindrical radial extension thereon for attaching the blade mounting element to the propeller shaft, a pair of opposed blade receiving socket members rotatably mounted in said element, a propeller blade adjustably secured in each socket member, a pair of links each having one of its ends respectively pivotally connected to each socket member, an anchor member mounted for axial movement within said cylindrical radial extension, and means pivotally connecting the opposite ends of said links to the anchor member.

9. In a hub construction for operatively attaching automatically variable pitch propeller blades to a propeller shaft, a cylindrical blade mounting element, a cylindrical radial extension thereon for attaching the blade mounting element to the propeller shaft, a pair of opposed blade receiving socket members rotatably mounted in said element, a propeller blade adjustably secured in each socket member, a pair of links each having one of its ends respectively pivotally connected to each socket member, a movable anchor member, means pivotally connecting the opposite ends of the links to the anchor member, and means for guiding the anchor member in a direction normal to the axis of rotation of the blade receiving sleeves.

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