April 5, 1932. J. R. ZIPAY 1,852,501

VARIABLE PITCH PROPELLER MECHANISM

Original Filed April 21, 1931

Fig. 1

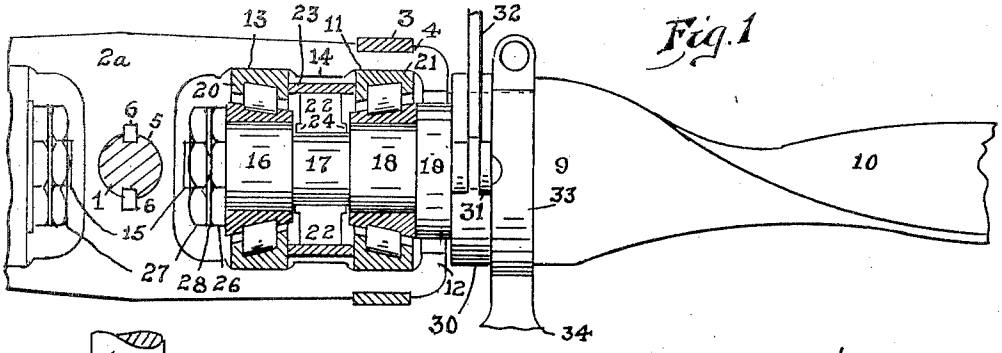


Fig. 2

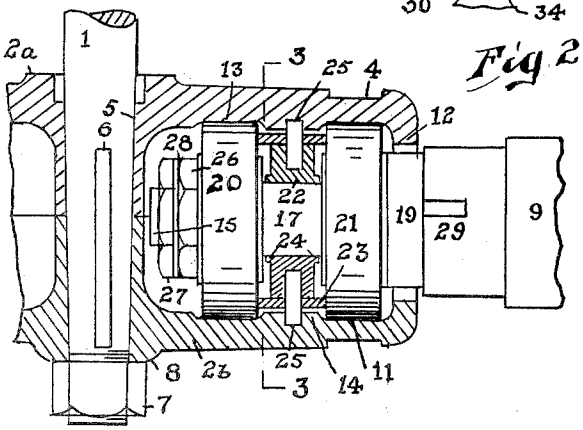


Fig. 3

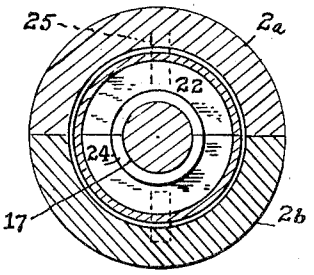


Fig. 4

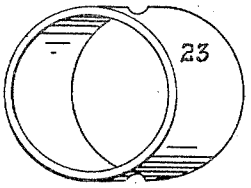
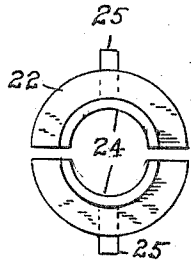


Fig. 5



INVENTOR

John Rapp Zipay

by Edward A. Laurence

his attorney

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UNITED STATES PATENT OFFICE

JOHN RAPP ZIPAY, OF PITTSBURGH, PENNSYLVANIA

VARIABLE PITCH PROPELLER MECHANISM

Application filed April 21, 1931. Serial No. 531,710.

This application is in part a continuation of my pending patent application Serial No. 436,748, filed in the United States Patent Office on March 18, 1930.

In variable pitch propeller structures the stems of the propeller blades are journaled in the ends of the propeller bushing which is fixed on the propeller shaft and means are usually provided, under the control of the operator, for rotating said stems in the bushing and regulating the pitch.

When the propeller is revolving the centrifugal forces tend to withdraw the stems of the propeller blades from the ends of the bushing, an accident which results in the crash of the aeroplane.

My present invention relates to improved means for preventing such withdrawal and indeed any longitudinal movement of the propeller blades relative to the bushing.

For this purpose I have invented a new and improved journal structure by means of which the stems of the propeller blades are revolubly held in the bushing but are positively prevented from longitudinal movement relative to the bushing.

Novel features of construction and also of arrangement of parts will appear from the following description.

In the accompanying drawings, wherein I have illustrated a practical embodiment of the principles of my invention, Fig. 1 is a broken front elevation showing one part of a partible propeller bushing mounted on the propeller shaft and having journaled in its ends the stems of the two propeller blades.

Fig. 2 is a sectional view taken on a plane at right angles to that of Fig. 1.

Fig. 3 is a sectional view taken along the line 3—3 in Fig. 2.

Fig. 4 is a perspective of the sleeve for one of the parted holder-rings.

Fig. 5 is an end view of one of said holder-rings.

Referring to the drawings, 1 represents the propeller shaft of the aeroplane which is driven in the usual manner by the motor. On the outer end of the shaft is mounted the transversely disposed propeller bushing which is parted and comprises the parts 2*a* and 2*b*, the plane of parting being preferably at right angles to the axis of the shaft.

The bushing parts indicated at 2*a* and 2*b* are clamped together by means of the clamping straps 3 which occupy the annular seats 4 cut in the perimetral surfaces of the propeller parts. In practice these clamping straps are usually of two parts hinged together with their free ends compressed together by suitable clamp bolts.

The central portions of the bushing parts are solid and are provided with registering bores 5 to receive the end of the propeller shaft 1, the bores and the shaft being tapered to provide a wedge fit, and the shaft being keyed to the parts as at 6. The outer end of the shaft is threaded to receive the holding nut 7 which is tightened against the annular boss 8 which forms the outer end of the bore 5 of the bushing part 2*b*.

At either side of their solid centers the bushing parts are cavitated to form, when the bushing is assembled, cylindrical bores into which the stems 9 of the propeller blades 10 are journaled.

Said bushing bores are provided adjacent to their outer ends with the annular seats 11, the outer walls of said seats being formed by the inwardly extending annular lips 12 at the ends of the bushing. Spaced inwardly from the seats 11 and formed in the wall of the bores are the similar annular seats 13, thus leaving between each pair of seats 11—13 an annular internal shoulder 14.

Each stem 9 has a reduced and threaded inner extremity 15 and adjacent thereto a cylindrical enlargement or shoulder 16, which when the elements are assembled is alined with the corresponding seat 13. Next to the shoulder 16 the stem is provided with a cylindrical neck 17 of less diameter and next to the neck 17 the stem is provided with the cylindrical shoulder 18 which is alined with the corresponding seat 11. Next to the shoulder 18 the stem 9 is provided with a shoulder 19 of still greater diameter which revolves within the lip 12 but does not contact therewith.

20 is a tapered roller bearing assembly whose outer member is contained in the seat 13 while its inner member is of proper inte-

rior diameter to fit on the shoulder 16. 21 is a similar bearing assembly with its outer member contained in a seat 11 while its inner member is mounted on the shoulder 18. The planes of parting of the two bearings converge towards each other and towards the journal, as shown at the right in Fig. 1.

22 represents a holder-ring which is split or parted diametrically and which fits loosely about the neck 17 of the journal, the parts of the holder-ring being held against separation by a solid encircling sleeve 23 which fits between the outer bearing members.

The parts of the holder-ring 22 are provided with hub flanges 24 extending towards either side and which encircle the neck 17 between the shoulders 16 and 18 and thus hold the body of the ring out of frictional contact with the roller bearing.

25 represent dowels which fit in holes bored radially of the holder-ring parts, and which extend through holes in the sleeve 23 and into sockets bored into the neck 17. Thus the holder-rings are prevented from rotary motion relative to the bushing.

The inner threaded end 15 of the journal has applied thereto the lock nuts 26 and 27 with the interposed washer 28.

As an additional safeguard against the accidental unscrewing of the nuts from the journal the bore of the bushing parts 2*a* and 2*b* is made short enough to clear the end of the journal but too short to permit the nuts to drop off the end of the journal.

When the elements are assembled and the bushing parts clamped together a very strong structure is provided. It is apparent that the bearing assemblies can not move out of their proper position because of the seats 11 and 13 and the holder-ring whose hub portion is interposed between the shoulders 16 and 18 on the propeller stem will prevent longitudinal movement of the propeller blades relative to the bushing even if the nuts on the inner end of the journal be absent.

Outside of the shoulder 19 the stems of the propeller blades 11 are provided with a cylindrical surface 29 upon which is mounted the collar 30 having a radially disposed crank 31 to which are connected the levers 32 which lead to the control device, not shown, convenient to the hand of the operator.

Also clamped on the surface 29 are the split collars 33 which carry the counter-balance weights 34.

I claim:—

1. In a variable pitch propeller mechanism for aircraft and like purposes, the combination with the propeller shaft of a bushing arranged to be secured on said shaft in transversely disposed relation thereto, said bushing being provided with bores at either side of said shaft and each of said bores being provided with a pair of spaced apart annular seats formed in the wall of the bore, propeller blades having stems which are journaled in said bores, anti-friction bearing mechanisms having their outer raceways engaged in said seats and their inner raceways mounted on said stems, each of said stems having a reduced neck between the inner and outer raceways, and a holder ring encircling said necks and held against movement longitudinal of the bushing.

2. In a variable pitch propeller mechanism for aircraft and like purposes, the combination with the propeller shaft of a bushing arranged to be secured on said shaft in transversely disposed relation thereto, said bushing being provided with bores at either side of said shaft and each of said bores being provided with a pair of spaced apart annular seats formed in the wall of the bore, propeller blades having stems which are journaled in said bores, anti-friction bearing mechanisms having their outer raceways engaged in said seats and their inner raceways mounted on said stems, each of said stems having a reduced neck between the inner and outer raceways, and a holder-ring encircling said necks and fixed relative to the bushing.

3. In a variable pitch propeller mechanism for aircraft and like purposes, the combination with the propeller shaft of a bushing arranged to be secured on said shaft in transversely disposed relation thereto, said bushing being provided with bores at either side of said shaft and each of said bores being provided with a pair of spaced apart annular seats formed in the wall of the bore, propeller blades having stems which are journaled in said bores, anti-friction bearing mechanisms having their outer raceways engaged in said seats and their inner raceways mounted on said stems, each of said stems having a reduced neck between the inner and outer raceways, a parted holder-ring encircling the neck of the stem, and means to prevent movement of the ring longitudinally of the bushing.

4. In a variable pitch propeller mechanism for aircraft and like purposes, the combination with the propeller shaft of a bushing arranged to be secured on said shaft in transversely disposed relation thereto, said bushing being provided with bores at either side of said shaft and each of said bores being provided with a pair of spaced apart annular seats formed in the wall of the bore, propeller blades having stems which are journaled in said bores, anti-friction bearing mechanisms having their outer raceways engaged in said seats and their inner raceways mounted on said stems, each of the stems having a reduced neck between the inner and outer raceways, and a holder-ring encircling said neck and having its outer portion engaged between the outer raceways.

5. In a variable pitch propeller mechanism for aircraft and like purposes, the combina-

tion with the propeller shaft of a bushing arranged to be secured on said shaft in transversely disposed relation thereto, said bushing being provided with bores at either side of said shaft and each of said bores being provided with a pair of spaced apart annular seats formed in the wall of the bore, propeller blades having stems which are journaled in said bores, anti-friction bearing mechanisms having their outer raceways engaged in said seats and their inner raceways mounted on said stems, each of the stems having a reduced neck between the inner and outer raceways, a parted holder-ring encircling said neck and having its outer portion engaged between the outer raceways, and a sleeve holding the parts of said ring in position.

6. In a variable pitch propeller mechanism for aircraft and like purposes, the combination with the propeller shaft of a bushing arranged to be secured on said shaft in transversely disposed relation thereto, said bushing being provided with bores at either side of said shaft and each of said bores being provided with a pair of spaced apart annular seats formed in the wall of the bore, propeller blades having stems which are journaled in said bores, anti-friction bearing mechanisms having their outer raceways engaged in said seats and their inner raceways mounted on said stems, each of the stems having a reduced neck between the inner and outer raceways, a parted holder-ring encircling said neck and having its outer portion engaged between the outer raceways, and a sleeve holding the parts of said ring in position, said ring and sleeve being fixed relative to the bushing.

Signed at Pittsburgh, Pa., this 18th day of April, 1931.

JOHN RAPP ZIPAY.