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C. B. KIRKHAM
PROPELLER MOUNTING
Filed Oct. 7, 1918

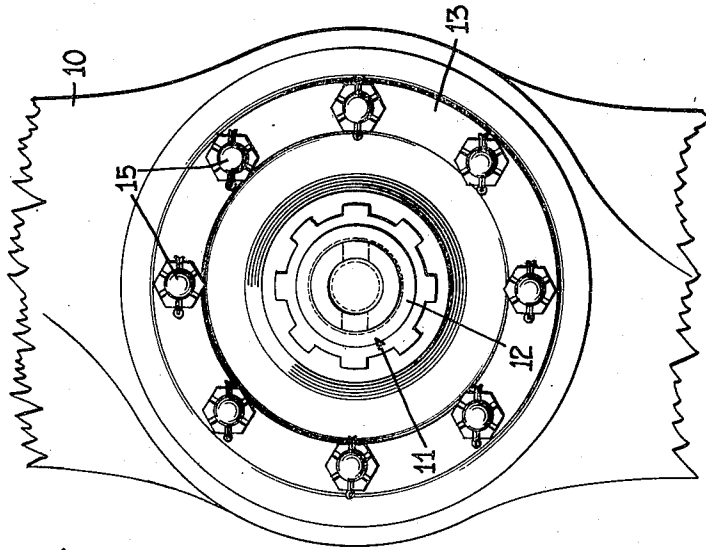


FIG. 1

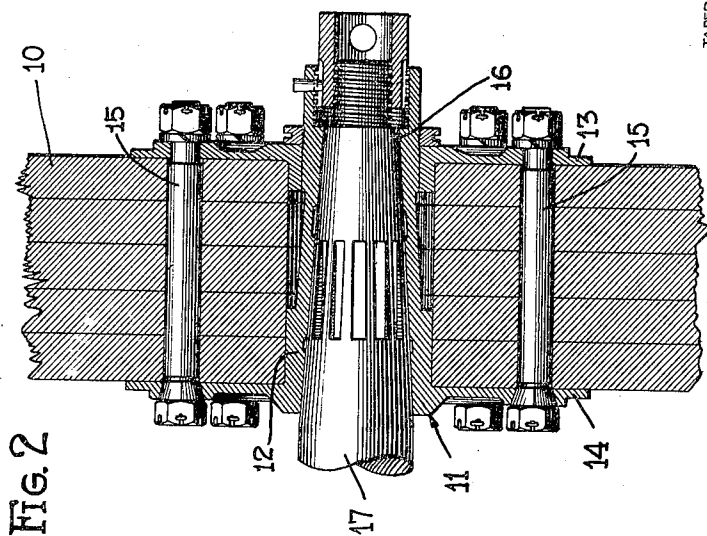
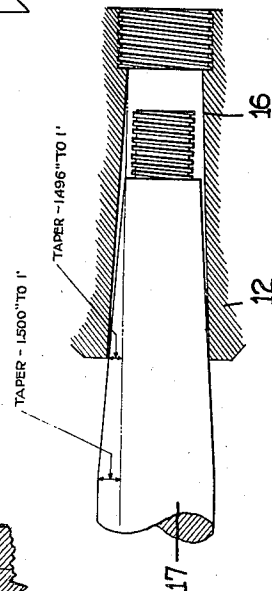


FIG. 2

FIG. 3.



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UNITED STATES PATENT OFFICE.

CHARLES B. KIRKHAM, OF GARDEN CITY, NEW YORK, ASSIGNOR TO CURTISS AEROPLANE AND MOTOR CORPORATION, A CORPORATION OF NEW YORK.

PROPELLER MOUNTING.

Application filed October 7, 1918. Serial No. 257,276.

To all whom it may concern:

Be it known that I, CHARLES B. KIRKHAM, a citizen of the United States, residing at Garden City, in the county of Nassau and State of New York, have invented certain new and useful Improvements in Propeller Mountings, of which the following is a specification.

My invention relates to propeller mountings and embodies a drive fit, as distinguished from a line or snug fit, between the hub of the propeller and the propeller shaft.

Heretofore a snug or line fit between the propeller hub and its driving shaft has been provided. This fit while seemingly tight and more or less snug is very often inexact or inaccurate. In machining the parts accuracy to a thousandths of an inch is required. Even the slightest inaccuracy in mating the parts causes a certain amount of play, not noticeable at first, to exist between them. This play, as a result of vibrations set up in the propeller shaft, greatly enlarges until the propeller at the hub, rides loosely on the shaft and finally, when least expected, causes the propeller to break or fracture. Obviously such a condition is dangerous. To eliminate this danger a drive fit between the propeller and the propeller hub is effected. In obtaining the drive fit the propeller hub sleeve is provided with an inside taper somewhat less than the outside taper of the driving end of the propeller shaft. This construction, as the propeller hub is driven on the propeller shaft, places the hub under tension at the point of maximum diameter of the propeller shaft with the result that the drive fit is secured and all possibility of even the slightest play or lost motion between the mating parts prevented.

Of the drawings:

Fig. 1 is a face view of the hub section of a propeller illustrating its mounting;

Fig. 2 is a transverse sectional view of the propeller mounting; and

Fig. 3 is a diagrammatic view illustrating graphically the difference in taper and diameter between the hub sleeve and the propeller shaft.

In the embodiment of the invention selected for illustration a two-bladed propeller 10 is shown. At its hub section the propeller is provided with a hub 11 comprising a hub sleeve 12, face plates 13 and 14 and securing bolts 15, the latter being pro-

vided for securing the propeller 10 to the hub.

In machining the hub sleeve 12 of the propeller hub the diameter of the bore 16 of the hub sleeve is made larger at its inner end than at its outer end. Ordinarily the diameter of the bore throughout its full length corresponds exactly with the diameter of the correspondingly tapered terminal of the propeller shaft 17 whereby in mating the two parts a line or tight fit is provided. As intimated above, much trouble is encountered in accurately machining these mating parts because of the fact that the slightest variation in diameter between them results in a more or less inaccurate fit. To secure a perfect fit, if such a fit is possible, (in following the practice hereinbefore outlined) it is necessary that the tapered end of the propeller shaft and the bore of the hub sleeve be given exactly the same diameter to the thousandths of an inch. Such exactness or accuracy is next to impossible. In grinding the tapered end of the propeller shaft and in reaming the bore of the hub sleeve, inaccuracies, due to improper adjustment of the machining tools, invariably occur. It is for this reason that play or lost motion between the mating parts exists. Moreover, the keys and keyways, even though perfectly mated can not under the old practice be relied upon to prevent lost motion between the propeller hub and the propeller shaft in a direction at right angles to the propeller axis.

The present invention contemplates, instead of tapering the propeller shaft terminal and the bore of the hub sleeve to the same extent, a slight difference in taper. For instance, the bore of the propeller hub sleeve is provided with a taper of 1.496 in. per ft. whereas the correspondingly tapered part of the propeller shaft is provided with a greater taper, say, a taper of 1.500 in. per ft., it being understood that the outer or smaller end of the propeller shaft and the correspondingly tapered part of the hub sleeve are provided with substantially the same taper, or at least the difference in taper is substantially less than the difference in taper of the larger end of the propeller shaft and the correspondingly tapered part of the hub sleeve. This difference in taper puts the walls of the hub sleeve throughout a portion of its length under direct tension and in consequence thereof necessitates a

forced or drive fit between the hub sleeve and the propeller shaft. In other words, the diameter of the stub terminal of the propeller shaft at one end is preferably exactly
5 equal to the diameter of the bore of the propeller sleeve at its corresponding end while the diameter of the stub shaft terminal at its opposite end is several thousandths of an inch greater than the original diameter of the bore of the hub sleeve at a corresponding point.
10

As above pointed out, the drive fit between the propeller hub and the propeller shaft forms a true and effective direct driving and
15 torque transmitting engagement between the mating parts and at the same time eliminates all lost motion and play between them longitudinally of the shaft. By compressing or contacting the walls of the hub sleeve
20 they are made to yield slightly and at the same time firmly grip the propeller shaft and "follow up" its movement relatively to the propeller should slight movement, for any reason, take place. Moreover, all hammering or pounding action between the
25 mating parts is eliminated.

The difference in taper between the propeller shaft and the propeller hub sleeve may be more or less than the difference suggested. If more, assuming the materials
30 used are of the highest grade, greater driving force will be required in mounting the propeller. If less, the driving force can be diminished. It is essential however, that sufficient driving force be exerted to rigidly
35 imbed the stub terminal within the hub sleeve and eliminate altogether even the slightest lost motion between them.

It is immaterial from the standpoint of

this invention whether or not keys and key- 40 ways are provided of the character illustrated. It is also immaterial whether or not the means illustrated for locking the mating parts together is used. It is essential however that a slight difference in taper be provided with the result that an actual drive fit 45 between the shaft and hub may be effected. A snug fit, a line fit, or even a tight fit, will not answer.

While I have described my invention in 50 detail in its present preferred embodiment, it will be obvious to those skilled in the art after understanding my invention, that various changes and modifications may be made therein without departing from the 55 spirit or scope thereof. I aim in the appended claim to cover all such modifications and changes.

What is claimed is:—

In a propeller mounting, a propeller shaft 60 having a tapered terminal, and a propeller hub having a tapered bore within which the tapered terminal of the propeller shaft is fitted, the degree of taper of the bore of the propeller hub being somewhat less than the 65 degree of taper of the terminal of the propeller shaft whereby a driving force is required in fitting the parts together and whereby the two parts when fitted together produce at one end of the tapered terminal 70 a snug fit and at the opposite end a drive fit as distinguished from a snug fit, the drive fit being the direct result of the driving force required in fitting the parts together.

In testimony whereof I hereunto affix my 75 signature.

CHARLES B. KIRKHAM.