

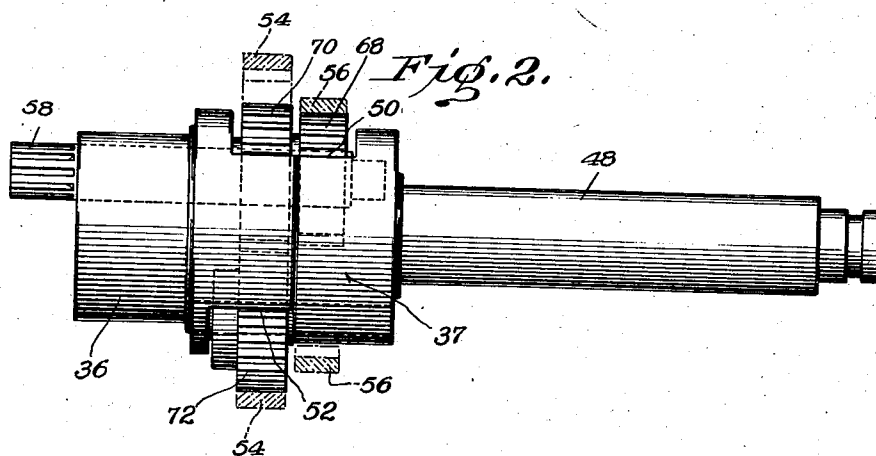
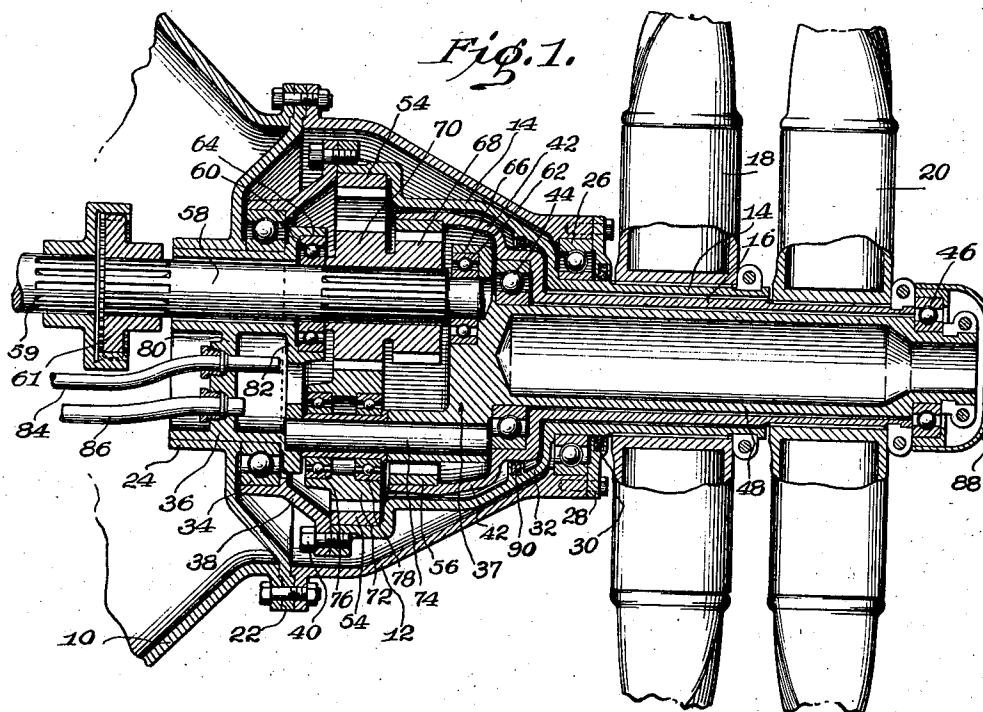
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PROPELLER DRIVE

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PROPELLER DRIVE

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This invention relates to air-craft propeller drive gears, and more particularly to a drive gear for driving dual propellers in opposite directions.

In single engine air-craft and dirigible air-craft the torsion resulting from the reaction of a single propeller is of considerable magnitude, and it is desirable to off-set such reaction torques. Where a propeller is located closely adjacent to a wing member the torque is more or less directly taken between the propeller and wing without very great undesirable effects. In planes where two propellers are employed by reversely rotating one propeller, its torque becomes neutralized by the other propeller. However, in any case where single propellers are employed, such propeller reaction must be transmitted through frame and wing members of the plane, thus setting up additional stresses which must be reckoned with in air craft design.

By employing dual propellers arranged to rotate about the same axis and closely adjacent one another, the reaction torque of one propeller is neutralized by the reverse rotation of the other, and consequently such torsion stresses as exist are directly carried to the engine frame or housing and are not transmitted through the air-craft structure itself. The present invention relates to improved dual propeller drives in which lightness and efficiency, as well as simplicity and rugged structure are present. The invention involves the use of concentric sleeve drive shafts for the two propellers each driven by an internal gear, one of which is directly driven, and the other indirectly driven through an idler pinion. The drive sleeves are journaled upon frame members entirely, thereby avoiding the journaling of one sleeve through another which would result in a relatively high speed journal. The arrangement of gears is such that various reduction speeds may be readily obtained and the speed of rotation of one propeller in one direction may be readily made different from the speed of rotation of the other propeller in the opposite direction.

It is accordingly an object of the invention to provide a dual propeller drive for opposite rotation in which each propeller is journaled independent of the other.

Another object of the invention is to provide a dual propeller drive in which a reduction gear ratio is present and in which differing propeller rotation speeds may be provided.

A further object of the invention is to provide a dual propeller drive construction of the utmost simplicity, lightness and ruggedness.

The above and other novel features of the invention will appear more fully hereinafter from the following detailed description when taken in conjunction with the accompanying drawing. It is expressly understood, however, that the drawing is employed for purposes of illustration only and are not designed as a definition of the limits of the invention, reference being had for this purpose to the appended claims.

In the drawing wherein similar reference characters refer to similar parts throughout the several views;

Figure 1 is a longitudinal section illustrating the general arrangement of drive mechanism and supporting structure and

Figure 2 is an elevation view of the main central support member.

Referring more particularly to Figure 1, it will be seen that there is shown therein an engine housing 10 having secured thereto a gear housing 12 in which are journaled propeller drive sleeves 14 and 16, each carrying a propeller hub 18 and 20.

Between the engine housing and the gear housing is arranged a support plate 22 having flanged central opening 24. The propeller drive sleeve 14 is journaled in said gear housing 12 upon an external bearing 26 located in the forward end of the housing and held in place by a front end cover plate 28 having an oil washer 30. The bearing 26 is positioned on the sleeve 14 in the angle resulting from the outward flare 32 of the sleeve just after it enters the gear housing 12. An internal bearing 34 is provided for the sleeve 14 adjacent the support plate 22 and is positioned on a sleeve-like portion 36 of the main support member 37 arranged in the flanged opening 24 of the support plate. The flared end of the sleeve 14 is provided with a bearing receiving collar 38 which may be secured to the sleeve in any suitable manner such as by bolts 40. There is thus provided a pair of spaced bearings 26 and 34 which support the propeller drive sleeve 14 in the manner of a cantilever.

The other propeller drive sleeve 16 which is telescopically mounted within the sleeve 14 and which extends forwardly beyond the sleeve 14 and rearwardly has a flare 42 nested within the flare 32 of the sleeve 14 and is supported for rotation upon internal bearings 44 and 46, in turn mounted upon the inner and outer ends respectively of a support shank 48, forming a part of the main support member 37.

The main support member of which the sleeve portion is a part extends from the flanged open-

ing 24 through the gear housing and merges into the shank 48 forming the bearing support for the propeller drive sleeve 16. Between the shank portion 48 and the sleeve portion 36, however, the main support member is cut away as indicated at 50 and 52 and as shown more particularly in Figure 2 in order that space may be provided for gearing to drive the propeller sleeves.

The drive means for the propeller sleeves consist of a pair of internal gears 54 and 56, one on each of the drive sleeves 14 and 16 and located within their respective flared portions 32 and 42. An engine-driven shaft 58 connected to the engine shaft 59 through a coupling 61 is journaled eccentrically in the flanged opening 24 of the support plate and upon external bearings 60 and 62 located respectively in annular recesses 64 and 66 formed in the end of the sleeve-like portion 36 of the main support member 37, and the inner end of the shank portion 48 respectively. The drive shaft 58 is provided with a pinion 68 directly driving the internal gear 56 of the propeller sleeve 16. There is also provided a pinion 70 on the drive shaft which indirectly drives the internal gear 54 through a reversing idler pinion 72. This latter pinion is journaled through bearings 76 and 78 upon a short shaft 74 extending between the sleeve-like portion 36 and the rear end portion of the shank 48 of the main support member 37.

The main support member, as will appear from the description already set forth, is a continuous integral member extending through the center of the entire assembly, the same taking the form of the hollow sleeve portion as described at 36 and extending on through to the hollow shank portion 48 and the two portions being connected together through a continuation of the sleeve portion, which continuation is provided with openings in the top and bottom to provide clearance for the drive gears. The sleeve portion may be provided with bulkheads 80 and 82 to assist in supporting the various bearings and lend rigidity thereto, and the whole assembly may be continuously supplied with cool oil circulating in through the tube 84 and out through the tube 86. This is made possible by the presence of the oil washer 30 as well as the cap piece 88 arranged over the front end of the sleeve 16 and also the oil washer 90 arranged between the sleeves, by reason of which the assembly is rendered oil tight.

It will be understood that the sleeves are splined or otherwise arranged to receive the propeller hubs, and the same are clamped in place in any suitable manner. It will also be understood that the various gears employed may be changed by varying the pitch diameters so that any gear ratio to one or the other propeller may be obtained. In practice it is generally preferable to drive the inner propeller at a rotation speed approximately 15% faster than the outer propeller and it is desirable also to drive both propellers at a speed much below that of the engine crank shaft speed. It will thus be seen that there is provided a novel combination of parts which cooperate to form a gear drive of extreme simplicity, ruggedness, lightness and strength, and satisfying all conditions.

Though a single embodiment of the invention has been illustrated and described, it is to be understood that the invention is not limited thereto but may be embodied in various mechanical forms. As many changes in construction and arrangement of parts may be made without

departing from the spirit of the invention, as will be apparent to those skilled in the art, reference will be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. In a dual propeller drive, a gear housing, a support member extending from the back of said housing and projecting out of the front thereof, a propeller drive sleeve journaled on said support member, a second propeller drive sleeve concentric with and surrounding a portion of said first named sleeve and journaled in said housing, internal gears on each of said sleeves, one being nested within the other, an idler pinion meshing with one of said internal gears, a drive shaft extending through the back of said housing having a pinion meshing with the other internal gear and a pinion meshing with said idler pinion.

2. In a dual propeller drive gear, a central support member having a shank portion merging into a hollow gear retaining portion of larger diameter than the shank portion, a propeller drive sleeve journaled on said shank portion and having a flared end provided with an internally toothed gear partially surrounding said gear retaining portion, a casing member surrounding said hollow gear retaining portion of the support in spaced relation, and secured thereto at the end opposite from the shank, a second propeller drive sleeve surrounding the first sleeve and terminating short of the first sleeve and journaled in said casing member, and having a flared end surrounding the flared end of said first mentioned sleeve and extending therebeyond, and having an internally toothed gear therein, a drive shaft eccentric to said sleeves and journaled in said gear retaining portion and having a pinion meshing with one of said internal gears, a second pinion on said drive shaft, and an idler pinion journaled in said gear retaining portion and meshing said second pinion and the other internal gear.

3. In a dual propeller drive gear, a central support member having a shank portion merging into a hollow gear retaining portion of larger diameter than the shank portion, a propeller drive sleeve journaled on said shank portion and having a flared end provided with an internally toothed gear partially surrounding said gear retaining portion, a casing member surrounding said hollow gear retaining portion of the support in spaced relation, and secured thereto at the end opposite from the shank, a second propeller drive sleeve surrounding the first sleeve and terminating short of the first sleeve and journaled in said casing member, and having a flared end surrounding the flared end of said first mentioned sleeve and extending therebeyond, and having an internally toothed gear therein, a drive shaft eccentric to said sleeves and journaled in said gear retaining portion and having a pinion meshing with one of said internal gears, a second pinion on said drive shaft, an idler pinion journaled in said gear retaining portion and meshing with said second pinion and the other internal gear and means for maintaining an oil tight seal to prevent oil leakage from said housing and support member.

4. In a dual propeller drive, a non-rotatable supporting shaft, inner and outer concentric tubular propeller driving shafts, each terminating at one end in an enlarged tubular housing, the housing of the outer shaft surrounding and extending axially beyond the housing of the inner shaft, internal gears carried by said housings,

said inner shaft being journalled upon said supporting shaft, a drive shaft journalled in said supporting shaft, the axis of said drive shaft being parallel to and radially offset with respect to said supporting shaft, gearing between said drive shaft and said internal gears for driving said inner and outer shafts, and means for journalling said outer shaft.

5. In a dual propeller drive, a non-rotatable supporting shaft, inner and outer concentric tubular propeller driving shafts, each terminating at one end in an enlarged tubular housing, the housing of the outer shaft surrounding and extending axially beyond the housing of the inner shaft, internal gears carried by said housings, said inner shaft being journalled upon said supporting shaft, a drive shaft journalled in said supporting shaft, the axis of said drive shaft being parallel to and radially offset with respect to said supporting shaft, gearing between said drive shaft and said internal gears for driving said inner and outer shafts, and means for journalling said outer shaft, said journalling means being supported from said supporting shaft axially beyond said enlarged housings.

6. In a dual propeller drive, a non-rotatable supporting shaft, inner and outer concentric tubular propeller driving shafts, each terminating at one end in an enlarged tubular housing, the housing of the outer shaft surrounding and extending axially beyond the housing of the inner shaft, internal gears carried by said housings, said inner shaft being journalled upon said supporting shaft, a drive shaft journalled in said supporting shaft, the axis of said drive shaft being parallel to and radially offset with respect to said supporting shaft, a jack shaft parallel to said supporting and drive shafts and being carried by said supporting shaft, a drive gear on said drive shaft in meshed relation with the internal gear of said inner shaft housing, a pinion in meshed relation with the internal gear of said outer shaft housing, a second gear carried by said drive shaft and in meshed relation with said pinion, and means carried by said outer shaft for journalling said outer shaft.

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