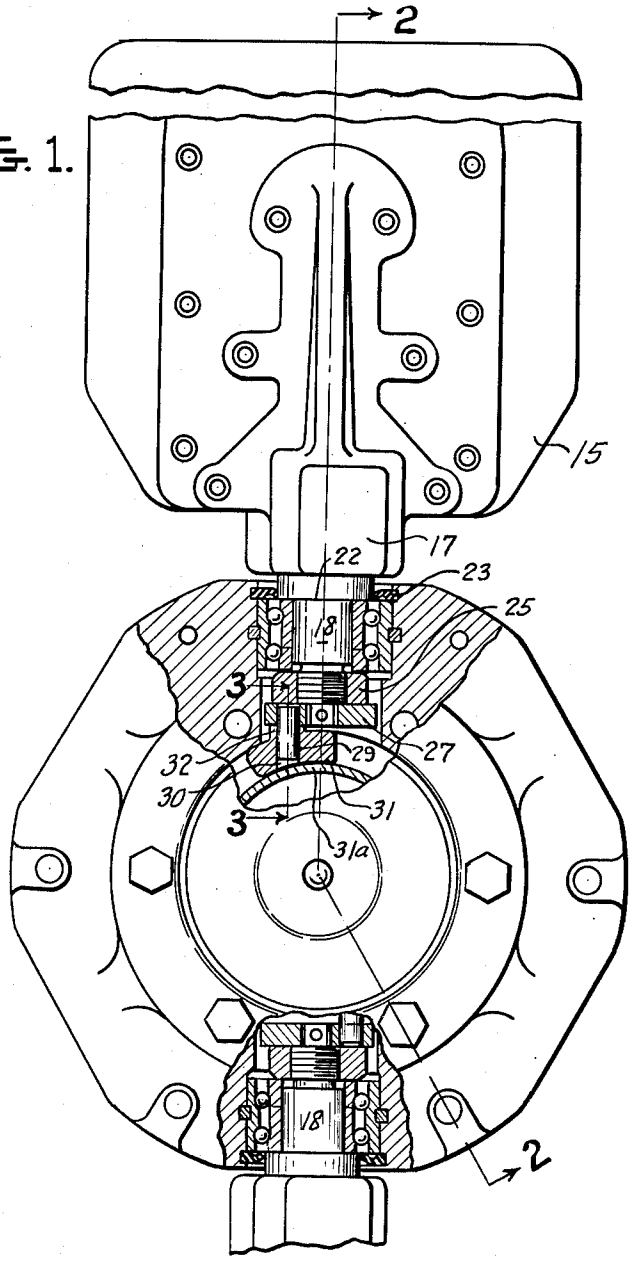
Aug. 23, 1949. J. J. BRANDON ET AL 2,479,668

VARIABLE PITCH FAN BLADE ASSEMBLY

Filed June 9, 1948 2 Sheets-Sheet 1

FIG. 1.



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FIG. 2.

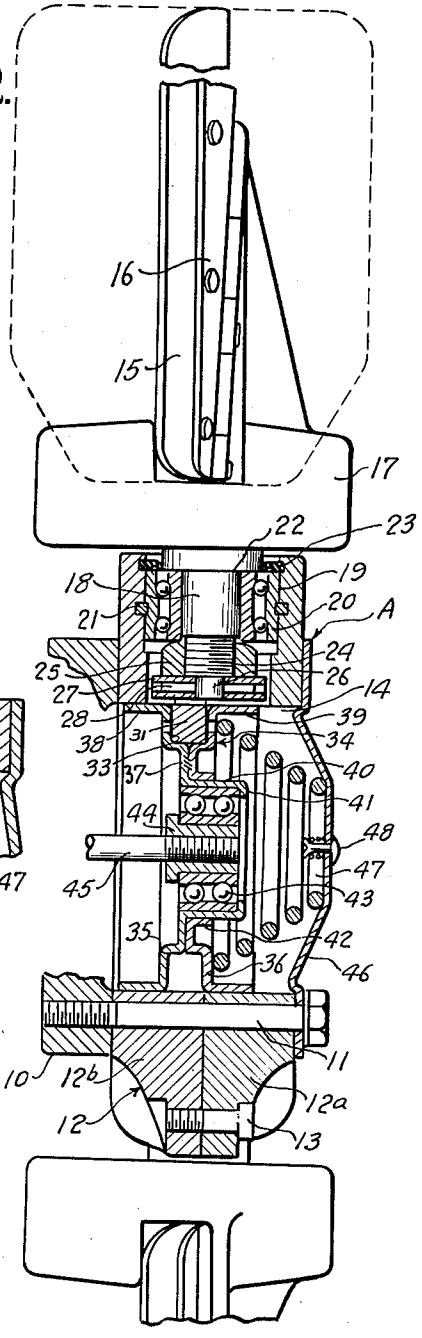
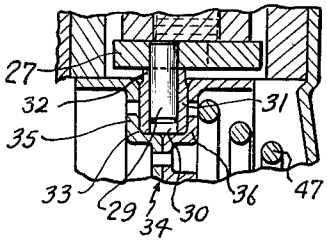


FIG. 3.



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VARIABLE PITCH FAN BLADE ASSEMBLY

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5 Claims. (Cl. 170—160.47)

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This invention relates to the cooling of internal combustion engines, but particularly to variable pitch fan assemblies for use in this connection, and an object is to improve and simplify variable pitch fan blade assemblies of this type to the end that they are rendered more reliable and efficient; they may be assembled more readily; they may be produced more economically on a quantity production basis; and they are sturdier so that they will withstand service demands.

Other objects and advantages of the invention will hereinafter appear, and for purposes of illustration but not of limitation, an embodiment of the invention is shown on the accompanying drawings, in which

Figure 1 is a fragmentary front end elevation of a variable pitch fan blade assembly, parts being broken away to show the operating mechanism, several of the fan blades being omitted;

Figure 2 is a vertical sectional elevation substantially on the line 2—2 of Figure 1; and

Figure 3 is an enlarged sectional view on the line 3—3 of Figure 1.

The illustrated embodiment of the invention comprises a variable pitch fan blade assembly A, which may be suitably mounted in advance of an internal combustion engine, for example, between the usual radiator and the engine block, and is driven from the engine, as will be readily understood by those skilled in the art. For example, 10 represents the hub of a drive sheave, which is secured by bolts 11 to the hub 12 of the fan blade assembly. The hub 12 is formed of two sections 12a and 12b which flatly abut against each other, a series of bolts 13 securing the peripheral edge portions of the hub sections together. The hub 12 is in the form of an annulus having an annular central apertured portion 14 and arranged equi-distantly of the outer portion of the hub are fan blades 15, which are secured to brackets 16 provided respectively with suitable counterweights 17. Each fan blade bracket has a stud shaft 18 which extends into a cylindrical socket 19 formed in the hub 12, one-half of the socket being formed in each of the hub sections 12a and 12b.

Interposed between the stub shaft 18 and the inner walls of the socket 19 is a ball bearing unit 20, which is held against shifting movement by a snap ring 21. The stub shaft 18 is shouldered at 22 to bear against the upper end of the bearing unit 20. A flexible non-metallic washer 23 has a portion recessed in the hub 12 and wipes against the enlarged portion of the stub shaft

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18 to provide an oil seal for militating against the loss of lubricant from the bearing unit 20.

The lower end portion of the stub shaft 18 is reduced and screw-threaded, as indicated at 24, to receive a nut 25 which bears against the inner race of the bearing unit 20. On the lower end of the screw-threaded shaft portion 24 is a reduced pin-like extension 26, which fits a central aperture in the disc 27, a pin 28 securing the disc 27 to the extension 26 so that the disc and stub shaft turn together.

Having a press fit in the disc 27 eccentrically thereof is a pin 29, which depends beyond the lower side thereof and extends relatively loosely into an opening or socket 30 formed in an intermediate portion of a shoe 31. The shoe 31 has an upstanding boss 32 at the upper end to bear flatly against the under side of the disc 27. The shoe is longitudinally elongate as indicated on Figure 1 and fits into a channel 33 formed in the periphery of a sleeve, generally indicated at 34, which, as will hereinafter appear, is shiftable axially or horizontally (Figure 2) within the central opening 14 of the hub. It will be manifest that axial movement of the sleeve 34 within the hub opening 14 (to the right or left of Figure 2) imparts similar movement to the shoe 27, thereby causing, through the eccentric pin 29, rotary motion of the fan blade 15, thereby to vary its pitch. Although a single fan blade and its mounting has been described, it will be understood that several equi-distantly spaced fan blades are carried by the hub 12 and are conjointly rotated about their axes to vary the pitch thereof.

The sleeve 34 is fabricated from a pair of metal stampings 35 and 36 formed with flat abutting surfaces, which are spot-welded together as indicated at 37, a number of spot welds being employed to produce a rigid structure. The outer edge or rim portion of each stamping is bent outwardly to provide oppositely extending annular rim flanges 38 and 39, which bear flatly against and are slidable along the wall of the opening 14. Adjacent the rim flanges 38 and 39, the metal of each stamping is recessed or shouldered to form the shoe-receiving channel 33, each stamping providing one-half of this channel, which extends circumferentially of the sleeve and into which the shoes 31 snugly fit. Since the bottom of the channel 33 is curvilinear, the base 31a of each shoe is also curvilinear to conform to the curvature of the channel, thereby to increase the bearing contact between the shoe and the base of the channel. The central por-

tion of the sleeve stamping 35 is bent to form a hub 40, the extreme end portion being flanged inwardly, as indicated at 41. The central portion of the sleeve stamping 36 is formed with a relatively short hub portion 42, which intimately engages a portion of the outer surface of the tubular portion 40.

Pressed into the hub portion 42 and abutting against the flange 41 is a ball bearing unit 43 and fixed to the inner race of the bearing unit 43 is a flange sleeve 44, which is internally screw-threaded to receive the threaded end portion of an actuating rod 45. Secured by the bolts 11 to the outer face of the hub 12 is a closure plate 46 against the inner face of which bears the smaller end of a conical coil spring 47, the opposite end of the spring 47 bearing against the sleeve 34 adjacent the rim flange 39. A spring-tensioned relief valve 48 is mounted centrally of the cover plate 46.

The rod 45 may be connected to and actuated by a thermostat (not shown) which is responsive to the temperature of the engine cooling liquid so that upon increase in temperature of the liquid, the rod 45 is moved to the right of Figure 2, thereby causing the fan blades 15 gradually to move into pitch in order to increase the volume of air supplied for engine cooling purposes. Upon decrease in the temperature of the engine cooling liquid, the rod 45 is moved to the left of Figure 2, allowing the coil spring 47 to actuate the sleeve 34 to the left of the figure, thereby gradually decreasing the pitch of the fan blades. Reference is hereby made to the patent to Earley et al. No. 2,437,810 dated March 16, 1948, for a more complete description and illustration of a suitable thermostatic control device.

An important characteristic of this invention resides in the actuating sleeve 34, which is simply and inexpensively constructed from metal stampings, which are secured together to produce a sturdy and reliable structure and one which is extremely light in weight, thereby obviating difficulties and expense heretofore occasioned in casting and machining of this part. The improved mounting of the shoes in the actuating sleeve enhances the efficiency of the assembly. Another feature of exceedingly practical advantage resides in the support for the fan blade carrying shaft, not only facilitating assembly but increasing the sturdiness of the structure to cope with vibration set up in the operation of the assembly.

It is to be understood that numerous changes in details of construction, arrangement and operation may be effected without departing from the spirit of the invention especially as defined in the appended claims.

What we claim is:

1. A variable pitch fan blade assembly comprising a centrally apertured rotatable hub, a plurality of fan blades arranged radially of said hub, a stub shaft for each fan blade mounted in said hub for rotary movement, a disc rotatable with said stub shaft, an eccentric pin on said disc and depending therefrom, a sleeve in the apertured portion of said hub for axial shifting movements, said sleeve comprising a pair of metallic stampings secured together, each stamping having a peripheral rim flange for sliding engagement with the wall of the hub aperture, an annular channel on the periphery of said sleeve, a shoe for each fan blade fitting said channel and having a bearing socket receiving the respective eccentric pin, each shoe being curved to conform

to the curvature of the channel thereby to provide a substantial bearing surface contact between the shoe and the channel, and means for imparting axial shifting movement to said sleeve.

2. A variable pitch fan blade assembly comprising a centrally apertured rotatable hub, a plurality of fan blades arranged radially of said hub, a stub shaft for each fan blade mounted in said hub for rotary movement, a disc rotatable with said stub shaft, an eccentric pin on said disc and depending therefrom, a sleeve in the apertured portion of said hub for axial shifting movements, said sleeve comprising a pair of metallic stampings arranged in abutting relation and fixedly secured together, said stampings providing therebetween an annular substantially U-shaped channel, a shoe for each fan blade fitting said channel and having a bearing socket for the respective eccentric pin, each shoe being curved in conformity to the curvature of said channel, and means for imparting axial shifting movement to said sleeve.

3. A variable pitch fan blade assembly comprising a centrally apertured rotatable hub, a plurality of fan blades arranged radially of said hub, a stub shaft for each fan blade mounted in said hub for rotary movement, a disc rotatable with said stub shaft, an eccentric pin on said disc and projecting therefrom, an actuating sleeve in the apertured portion of said support for axial shifting movements, said sleeve comprising a pair of metallic stampings fixedly secured in abutting relation, each stamping having annular rim flanges for sliding engagement with the apertured wall of said hub, a peripheral channel formed by the said flanges and extending circumferentially of the sleeve, a shoe for each fan blade fitting said channel and having a bearing socket for the respective eccentric pin, and means for imparting axial shifting movement to said sleeve.

4. A variable pitch fan blade assembly comprising a centrally apertured rotatable hub, a plurality of fan blades arranged radially of said hub, a stub shaft for each fan blade mounted in said hub for rotary movement, a disc rotatable with said stub shaft, an eccentric pin on said disc and projecting therefrom, an actuating sleeve in the apertured portion of said support for axial shifting movements, said sleeve comprising a pair of metallic stampings fixedly secured in abutting relation, each stamping having annular rim flanges for sliding engagement with the apertured wall of said hub, a peripheral channel formed by the said flanges and extending circumferentially of the sleeve, a shoe for each fan blade fitting said channel and having a bearing socket for the respective eccentric pin, a central hub sleeve integral with said stampings respectively, an anti-friction bearing unit within said hub sleeve, rod means engaging said anti-friction bearing for shifting said actuating sleeve in one direction, and a spring for shifting said actuating sleeve in the opposite direction.

5. A variable pitch fan blade assembly comprising a centrally apertured rotatable hub, a plurality of fan blades arranged radially of said hub, a stub shaft for each fan blade mounted in said hub for rotary movement, an anti-friction bearing unit in said hub for each stub shaft, a snap ring holding said bearing unit against endwise movements, an oil seal for said bearing unit for militating against loss of lubricant therefrom, a disc rotatable with said stub shaft, an eccentric

pin on said disc and projecting therefrom, an actuating sleeve in the apertured portion of said support for axial shifting movements, said sleeve comprising a pair of metallic stampings fixedly secured in abutting relation, each stamping having annular rim flanges for sliding engagement with the apertured wall of said hub, a peripheral channel formed by the said flanges and extending circumferentially of the sleeve, a shoe for each fan blade fitting said channel and having a bearing socket for the respective eccentric pin, a central hub sleeve integral with said stampings respectively, an anti-friction bearing unit within said hub sleeve, rod means engaging said anti-friction bearing for shifting said actuating sleeve

in one direction, and a spring for shifting said actuating sleeve in the opposite direction.

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