May 2, 1944. H. H. ROBY 2,348,095

GAUGE FOR SETTING THE PITCH OF PROPELLER BLADES

Filed March 30, 1942

Fig. 1.

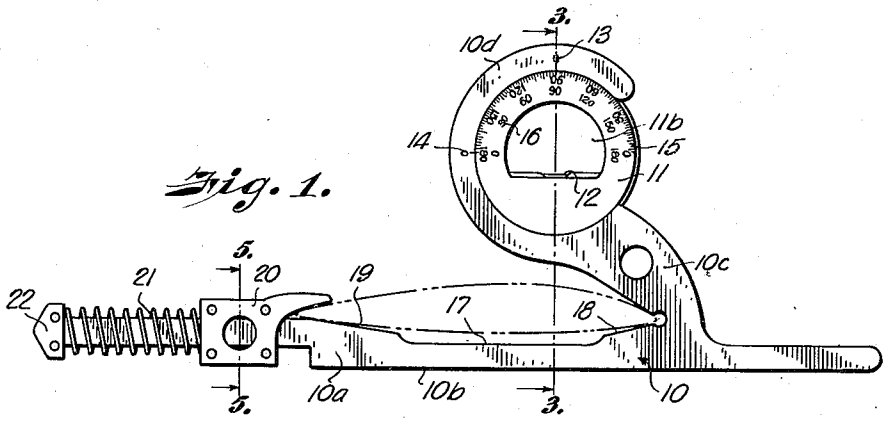


Fig. 2.

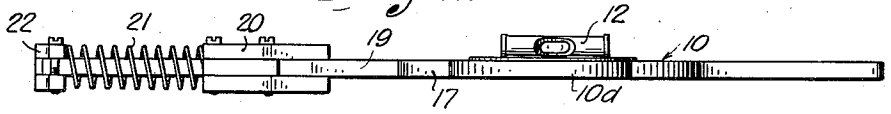


Fig. 3.

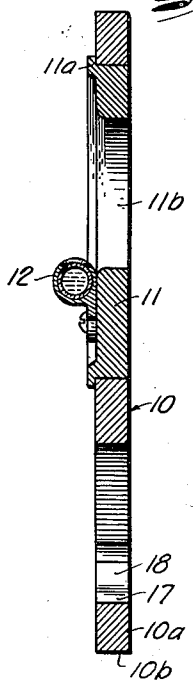


Fig. 4.

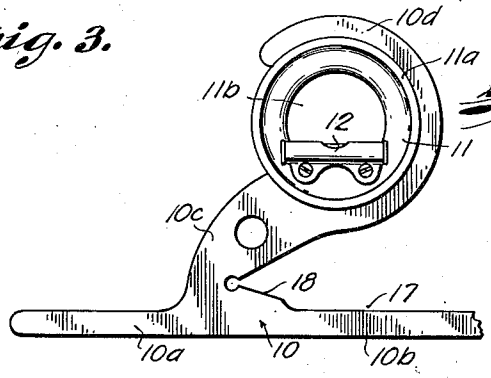
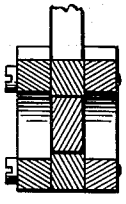


Fig. 5.



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GAUGE FOR SETTING THE PITCH OF PROPELLER BLADES

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5 Claims. (Cl. 33—174)

My invention relates to improvements in gauges for setting the pitch of propeller blades.

It is necessary that the blades of a propeller have the proper pitch and that each of the blades have the same pitch. In variable pitch propellers, the blades must be checked for trueness at regular intervals.

In setting the pitch of a propeller blade, it is customary to hold the gauge against the blade at a selected distance from the center of the hub. This distance is usually approximately two-thirds the distance from the center of the hub to the tip of the blade. A suitable indicating means cooperating with a scale on the gauge permits a reading of the pitch angle of the blade to be taken. However, this reading is not accurate unless the crank shaft on which the propeller is mounted is horizontal. When an airplane is resting on the ground, its crank shaft is tilted from the horizontal. Therefore, when measuring the pitch angle of the propeller blade, the angle at which the crank shaft is tilted must be taken into consideration. The usual practice is to dismount the entire propeller each time the pitch angle of the blades is measured.

An important object of my invention is to provide a novel propeller pitch gauge that permits the pitch angle of the propeller blades to be accurately determined without dismounting the propeller and regardless of the angle at which the fuselage and engine of the airplane are positioned.

Another object of my invention is the provision of a novel propeller pitch gauge that is self-clamping on the propeller blade thus leaving the mechanic's hands free to make other adjustments and to record the data obtained.

Still another object of my invention is the provision of a propeller pitch gauge of the above mentioned character that is light in weight, simple in construction, and efficient in operation.

Other objects and advantages of my invention will be apparent during the course of the following description.

In the drawing forming a part of this specification and wherein like numerals are employed to designate like parts throughout the same,

Fig. 1 is a front elevation of a propeller pitch gauge embodying my invention,

Fig. 2 is a top plan view of the same,

Fig. 3 is an enlarged vertical sectional view, taken on the line 3—3 of Fig. 1,

Fig. 4 is a fragmentary rear elevation of the gauge, and

Fig. 5 is a vertical sectional view, taken on the line 5—5 of Fig. 1.

In the accompanying drawing wherein is shown a preferred embodiment of my invention, the numeral 10 designates a frame of sheet metal. The frame comprises an elongated base 10*a* and a laterally extending integral arm 10*c*. The base 10*a* is formed with a rectilinear edge 10*b* and the arm 10*c* terminates in an arcuate extension 10*d*. The arcuate extension 10*d* partially surrounds and rotatably retains a level protractor disk 11.

As best shown in Fig. 3, the front surface of the protractor disk 11 is maintained flush with the front surface of the frame by a radial shoulder 11*a*. The protractor disk 11 is retained within the arcuate extension 10*d* by frictional engagement of its periphery with the inner edge of the extension. A spirit level 12 mounted on the rearward side of the protractor disk 11 may easily be seen through an opening 11*b* in the disk. Indicator marks 13 and 14 on the arcuate extension 10d cooperate with scales 15 and 16 on the protractor disk 11 to indicate the number of degrees that the protractor disk is rotated either to the right or left of the initial position shown in Fig. 1. Attention is directed to the fact that indicator mark 13 is disposed on a line which extends through the center of the protractor disk and is normal to the lower rectilinear edge 10*b* of the frame. The indicator mark 14 is disposed at an angle of 90 degrees from indicator mark 13. Each of the scales 15 and 16 extends through 180 degrees. Scale 15 extends in an anti-clockwise direction and the 180° mark registers with indicator mark 14 when the protractor disk is in the initial position. Scale 16 extends in a clockwise direction and the 0° mark registers with indicator mark 14 when the protractor disk is in the initial position. In other words, if the rectilinear edge 10*b* of the frame is placed upon a horizontal surface and the protractor disk 11 is in the initial position, the bubble in the spirit level 12 will be visible and centered.

A recess 17 in the upper edge of the frame is provided at its opposite ends with inclined surfaces 18 and 19. As best shown in Fig. 1, the inclined surfaces 18 and 19 seat the leading and training edges of a propeller blade so that the chord of the blade is parallel to the rectilinear edge 10*b*. The inclined surface 18 and the lower edge of arm 10*c* provide a V-shaped recess in which one edge of the propeller blade is retained. A clamp 20 slidable on the end poriton of base 10*a* cverlies the opposite edge of the propeller blade. A coil spring 21 confined between stop 22 and clamp 20 urges the clamp into engagement with the propeller blade. As best shown in Fig. 1, the portion of the base 10*a* on which the clamp 20 slides is offset so that the clamp does not project beyond rectilinear edge 10*b*.

When the pitch angle of a propeller blade is taken, the blade is rotated to a horizontal position and the gauge is clamped thereon, as shown in Fig. 1. The gauge may be applied to face either the butt or tip end of the blade. At the present time, most propeller blades are pro-

vided with a "pitch line" which indicates the section of the blade at which the pitch angle is to be measured. The gauge is applied to the blade at the pitch line. If no pitch line is shown, the gauge is applied to each blade of the propeller an equal distance from the center of the hub. As hereinabove described, this distance is usually approximately two thirds the distance from the center of the hub to the tip of the blades.

When the gauge is applied to the propeller blade, the protractor disk 11 is rotated until the spirit level 12 is horizontal. The indicator mark 13 will indicate the pitch angle on outer scale 15. The angle indicated by the gauge will be the true pitch angle of the propeller blade if the crank shaft on which the propeller is mounted is horizontal. However, when the airplane is resting on the ground, the fuselage and engine are tilted. The angle at which the airplane is tilted varies with different types of planes. The crank shaft extends through the crank case. The bottom of the crank case is exposed or easily accessible and parallel with the crankshaft. Therefore, when the rectilinear edge 10b of the pitch gauge is placed against the bottom of the crank case, the level protractor disk 11 may be rotated to give the angle at which the crank case is tilted from the horizontal. The spirit level is rotated to a position above the opening 11b and the reading taken on the inner scale 16 as registered by indicator mark 14. If the pitch angle of a right hand propeller blade is being measured, the number of degrees which the crank shaft is tilted from the horizontal plus the number of degrees actually registered by the protractor when the pitch angle of the blade is measured will give the true pitch angle. If a left hand propeller blade is being measured, the number of degrees that the crank shaft is tilted from the horizontal must be subtracted from the measured pitch of the blade to give the true pitch angle.

In variable pitch propellers my gauge may be used to expeditiously give each blade the desired pitch. The operation is simple and may be readily performed without dismounting the propeller. The angle of inclination of the crank shaft is measured in the manner hereinabove described. The protractor disk is then rotated to add the number of degrees of desired pitch. The gauge is then applied to the propeller blade and the blade rotated about its longitudinal axis until the spirit level 12 is horizontal. The blade will then have the desired pitch. It will be observed that the gauge is self-clamping to the blade, thus leaving the mechanic's hands free to rotate the blade, loosen or tighten the clamps connecting the blade to the hub, and make other adjustments and perform other necessary operations.

The manner in which the gauge grips the opposite longitudinal edges of the propeller blade so that the chord of the blade is parallel with the rectilinear edge 10b permits the gauge to operate satisfactorily on either a single cambered or a double cambered blade. Regardless of the shape of the blade, the chord of the air foil will always be positioned parallel to the edge 10b.

It may thus be seen that I have realized the objects of my invention. I have provided a gauge that is light in weight. The gauge is easily operable and may be easily and expeditiously applied to varying types and shapes of propeller blades. The blade may be given the desired pitch quickly without dismounting the propeller regardless of the angle at which the fuselage and engine of the airplane are inclined from the horizontal. The clamp is self-retaining on the blade, thus leaving the hands of the mechanic free to perform other necessary operations.

It is to be understood that the form of my invention herewith shown and described is to be taken as a preferred example of the same and that various changes in the size, shape and arrangement of parts may be resorted to without departing from the spirit of my invention or the scope of the appended claims.

Having thus described my invention, I claim:

1. A propeller pitch gauge comprising a frame, self-adjusting means on said frame for releasably gripping the opposite edges of a propeller blade, and a level protractor rotatably mounted in the frame and adjustable with reference to the propeller blade to determine its pitch when the blade is in a horizontal position.

2. A propeller pitch gauge comprising a frame having a base portion and a curved arm portion, self-adjusting means on the base portion of said frame for releasably gripping the opposite edges of a propeller blade, and a level protractor rotatably mounted in the curved arm portion of the frame, said protractor in the form of a disk, said disk having graduations thereon cooperating with an indicator mark on the arm portion to register the pitch of the said propeller blade.

3. A propeller pitch gauge comprising a frame having a base portion and a curved arm portion, self-adjusting means on the base portion of said frame for releasably gripping the opposite edges of a propeller blade, and a level protractor rotatably mounted in the curved arm portion of the frame, said protractor in the form of a disk, said disk having graduations thereon cooperating with an indicator mark on the arm portion to register the pitch of the said propeller blade, said indicator mark being on a line passing through the center of the disk and perpendicular to the chord of the propeller blade.

4. A propeller pitch gauge comprising a frame having a curved arm portion and a base portion formed with a rectilinear edge, self-adjusting means on the base of the frame for releasably gripping the leading and trailing edges of a propeller blade in a manner to position the rectilinear edge of the frame parallel to the chord of the blade, and a level protractor rotatably mounted in the curved arm portion of the frame, said protractor in the form of a disk, said disk member having graduations thereon cooperating with an indicator mark on the arm to register the pitch of the said propeller blade, said indicator mark being on a line passing through the center of the disk and normal to the chord of the propeller blade and to the said rectilinear edge of the frame.

5. A propeller pitch gauge comprising a frame having a curved arm portion and a base portion formed with a rectilinear edge, a stationary clamp means on the base portion of the frame, a self-adjusting clamp means slidable on the frame, and a level protractor rotatably mounted in the curved arm portion of the frame, said protractor in the form of a disk, said disk member having graduations thereon cooperating with an indicator mark on the arm portion to register the pitch of the propeller blade, said indicator mark being on a line passing through the center of the disk and normal to the chord of the propeller blade and to the said rectilinear edge of the frame.

HORACE H. ROBY.