

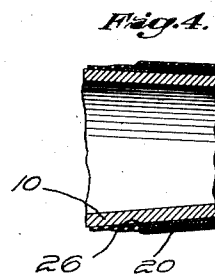
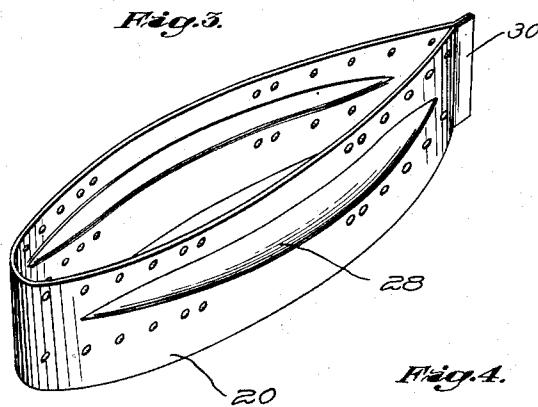
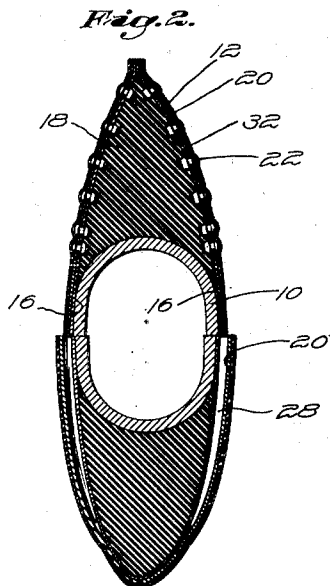
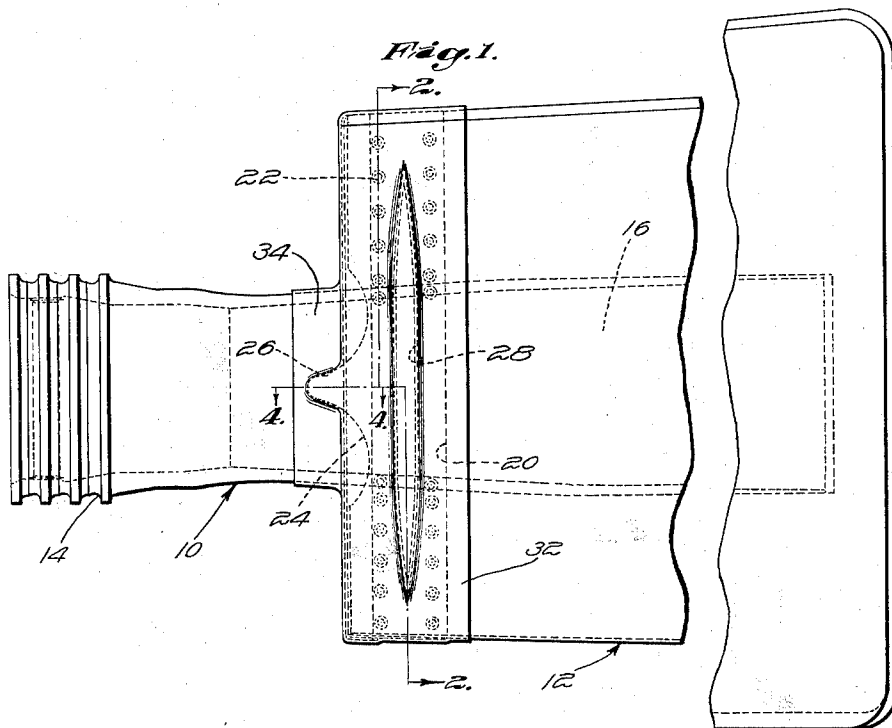
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2,623,599

PROPELLER BLADE STRESS DISTRIBUTING MEANS

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PROPELLER BLADE STRESS DISTRIBUTING
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4 Claims. (Cl. 170-159)

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This invention relates to an aeronautical propeller blade construction and particularly to built up hollow blade constructions.

An object of the invention is a construction which will reduce or prevent destructive movements or vibrations of the shell of a built up blade.

Another object is a blade shell with a shell portion constructed so as to distribute the loads at the shank end and thus avoid fatigue cracks.

Other objects and advantages will be apparent from the specification and claims, and from the accompanying drawings which illustrate what is now considered to be a preferred embodiment of the invention.

Fig. 1 is an elevation with portions broken away of a propeller blade incorporating the invention.

Fig. 2 is a cross-section on lines 2-2 of Fig. 1.

Fig. 3 is a perspective view showing the formed collar separate from the blade shell.

Fig. 4 is a section on line 4-4 of Fig. 1.

The propeller blade shown in Fig. 1 is built up of two main parts, a core indicated generally at 10, and a shell indicated generally at 12. Only sufficient description of this blade will be given here to understand the invention forming the subject of this application, reference may be had to Martin Patent No. 2,522,955, issued September 19, 1950, and Lampton Patent No. 2,511,858, issued June 20, 1950, for a more detailed description. In the now preferred construction, the core is formed of a steel tube and has races 14 formed in the shank end thereof by means of which the core may be retained in a hub, not shown. The outboard portion of this tube is flattened to substantially airfoil shape on two sides and the airfoil forming shell 12 which may be of sheet steel is placed over this tube so that the flattened portions of the tube substantially fit corresponding portions of the shell. The shell and tube are then soldered together along the mating surfaces 16 thus giving a completed propeller blade formed of an internal core carrying the blade retaining means and supporting the airfoil forming shell. The space between the core and the shell may be filled with material such as expanded rubber 18 vulcanized to both the tube and shell to help support the shell against the forces imposed thereon during flight.

Experience has shown that under flight conditions the leading and trailing edge portions of the shell which overhang the core may tend to twist and deform under loads imposed thereon during flight and may breathe, that is, opposite sides may move toward or from each other so as

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to expand or contract the area bounded by those sides or the whole leading or trailing edge may bend or twist forward or backward around the core. These various movements set up stresses in the sheet metal of the shell and especially adjacent the joint between the shell and core and near the shank end of the propeller blade such that fatigue cracks appear in the shell after only a short period of operation. These fatigue cracks render the blade unsafe for further use and the entire blade must then be scrapped.

I have found, however, that by placing a collar such as that shown in Fig. 3 and indicated by the reference numeral 20 around the shank end of the shell and securing the collar to the shell, as by rivets 22, that the deflection of the shank end of the shell can be reduced and the stresses induced by these deflections diffused over the shell and thus transmitted to the core in such a way as to avoid a concentration of stress and thus prevent or delay the fatigue cracking.

To assist in distributing the load and avoiding a concentration of stress, the shank end of the shell portion is undercut at 24 and faired into the shank of the core at 26 thus providing a tapered longitudinally extending projection integral with the shell portion and extending along and soldered to the core and blending into the shank end of the shell.

The collar 20 is an aluminum or steel band which extends entirely around the shank end of the shell. A bulge 28 is pushed out on each side of the collar 26 and acts to increase the moment of inertia of the section of the collar and thus increase its load carrying capacity and reduce its deflection. This collar when applied and securely riveted to the shell, provides large stiffness around the blade shell at the closure end to reduce the shell deflections mentioned above but does not reduce the deflection in a longitudinal direction. In effect this stiffness separates the longitudinal loads from the transverse loads and provides reinforcement mainly to reduce deflection which would be caused by the transverse loads. After the collar has been applied to the shell the trailing edge portion 30 of the collar may be removed and the collar faired into the general airfoil contour of the blade. The entire collar and shank end of the shell may then be covered with a protecting material such as a neoprene coating 32 extending down onto the shank of the core as at 34 and cemented or vulcanized in position.

It is to be understood that the invention is not limited to the specific embodiment herein illus-

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trated and described, but may be used in other ways without departure from its spirit as defined by the following claims.

I claim:

1. In an aeronautical propeller having a shank end and having a sheet metal airfoil forming shell having a shank end adjacent said propeller shank end and supported on a central longitudinally extending core and having leading and trailing portions overhanging said core at the shank end of said shell and defining the chordwise extent of said shell, a sheet metal collar surrounding, and secured to, said shell at the shank end thereof and having chordwise extending ribs formed therein and bulging outwardly therefrom.

2. In an aeronautical propeller having a shank end and having a sheet metal airfoil forming shell having a shank end adjacent said propeller shank end and supported on a central longitudinally extending core and having leading and trailing portions overhanging said core at the shank end of said shell and defining the chordwise extent of said shell, a sheet metal collar surrounding said shell at the shank end thereof and having a chordwise extending rib formed in each side thereof and bulging outwardly therefrom and a row of rivets on each side of said rib securing said collar to said shell.

3. Means for preventing destructive movement, and the concentration of stresses, in the shell of a built up aeronautical propeller having a shank end and having a sheet-metal, airfoil-forming, shell having a shank end adjacent said propeller shank end and soldered to and supported on a longitudinally extending central strength member and having leading and trailing portions of said shell overhanging said core in a chordwise direction at the shank end of said shell, comprising, a tapered longitudinally extending projection integral with said shell extending along and soldered to said core and blending into the shank end of said shell and a sheet metal collar surrounding and secured to said shell at the shank end thereof adjacent said projection and having chordwise extending ribs bulging outwardly therefrom.

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4. A propeller construction comprising an even surfaced core having a shank and extending longitudinally of the propeller and constituting the strength member of the propeller, a sheet metal airfoil forming shell surrounding said core and having an open end through which said shank of said core extends, said core being of smaller chordwise extent than said shell and co-extensive with and soldered to said shell only along a central longitudinally extending strip leaving leading and trailing portions of said shell unsupported by said core, said shell overhanging said core in a chordwise direction throughout the length of said shell and said core, a tapered longitudinally extending projection integral with and tapering from the open end of said shell adjacent to and extending along the shank of said core and soldered to said core throughout the length of the projection to form an extension of said soldered strip securing said shell to said core to thereby distribute the load and avoid a concentration of stress at the shell end in transmitting force between said shell and said core.

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