

June 13, 1961

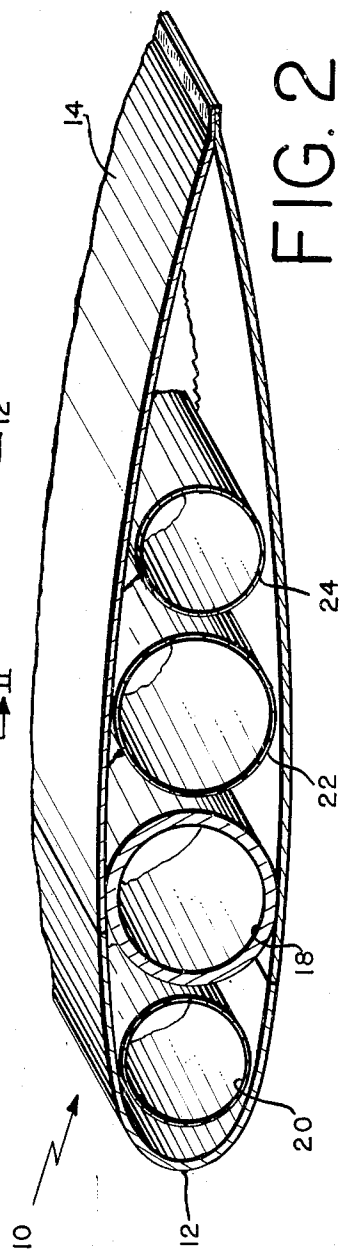
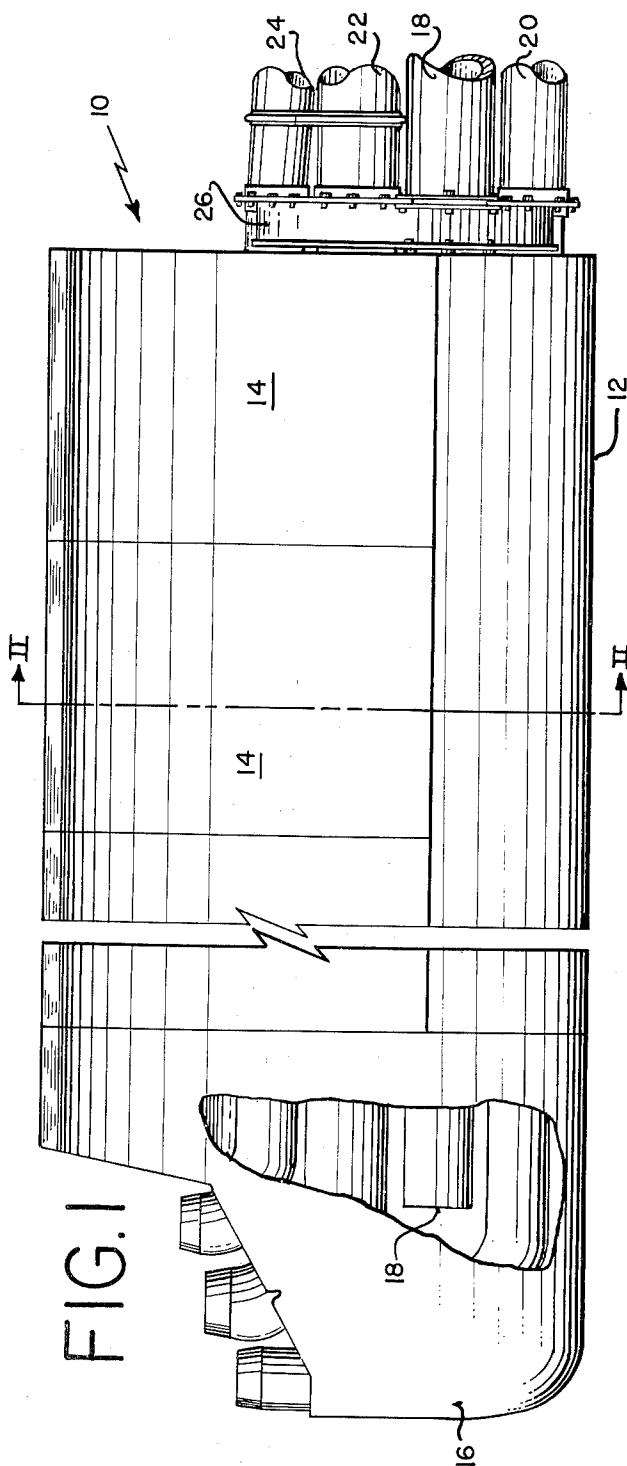
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2,988,152

ROTOR BLADE

Filed Dec. 3, 1958

3 Sheets-Sheet 1



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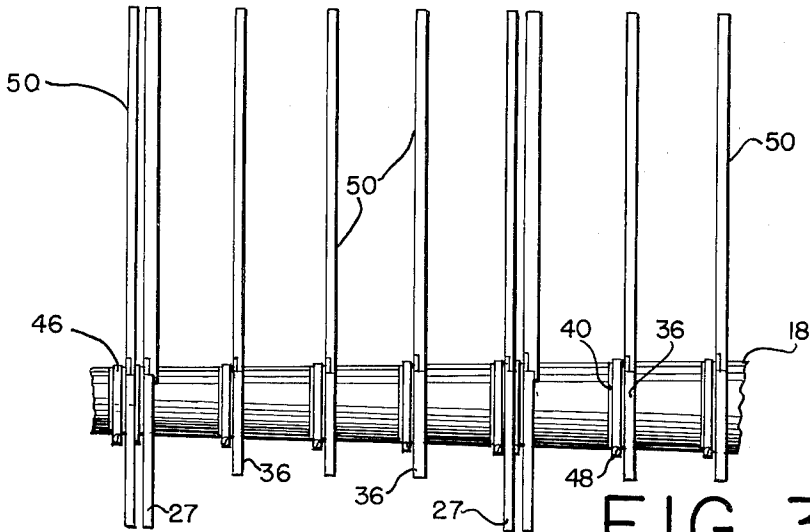


FIG. 3

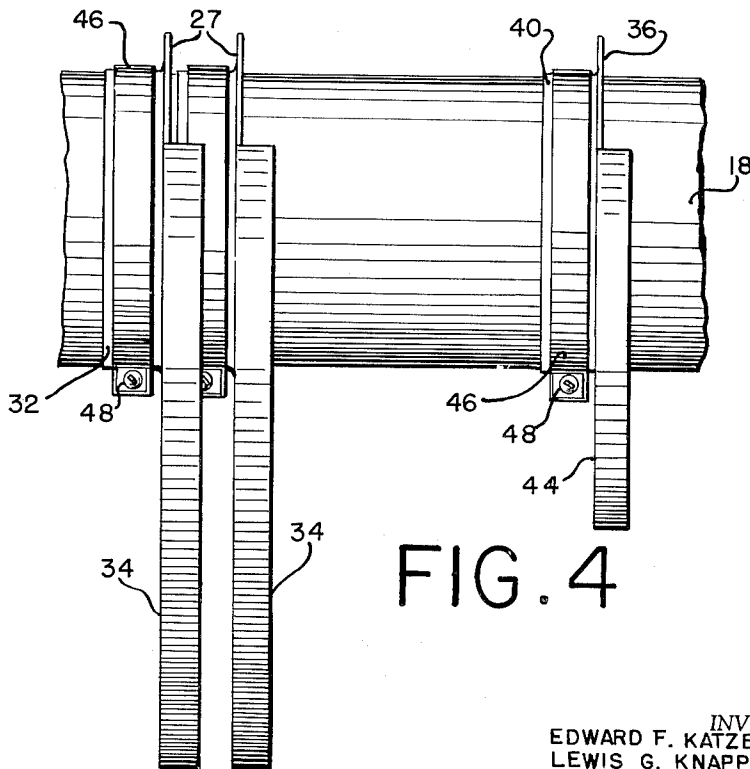


FIG. 4

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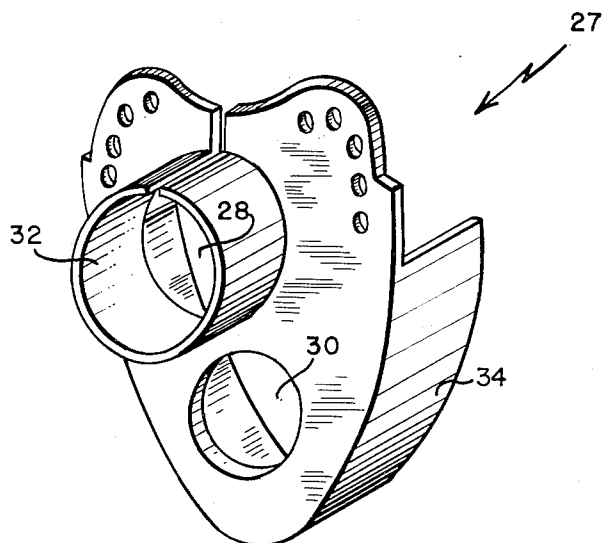


FIG. 5

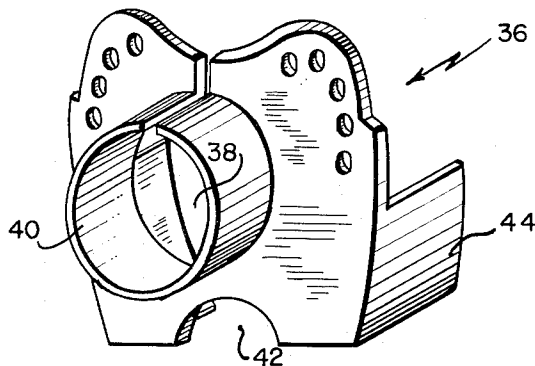


FIG. 6

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2,988,152

ROTOR BLADE

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6 Claims. (Cl. 170—135.4)

This invention relates to rotor blades and more particularly to improvements in the construction of rotor blades for rotary wing aircraft.

An object of the invention is to provide a strong, simple rotor blade.

More specifically, it is an object of the invention to provide an improved rotor blade which includes ducts for conducting compressed air therethrough.

Another object of the invention is to provide such a blade while reducing its weight and simplifying its framework.

Other and different objects, features, and advantages of our invention will become apparent upon consideration of the following detailed description thereof, especially when taken in conjunction with the accompanying drawings, in which:

FIGURES 1 is a top plan view of a rotor blade according to our invention, a portion of the blade skin being broken away;

FIGURE 2 is a vertical section on the line II—II of FIGURE 1;

FIGURE 3 is a partial view of the central spar with ribs and collars attached;

FIGURE 4 is an enlarged detail view of some of the rib and collar connections to the spar;

FIGURE 5 is a perspective showing of a full collar for the spar; and

FIGURE 6 is a perspective showing of a half collar for said spar.

Throughout the drawings like characters of reference designate like parts. Turning to FIGURE 1, a rotor blade for a rotary wing aircraft is shown generally at 10. The skin covering the blade 10 is formed in several sections. Along the forward edge of said blade, a skin section 12 is continuous for almost the entire blade length. Rearward of the section 12, the rotor blade skin is formed by a plurality of individual sections 14, each of which abuts the section 12 and then tapes off to the trailing edge of the blade. The remaining skin section 16 is shaped to abut both an end of the section 12 and one of said individual sections 14.

A hollow, steel spar member 18 passes through the blade 10 and into the section 16. A single air duct 20 is positioned alongside said spar within the section 12. An additional pair of air ducts 22 and 24 are also positioned along said spar, but on the opposite side thereof. A bracket 26 is carried by said spar 18 just inboard of the blade 10. Said bracket serves to secure the ducts 20, 22 and 24 in place. The outer end of each of the air ducts has a rearward bend and extends through an opening in the skin section 16. These ducts serve the dual purpose of conveying hot gases through the blade to prevent the formation of ice on the latter, and of causing rotation of said blade due to the reaction of said gases issuing from said ducts.

The internal construction of the rotor blade may best be seen in FIGURES 3-6. A plurality of collars 27 are spaced along the length of the spar 18. Said collars are of two types. A full collar 27 is shown in FIGURE 5. Each collar 27 has at one of its ends a split-ring type opening 28 which is adapted to receive the spar 18. These collars also have a second opening 30 there-

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ing. Collar 27 also includes a flange 32 which extends in one direction from said opening 28. A second flange portion 34 extends in the opposite direction and around the lower end of said collar. The collars 27 are arranged in adjacent pairs along the spar 18, and between each of such pairs are a number of half collars 36. These latter collars have a split-ring opening 38 corresponding to the opening 28 in the full collars. Each opening 38 has a flange 40 associated therewith. The lower portion of each collar 36 has a semicircular recess 42 therein which receives the air duct 20. A partial flange 44 extends adjacent said recess.

Both types of collars are secured to the spar 18 by means of individual clamps 46. These may take any desired form, and are here shown as the split type which tightened by means of an adjusting screw 48. Rearwardly extending ribs 50, having openings for receiving the air ducts 22 and 24, are attached to each of the collars. A series of bolt or rivet holes are provided in each collar 27 and 36 on either side of the split of the opening 38. Corresponding holes are provided in each rib.

The continuous section 12 of the blade skin is thus supported by the flanges 34 of the collars 27. Further partial support is achieved by the flange portions 44 on the half collars 36. The skin sections 14 are supported by the ribs 50 and the junctions of such sections are arranged to correspond to the pair of closely spaced ribs which are secured to the pairs of full collars 27.

It is to be understood that the above-described embodiment is merely illustrative of the applications of the principles of our invention. Numerous other arrangements may be devised by those skilled in the art without departing from the spirit and scope of the invention.

What we claim is:

1. A rotor blade for a helicopter comprising a thin sheet metal portion forming a longitudinal leading edge, a plurality of thin sheet metal portions extending rearwardly from said leading edge portion, a spar located within said thin sheet metal portions and extending longitudinally of said blade, a plurality of air ducts located within said sheet metal portions and having at least one of said ducts forwardly and at least one other rearwardly of said spar and parallel thereto, collars fixed to said spar and having forwardly extending portions supporting the thin sheet metal portion forming the leading edge, and rearwardly extending ribs fixed to said collars supporting said rearwardly extending skin sections and having openings for receiving the air ducts located rearwardly of said spar.

2. A rotor blade for a helicopter comprising a thin sheet metal portion forming a longitudinal leading edge, a plurality of thin sheet metal portions extending rearwardly from said leading edge portion, a spar located within said thin sheet metal portions and extending longitudinally thereof, a plurality of air ducts located within said sheet metal portions and having at least one of said ducts forwardly and at least one other rearwardly of said spar and parallel thereto, collars fixed to said spar and having forwardly extending portions receiving the air duct located forwardly of said spar and supporting the thin sheet metal portion forming the leading edge, and rearwardly extending ribs fixed to said collars supporting said rearwardly extending skin sections and having openings for receiving the air ducts located rearwardly of said spar.

3. A rotor blade for a helicopter comprising a thin sheet metal skin portion forming a leading edge, a plurality of thin sheet metal skin sections adjacent said leading edge and extending rearwardly thereof, a hollow spar within the said skin formed by said portion and sections, a plurality of air ducts within said skin, at least one of said ducts being positioned on each side of said spar, collars

on said spar and having portions thereof extending toward said leading edge to support said skin portion, and ribs attached to said collars and extending rearwardly to support said skin sections.

4. A device as defined in claim 3 wherein some of said collars have apertures therethrough which receive the duct which is positioned forwardly of said spar.

5. A device as defined in claim 3 wherein one end of each of said ducts extends beyond said spar and passes through the sheet metal skin, and the other end of each of said ducts is rigidly clamped to said spar.

6. A rotor blade for helicopters comprising a hollow spar, a plurality of air ducts positioned adjacent said spar, at least one of said ducts being separated from the others by said spar, means securing said ducts and said spar in spaced relation, a plurality of collars clamped on said spar and having portions extending in opposite directions therefrom, ribs secured to the portions extending in one

of said directions and thin sheet metal skin sections covering said spar, ducts, ribs and collars, and being supported by the latter two.

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