April 16, 1929. H. N. WYLIE 1,708,994

METAL SPAR FOR USE ON AIRCRAFT

Filed Nov. 10, 1927

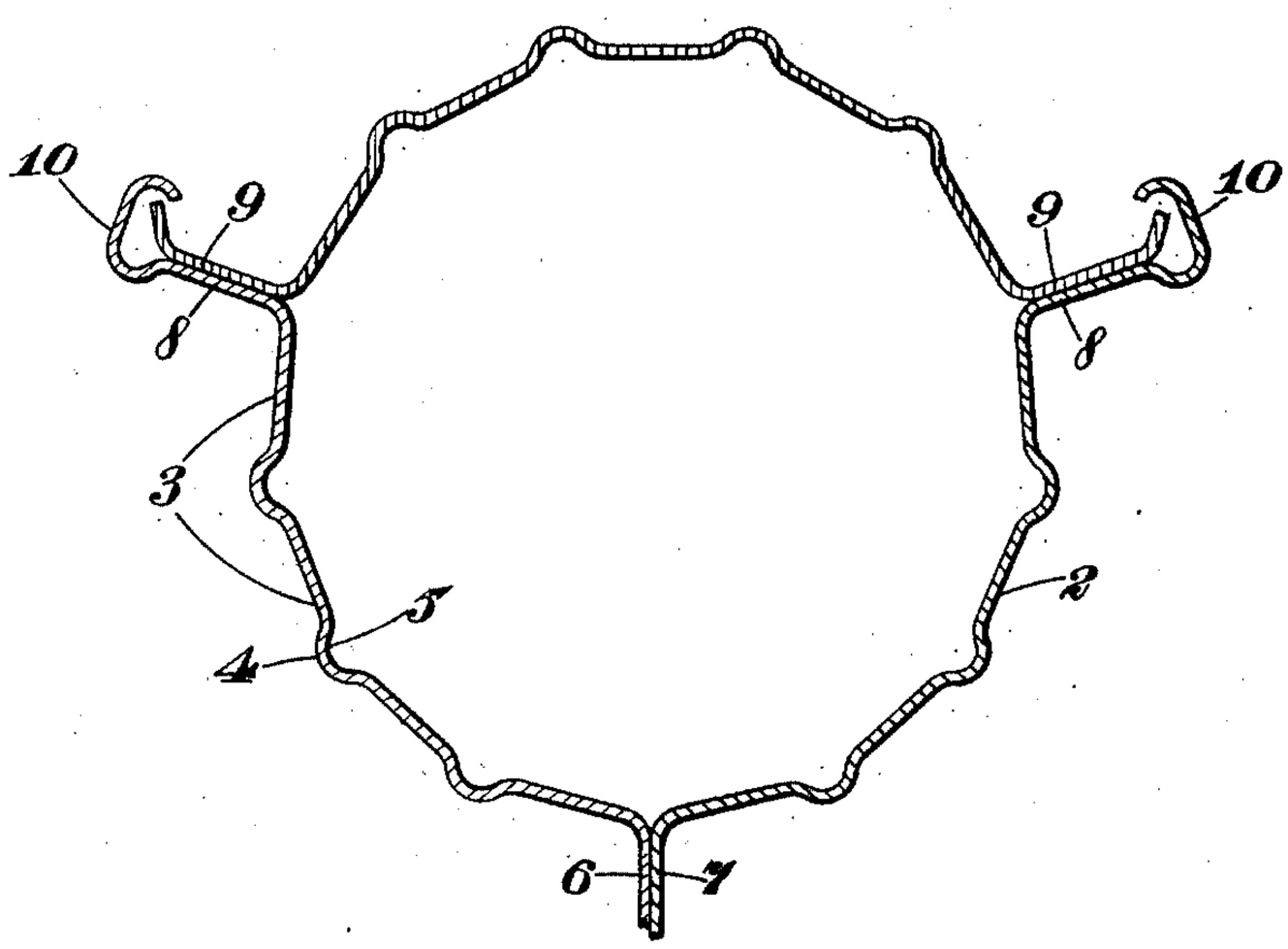


Fig. 1.

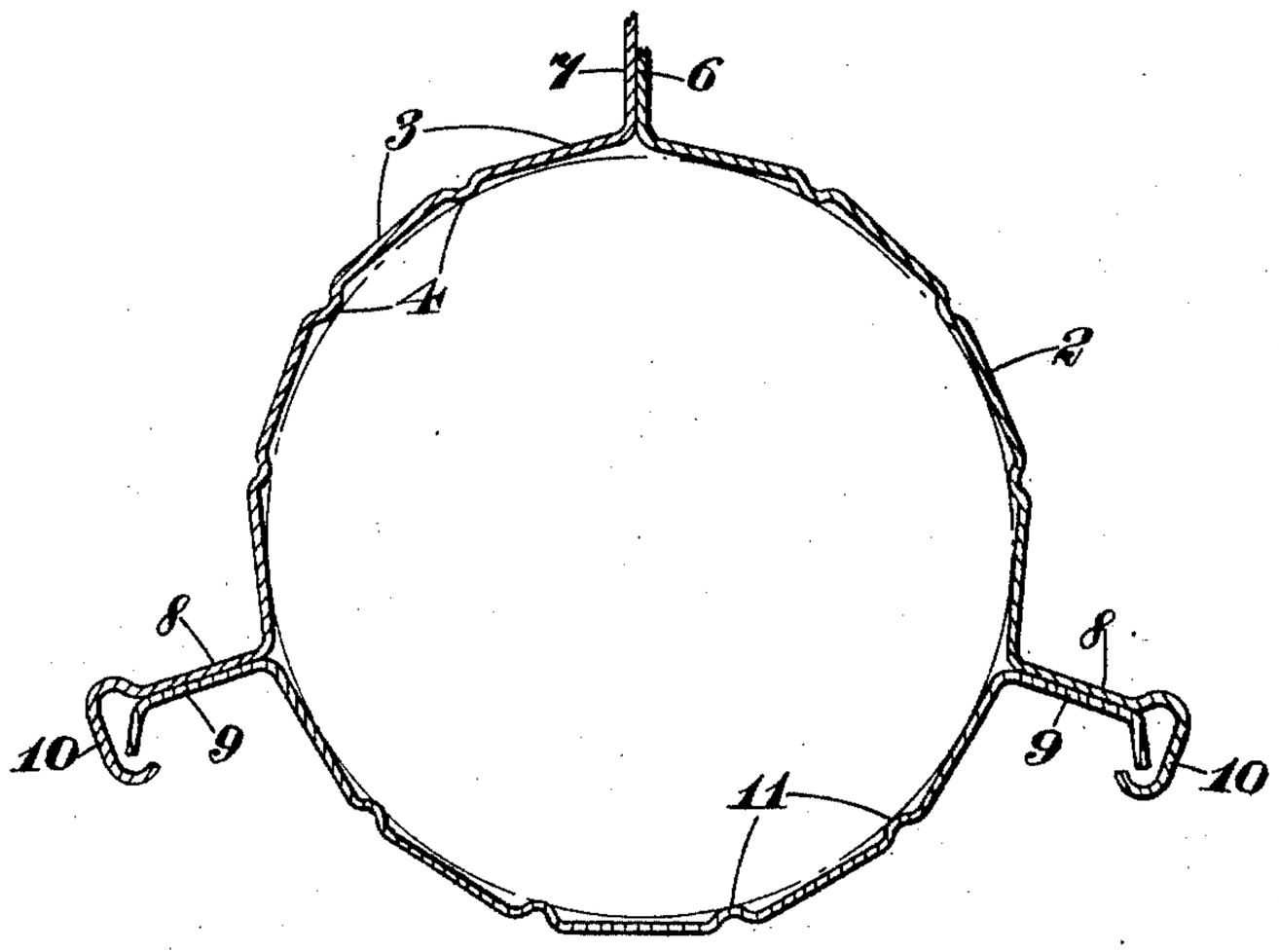


Fig. 2.

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UNITED STATES PATENT OFFICE.

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METAL SPAR FOR USE ON AIRCRAFT.

Application filed November 10, 1927, Serial No. 232,404, and in Great Britain November 13, 1926.

This invention relates to metal spars for use on aircraft, of the kind in which the spar is formed from thin metal plate which has been bent about longitudinal axes of the spar so that its cross-section is better adapted to withstand shear and longitudinal compression stresses. It has previously been proposed to effect the bending so that the cross-section of the plate is in the form of an arc or of a sinuous curve, or so that it comprises a series of straight lines each inclined to the next, their meeting points, however, all lying upon curves as above described.

The object of the present invention is to provide an improved method of shaping the plate so that the spar produced will be of greater strength and also less liable to damage from accidental blows which might cause indentations in it.

In the accompanying drawings, which illustrate two methods of carrying out this invention,

Figure 1 is a cross section of one construction of spar, and

Figure 2 is a similar view showing an alternative construction.

In carrying out the invention, the metal of the spar 2 is bent in the manner above referred to, and in accordance with the desired form of spar to be produced, which in both the constructions here illustrated is a polygon lying in (or around) a circle. In the bending of the metal to produce the faces 3 of the polygon, a longitudinal ridge 4 is formed at each angle, as, for example, by the use of rollers which produce at each angle a groove 5 on one side of the metal and a corresponding ridge on the other side.

In Figure 1 the ridge 4 is made external and in Figure 2 it is internal.

Thus it will be seen that the metal will assume a form in which there are a series of flats as indicated at 3 in the longitudinal direction of the spar, and these flats are each separated by ridges either external or internal, so that the ridges serve to strengthen the spar and to increase its longitudinal stiffness, whilst at the same time, when externally arranged, they act as a protective element to the intermediate flat portions of the metal, lessening risk of damage to them through accidental blows.

It has been found that in a member in which the ridges 4 have a height (or depth) not less than the thickness of the metal of the spar the flat portions 3 may have a width which is between twenty times and thirty times the thickness of the metal. A width of twenty times the thickness of the metal is suitable for members that require to withstand compression stresses of the order of 80 tons per square inch, whereas a width of thirty times the thickness is suitable for members in which the compression stress does not exceed 40 tons per square inch.

The height (or depth) of the ridge is measurable from the corner which otherwise would exist by the meeting of the flat surfaces on each side of the ridge and on that side of the spar from which the ridge projects.

Where the ridge projects inwardly its crest may be tangential to the inscribed circle of the polygonal spar, as shown at 11.

In order that the above stresses may be realized, it will be understood that the ridges must lie on curves as in the case of those previously mentioned sections constituted by a series of straight lines each inclined to the next and having their corners lying upon arcuate or sinuous curves.

Spars as here illustrated may be built up of three strips of metal, two of which can be flanged as at 6 and 7 to connect with one another, and, if desired, with a central web (not shown), or webs could be constituted by extending the flanges 6 and 7. The remaining strip can be connected to the two others as at 8 and 9, attachment means for other elements being provided as at 10.

What I claim as my invention and desire to secure by Letters Patent of the United States is:—

1. In a hollow metal spar, the combination of a plurality of strips of sheet metal bent to form a hollow polygonal member whose

cross sectional contour comprises a series of straight lines each inclined to the next, and a ridge formed in the metal at each angle of the section, whose depth is substantially equal to the thickness of the metal.

2. A hollow metal spar as claimed in claim 1, in which the ridge has a height not less than the thickness of the metal of the spar, and the width of the intermediate flats is between twenty and thirty times the thickness of the metal, substantially as set forth.

In testimony whereof I have signed my name to this specification.

HAMILTON NEIL WYLIE.