June 8, 1937. C. DORNIER 2,083,226

GIRDER FOR STRUTS OR THE LIKE

Filed Oct. 18, 1932

Fig. 1.

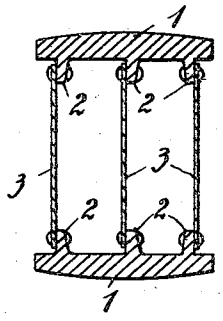


Fig. 2.

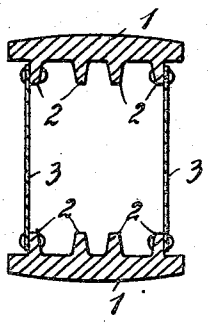


Fig. 3.

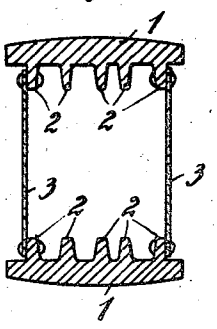


Fig. 4.

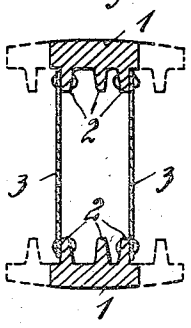


Fig. 5.

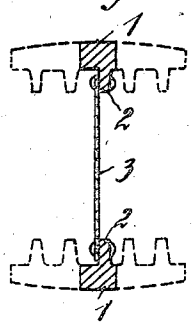


Fig. 6.

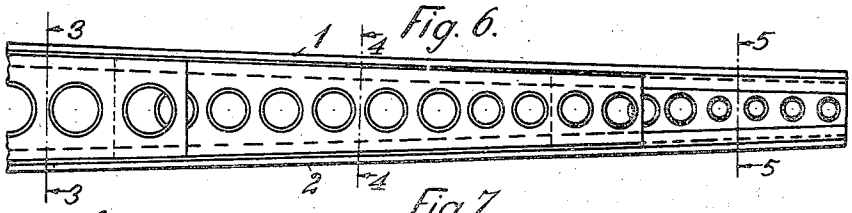
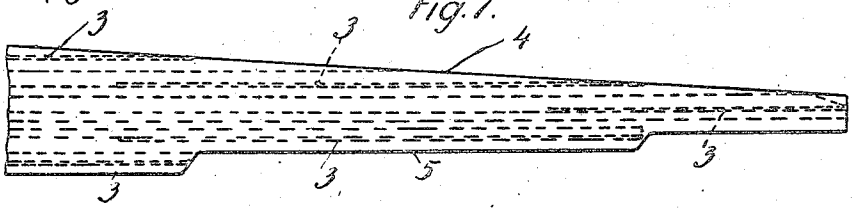


Fig. 7.



Inventor:
Claude Dornier
by Karl Kirchner
Atty.

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GIRDER FOR STRUTS OR THE LIKE

Claude Dornier, Friedrichshafen-on-the-Bodensee, Germany, assignor of one-half to Dornier-Metallbauten G. m. b. H., Friedrichschafen-on-the-Bodensee, Germany

Application October 18, 1932, Serial No. 638,348
In Germany October 28, 1931

10 Claims. (Cl. 189—37)

My invention relates to girders, more particularly such as are adapted for use as spars in the wings of aeroplanes.

It has heretofore been proposed to construct such spars with chords and webs, the webs having the form of a framework or of full or openwork sheet metal webs. Since the chords are also made of sheet metal, the connection between the webs and the chords has been effected by means of angles riveted to the chords and webs, respectively, at least two rows of rivets being required for securing each angle iron in place.

It is an object of my invention to simplify the construction of girders of this kind, by designing the chords as drawn or rolled shapes of substantially rectangular cross section with substantially rectangular flanges formed on one side, which serve for fixing the webs thereto. Preferably each chord is formed with at least three flanges so that if desired several webs can be provided between the chords of each girder.

In self-supporting girders the width of the chords may decrease from the fixed end towards the free end of the girder, the webs being secured to the outer flanges near the fixed end and to the inner flanges near the free end, the contour of the chords being narrowed down by milling or the like from the fixed towards the free end. The width may decrease gradually or uniformly according to a straight line or a curved line, for instance, a parabola. The distance between the webs is chosen in accordance with the number of flanges on the chords. Consecutive webs secured to the inner and outer flanges are arranged with overlapping ends. If the distance between the upper and the lower chord is made to decrease from the fixed end to the free end, a self-supporting spar forming a body of substantially uniform strength is obtained.

In the drawing affixed to this specification and forming part thereof some girders embodying my invention are illustrated diagrammatically by way of example.

In the drawing

Fig. 1 is a cross section of a girder formed with three webs,

Fig. 2 is a similar view of a girder having two webs,

Figs. 3, 4 and 5 are cross sections of the girder shown in Figs. 6 and 7, having a different number of webs in different parts of its length, these figures being sections along the lines 3—3, 4—4 and 5—5, respectively, of Fig. 6,

Fig. 6 is a side elevation and

Fig. 7 is a plan view of this girder.

Referring to the drawing and first to Fig. 1, the girder comprises an upper and a lower chord, each being formed as a drawn or rolled shape having a substantially rectangular body portion 1 and flanges 2 extending at right angles from the body portions and having substantially rectangular cross section. 3 are the webs secured to the flanges 2, each web being fixed to each flange by a single row of rivets only. Each chord is formed with three flanges and to each flange a web is fixed.

In Figs. 2 and 3 each chord 1 is provided with four and five flanges 2, respectively, two webs being fixed to the outer flanges near the fixed end of the girder, while near the free end shown in Fig. 4 the webs are secured to the inner flanges, the outer portions (shown in dotted lines) of the chords being removed by milling or the like. If desired, the chords may taper towards their free ends in such manner that only a single flange remains over to which a single web is secured as shown in Fig. 5. It should be understood that Figs. 3, 4 and 5 are cross sections of the inner, middle and outer portions of one and the same girder.

The gradual reduction in width and spacing of the chords is shown in Figs. 6 and 7. The distance between the upper and lower chords is a minimum at the free end (right hand end) of the girder. The width of the chords diminishes also as shown in Fig. 7, either uniformly as shown at the upper contour line 4, or in steps as shown at the lower contour line 5. The upper contour line 4 is shown as a straight line but may be curved if desired, for instance, parabolically. The webs 3 are here shown as openwork metal sheets, those at the inner end of the girder being secured to the outer flanges, those in the middle and at the free end to the inner flanges, the ends of adjoining webs overlapping each other, as can best be seen in Fig. 7.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

I claim:

1. A girder comprising a pair of chords and a plurality of substantially parallel webs which are materially shorter than said chords, each chord being formed with at least three longitudinal flanges extending substantially at right angles to said chords, a web being fixed to each outer flange of each chord and extending from one end towards but short of the middle of such chord, and a web fixed to the inner flange of each chord

and extending from the other end towards the middle of such chord.

2. A girder comprising a pair of chords and five substantially parallel webs which are materially shorter than said chords, each chord being formed with five flanges extending substantially at right angles to said chords, two such webs being fixed to the outer flanges and extending from one end of and towards, but short of the middle of each chord, two other such webs being fixed to the adjoining flanges and extending only over the middle portion of each chord, the fifth web being fixed to the middle flanges of such chords and extending from the other ends towards, but short of the middle of each chord.

3. A girder fixed at one end comprising a pair of chords and a plurality of substantially parallel webs which are materially shorter than said chords, each chord being formed with at least three longitudinal flanges extending substantially at right angles to said chords, a web being fixed to each outer flange of each chord and extending from the fixed end towards but short of the middle of such chord, and a web fixed to the inner flange of each chord and extending from the free end towards the middle of such chord.

4. A girder fixed at one end comprising a pair of chords and five substantially parallel webs which are materially shorter than said chords, each chord being formed with five flanges extending substantially at right angles to said chords, two such webs being fixed to the outer flanges and extending from the fixed end of and towards, but short of the middle of each chord, two other such webs being fixed to the adjoining flanges and extending only over the middle portion of each chord, the fifth web being fixed to the middle flanges of such chords and extending from the free ends towards, but short of the middle of each chord.

5. A girder having a fixed end and a free end comprising a pair of chords provided with a plurality of spaced, longitudinally extending flanges, said chords being tapered in width thereby reducing the number of said flanges at said free end, and a series of short, overlapping, spaced webs secured to the marginal flanges along the length of said girder and uniting said chords.

6. A girder comprising a pair of chords tapered in width towards one end and provided with a plurality of spaced substantially parallel longitudinally extending flanges, a plurality of longitudinally extending webs secured to said flanges and uniting said chords, said webs being short and overlapped and their spacing being reduced towards said tapered end.

7. A girder comprising a pair of chords tapered in width towards one end and provided with a plurality of spaced, longitudinally extending flanges, a plurality of longitudinally extending webs distributed substantially discontinuously between said chords, secured to said flanges and uniting said chords, the spacing of said webs being reduced toward said tapered end.

8. The structure of claim 7 wherein the distance between the chords is reduced at the tapered end of said girder.

9. A girder having a fixed end and a free end comprising a pair of chords provided with a plurality of spaced, longitudinal flanges on one side of each chord, a plurality of longitudinally extending webs distributed substantially discontinuously between said chords, secured to said flanges and uniting said chords, the number and spacing of said webs being reduced toward the free end of said girder.

10. A girder having a fixed end and a free end comprising a pair of chords provided with a plurality of spaced longitudinal flanges on one side of each chord, a plurality of longitudinally extending webs, distributed substantially discontinuously between said chords, secured to said flanges and uniting said chords, the number and spacing of said webs being reduced toward said free end, said webs being secured to the outermost flanges at said fixed end and to inner flanges at said free end.

CLAUDE DORNIER.