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C. DORNIER

1,928,009

HOLLOW METAL BEAM

Filed Oct. 22, 1928

Fig. 1.

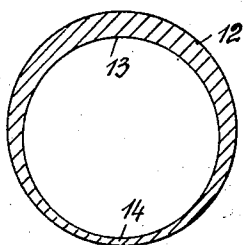


Fig. 2.

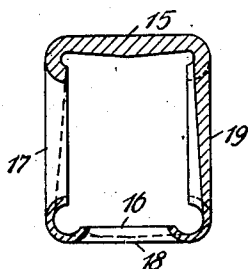


Fig. 3.

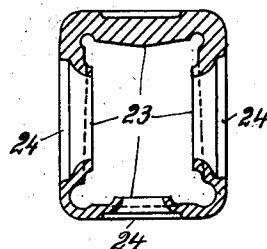


Fig. 4.

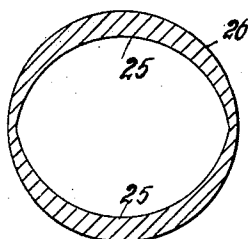


Fig. 5.

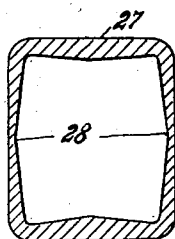


Fig. 6.

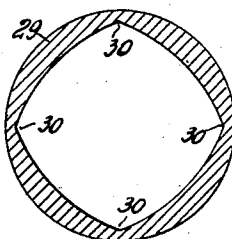


Fig. 7.

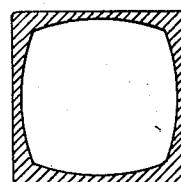


Fig. 8.

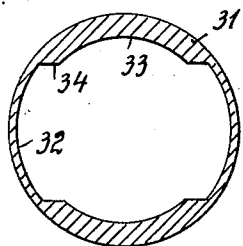


Fig. 9.

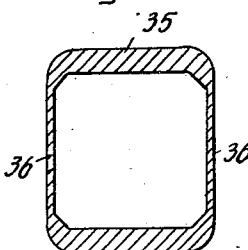


Fig. 10.

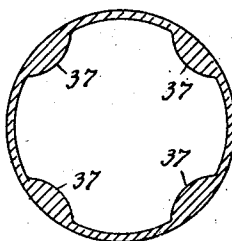


Fig. 11.

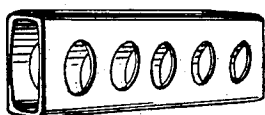
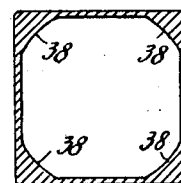


Fig. 12.

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UNITED STATES PATENT OFFICE

1,928,009

HOLLOW METAL BEAM

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Application October 22, 1928, Serial No. 314,256,
and in Germany December 27, 1927

11 Claims. (Cl. 189—41)

My invention refers to hollow structural members and more particularly to hollow metal beams. It involves improvements upon the metal beam patented to me by Letters Patent of the United States No. 1,552,474 dated September 8, 1925, which discloses a hollow metal beam having thin walled webs and depressions and beaded openings in two of the webs, the beam being made of a thin walled seamless tube of quadrangular section. Hollow metal beams of this kind are particularly fit for use in the construction of flying machines and more especially the wings thereof.

According to the present invention the hollow beam is also made of a seamless tube, but the finished beam need not have quadrangular section, but may have any desired polygonal section being produced for instance from a tube of circular cross-section by drawing. Furthermore the thickness of wall of the blank tube differs in various places, being distributed in such manner that the finished beam is provided with thicker walls in those places which are subjected to particularly high stresses.

In order, further, to enable the beam to be connected with other structural parts, for instance by means of screws, rivets or the like, openings must be provided at least on the side of the beam, which faces the side by which the beam shall be fixed, in order to enable the screws or rivets to be handled and fixed from within the beam. If the beam is designed to be fixed to other structural parts by two or more of its sides, openings must be provided in several sides of the beam, but in this case these openings must be spaced sufficiently to leave room for rivets or screws. In such case, if the beam has a cross section with an even number of sides, the openings in opposite sides are preferably arranged in staggered relation.

In the drawing affixed to this specification and forming part thereof different forms of blanks adapted for the manufacture of the novel beam and a number of beams to be made from these blanks and embodying my invention are illustrated diagrammatically by way of example in cross section.

Referring to the drawing

Figs. 1, 4, 6, 8, and 10 illustrate blanks of different cross section, while the remaining figures illustrate different forms of beams Fig. 12 being a perspective view, on a smaller scale, of a beam as shown in Fig. 2.

The blank tube 12 illustrated in Fig. 1 has a cross section confined between two eccentrically positioned circles, whereby its wall thickness is

highest in one point 13 and smallest in the opposite point 14.

Fig. 2 discloses a tube of substantially quadrangular cross section manufactured from a blank as shown in Fig. 1. In the top part 15 forming the upper chord which is placed under pressure, the greatest wall thickness is found, while the opposite wall 16 forming the bottom chord placed under tension has the smallest wall thickness. 17, 18 and 19 are openings provided in the bottom and side walls, the openings 17 and 19 being preferably arranged in staggered relation.

Fig. 3 illustrates a similar beam also made of a tube blank as shown in Fig. 1, all the sides of which are formed with depressions 23, three of which are formed with openings 24.

The tubular blank shown in Fig. 4 has an outwardly circular cross section, while it is inwardly confined by two circular curves 25 arranged eccentrically to each other and to the outer circle 26. Here the wall thickness is highest at two diametrically opposite places and lowest in two places which are also diametrically opposite to each other, but staggered 90° relative to the first places.

Fig. 5 illustrates a hollow beam of quadrangular cross section made from a blank as shown in Fig. 4 and having diametrically opposed thicker walls 27 and thinner walls 28.

The blank illustrated in Fig. 6 has a cross section which shows four parts 29 of maximum wall thickness with four intermediate parts 30 of minimum thickness.

In the quadrangular beam illustrated in Fig. 7, and made from a blank as shown in Fig. 6, the maximum thickness is found in the corners, the minimum thickness in the side portions between the walls.

Fig. 8 illustrates another tubular blank bounded outwardly by a circle 31, while inwardly a larger circle 32 and a smaller circle 33 are connected by substantially straight lines 34, whereby the blank has two thick and two thin wall portions of uniform thickness alternating with each other.

The hollow beam shown in Fig. 9 is made from such a blank, it has substantially uniform great wall thickness on two sides 25 and uniform small wall thickness on two sides 36.

The blank shown in Fig. 10 has a cross section confined substantially between two centrally disposed circles, save for four symmetrically distributed portions 37 of greater thickness, which reinforce the walls in these four places.

The beam made from such a blank and illus-

trated in Fig. 11 has an outer quadrangular cross section, the corners 38 being reinforced by suitably distributing the metal accumulated in the portions 37 of the blank.

- 5 Obviously such reinforced portions tend to greatly increase the bending strength of the beam.

Obviously the side walls in all the beams illustrated in the drawing may be formed with depressions near the edges and may be formed with openings or indentures which may be beaded as shown for instance in Figs. 2 and 3.

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.

In the claims affixed to this specification no selection of any particular modification of the invention is intended to the exclusion of other modifications thereof and the right to subsequently make claim to any modification not covered by these claims is expressly reserved.

I claim:—

1. A hollow, structural, metal beam having a cross section of varying thickness, both the inner and outer boundaries of which are of substantially polygonal shape, forming a plurality of side walls having varying thicknesses; the said beam being produced by a drawing operation and being free from laps and seams and from projecting ribs.

2. The beam of claim 1 wherein the cross section is quadrangular.

3. The beam of claim 1 wherein at least one side wall is provided with beaded openings.

4. The beam of claim 1 wherein at least one side wall is thicker than the remaining walls.

5. A hollow, structural, metal beam having a substantially polygonal cross section and a plu-

rality of side walls, at least one side wall being thicker than the portion of wall opposite; the said beam being produced by a drawing operation and being free from laps and seams and from projecting ribs.

6. The beam of claim 5 wherein the cross section is quadrangular.

7. A hollow, structural, metal beam having a substantially quadrangular cross section and four side walls, one of said side walls being thicker than the opposite wall and at least one of the other two side walls being provided with openings; the said beam being produced by a drawing operation and being free from laps and seams and from projecting ribs.

8. The beam of claim 7 wherein both of the other two side walls are provided with beaded openings which are staggered longitudinally.

9. The beam of claim 7 wherein all side walls but the said thicker side wall are provided with openings.

10. A hollow, structural, metal beam of substantially polygonal cross section and having an even number of side walls varying in thickness, two of the opposed side walls of said beam having a greater thickness than that of two intermediate opposed side walls; the said beam being produced by a drawing operation and being free from laps and seams and from projecting ribs.

11. A hollow, structural, metal beam having a wall of substantially quadrangular cross section, the said wall having four oppositely disposed portions having a greater thickness than the intermediate portions; the said beam being produced by a drawing operation and being free from laps and seams and from projecting ribs.

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