Oct. 2, 1934. L. R. GRUMMAN 1,975,228

STRUCTURAL MEMBER

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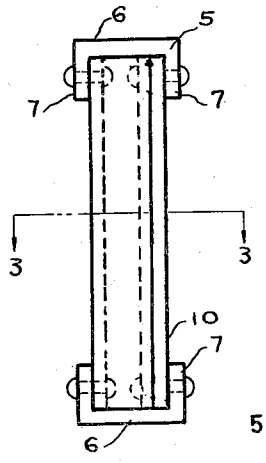


FIG. 1

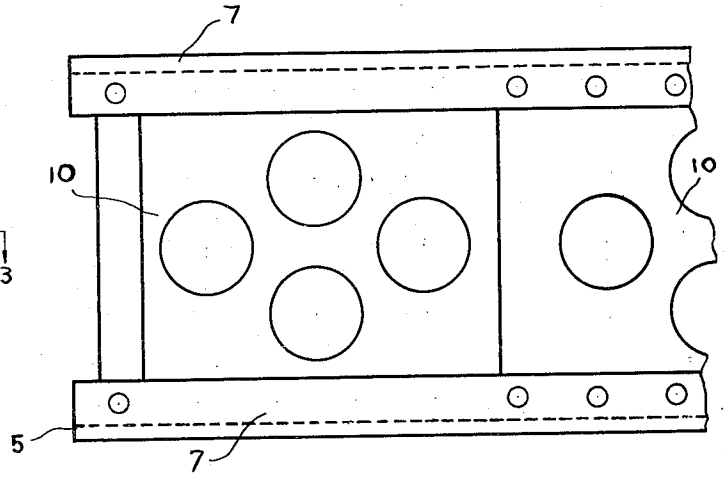


FIG. 2

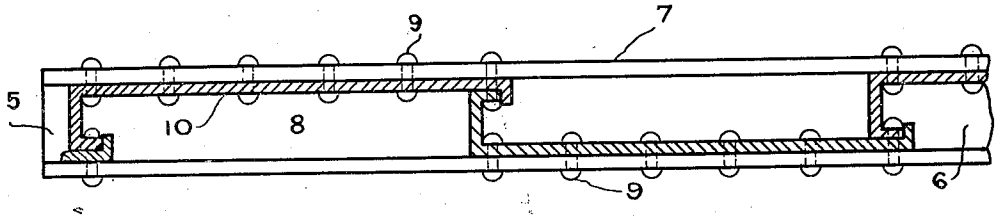


FIG. 3

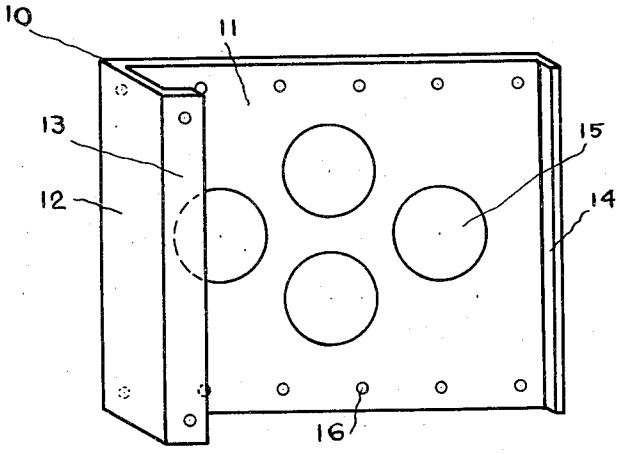


FIG. 4

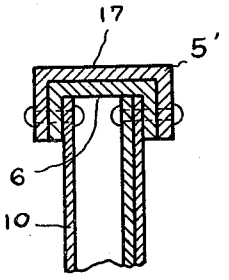


FIG. 5

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STRUCTURAL MEMBER

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5 Claims. (Cl. 189—37)

This invention relates to a structural member, particularly a beam or spar and more specifically a metallic beam or spar comprised of a number of component members which may be riveted, bolted or welded together to make a single member of great strength and rigidity combined with extreme lightness.

My particular construction combines the virtues of the so-called "wandering web" type of beam and the box girder. It has less web than a box girder for my web is applied in staggered form, but it has numerous cross web members which give great rigidity. It is simpler and easier to assemble than either the wandering web or box girder types and may be built up of relatively inexpensive units.

The principal object of the invention is to provide a beam or spar suitable because of its lightness and strength for use as the chief strength member of an airplane wing, although it may easily be adapted for use as a mast or boom on a sailing vessel and for other structural purposes where strength and lightness are of primary importance.

Other objects are to provide a member of the type described which shall permit of ready accessibility for ease of examination and repair, and shall permit of construction in which the strength and weight may be easily varied to meet the requirements of the use to which the member is to be put. Thus if the member were required for use as the main beam of a wing extending unbroken from one wing tip to the other it would be possible to make it of greater strength in the center and of lesser strength and weight at the extremities. Other objects are either obvious or will be hereinafter mentioned.

In the drawing in which similar reference characters refer to similar parts in each figure,

Fig. 1 represents an end view of a built up spar constructed in accordance with the invention,

Fig. 2 is a side view of the same spar,

Fig. 3 is a sectional view taken through Fig. 1 on the line 3—3 looking in the direction of the arrows,

Fig. 4 is a perspective view of the web members, and

Fig. 5 is a modification of the invention in which a reinforcing member has been incorporated.

Referring to the drawing, channel members 5 which may be U shaped if desired and which have a base 6 and parallel arms 7 form the longitudinal members or cap pieces of a beam designated generally as 8.

Fastened to the arms 7 of the cap piece 5 in any suitable manner such as by rivets 9 or by welding are a plurality of webs 10 which may be of suitable metal stampings.

A web 10 is shown in detail in Fig. 4 and consists of a single piece of metal bent to provide a flat or web section 11, a post or cross web section 12 which is preferably slightly shorter than the inside width of the channel member to permit overlapping of the units, a reinforcing foot or flange 13, and an abutment flange or head 14. The flat section may be perforated as at 15 in the interest of further lightness. Suitable holes 16 are provided to permit of riveting the web to the cap pieces. The webs are placed head to foot in interlocking engagement with each other within the arms 7 of the cap pieces 5. Because of this head to foot staggered arrangement the interior of the spar is rendered readily accessible and the work of placing the rivets 9 is facilitated.

The reinforcing foot 13 is placed within the abutment 14 rather than outside it in order that the adjoining web elements may be connected together by rivets or otherwise to give added rigidity to the joist or beam. The double web thickness thus formed at regular intervals along the length of the beam forms posts which greatly strengthen the construction as shown in Figure 5. This is a conspicuous advantage over the continuous web type of construction where such reinforcement is impractical.

The webs 10 may be of varying gauge and the heavier ones may be placed at the points of greatest strain on the beam, thereby concentrating weight and strength where it is required. Greater strength may be given to the cap piece where required by providing a larger channel member 5' to fit outside cap piece 5 at such points.

It will be readily seen that many modifications of this construction may be made without departing from the scope of the invention.

I claim:

1. A structural member comprising a pair of longitudinal channel elements having their open faces in opposed relationship, a plurality of web elements, each having longitudinal and transverse webs, in staggered relationship to each other and disposed between the channels, flange means integral with the web elements to permit interlocking, and means to affix the longitudinal webs to the channel elements and to the flange of an adjacent web element to interconnect the web elements.

2. In a structural member of the type described a web element comprising a sheet of metal having

a major flat longitudinal portion, a flat transverse portion at substantially right angles to one end of the longitudinal portion and a flange at the free end of each portion whereby adjacent web elements may be interlockingly interconnected and attached to suitable cap pieces.

3. A structural member comprising a pair of channel elements having their open faces opposed to each other, a plurality of web elements of identical form each having a longitudinal web with a transverse web at one end thereof, a flange at the free end of each web whereby the web elements may be connected within the channels in interlocking staggered relationship by means which also attach the longitudinal webs to a side of the channel elements.

4. A structural member comprising a pair of longitudinal elements having a plurality of web elements therebetween and affixed thereto, said web elements having a plurality of webs at angles to each other, and a flange at the free end of each web whereby the web elements may be assembled in staggered interlocking and interconnected relationship within the longitudinal elements to constitute a continuous wandering web whereof the abutting flanges form post elements.

5. A structural member comprising a pair of longitudinal elements having a plurality of web elements therebetween and affixed thereto, said web elements having a pair of webs substantially at right angles to each other and having a flange at the free end of each web whereby the web elements may be assembled in interlocking, overlapping, staggered relationship to form a continuous web.

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