July 17, 1962 H. E. HANDLEY 3,044,585

STRUCTURAL BEAMS AND COLUMNS

Filed Nov. 18, 1957

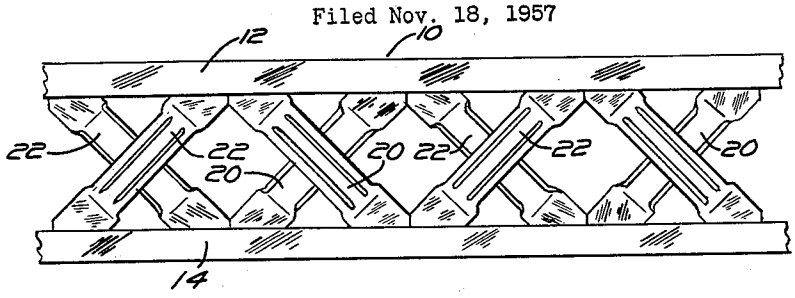


FIG. 1

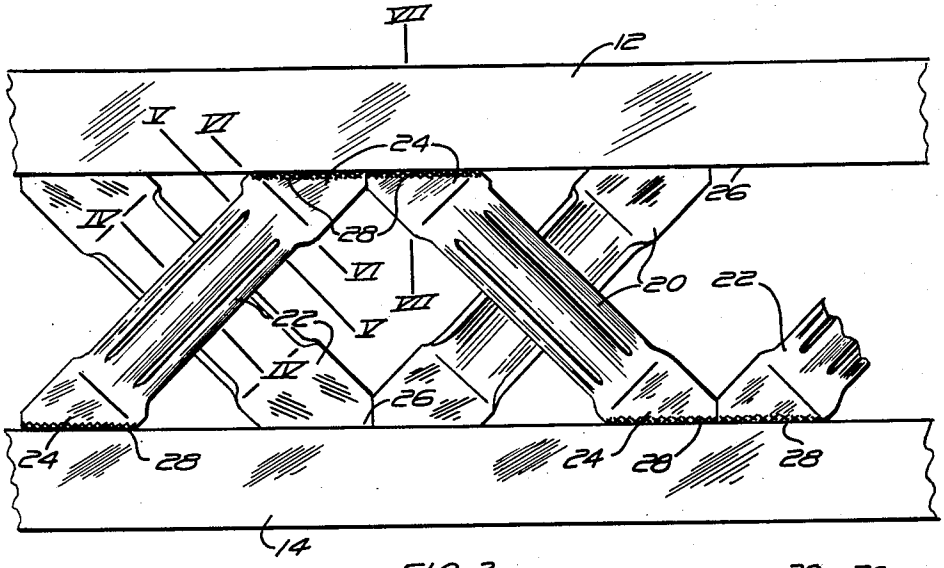


FIG. 3

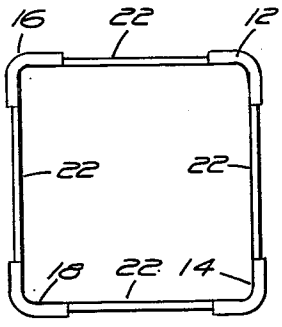


FIG. 2

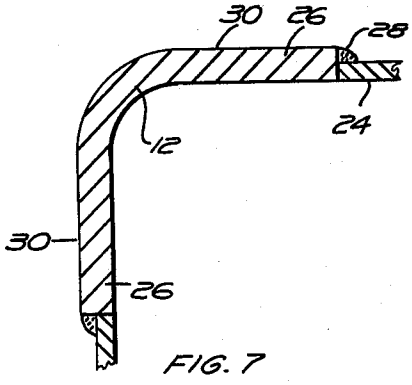


FIG. 7

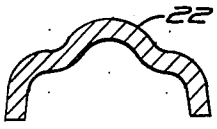


FIG. 4

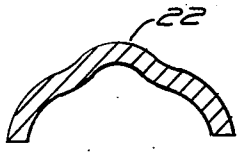


FIG. 5

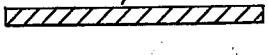


FIG. 6

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STRUCTURAL BEAMS AND COLUMNS

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1 Claim. (Cl. 189—37)

The present invention relates to improvements in built-up structural members such as columns, beams, and the like, in which three, four or more longitudinally extending corner members are disposed in spaced relation by diagonal lacing members.

Where the cost of material is relatively high, such as in the case of aluminum and magnesium alloys, stainless steel, plastic reinforced with fiber glass and the like, it is necessary that the ratio of strength to weight in the structural member fabricated from such materials be maintained as great as possible. If standard practices used in the fabrication of steel built-up structures is followed in which rods and angles are employed, fabrication of similar structures using more costly materials is uneconomical and the advantages obtained are, in most cases, more than offset by cost increases. This is particularly true when extruded sections and rods are employed in the fabrication of built-up structures.

According to the invention, a high ratio of strength to weight in built-up structural members has been obtained by employing sheet and strip material from which the corner and lacing members are formed by pressing, rolling or breaking. Preferably, the diagonal lacing members abut the longitudinal edges of the corner members and where a flush weld is desired the relative thicknesses of the component parts of the structure are selected to provide a stepped joint at the point of abutment between the longitudinal edges of the corner members and the ends of the lacing members. In practice, both ends of the lacing members and the angular sections of the corner members defining the longitudinal edges thereof will be flat with the extent of the end welds substantially increasing to the transverse cross-section perimeter of the lacing members.

For example, I have found that where the use of built-up structural members of steel corner angles and steel lacing rods have been found objectionable because of corrosion in service, extruded aluminum sections and aluminum rods may not be economically substituted to otherwise duplicate the steel construction. However, by employing sheet and strip aluminum alloy stock and forming the corner and lacing members therefrom, the working of the stock in fabrication increases its strength and strip and sheet is less expensive than extruded sections and rods. When these cost factors are coupled with the specific form of lacing with which the invention is concerned, an economical built-up aluminum alloy structural member results. Similar advantages will result with stainless steel, magnesium, and such high strength plastics as thermosetting resin reinformed with fiber glass.

Thus, an object of the present invention is to provide improvements in built-up structures of the type described enabling the fabrication of the same from corrosion resisting materials.

Other objects and advantages residing in the specific arrangement, construction and combination of parts will more fully appear from the following specification and the appended claim.

In the drawings,

FIG. 1 is a fragmentary side elevational view of a built-up structure embodying the invention,

FIG. 2 is an end view of FIG. 1,

FIG. 3 is an enlarged fragmentary view of a portion of FIG. 1,

FIG. 4 is a cross-sectional view taken on line IV—IV of FIG. 3,

FIG. 5 is a cross-sectional view taken on line V—V of FIG. 3,

FIG. 6 is a cross-sectional view taken on line VI—VI of FIG. 3, and

FIG. 7 is a cross-sectional view taken on line VII—VII of FIG. 3.

Referring to the illustrated form of the invention, FIGS. 1 and 2 disclose a built-up structural member **10** of box section fabricated from similar L-section corner members **12**, **14**, **16** and **18** disposed in spaced relation into a box section by lacing members **20** and **22**, the members **20** and **22** being associated in pairs and being identical except for being rights and lefts. Preferably, the corner members **12** etc. are of heavier gauge material than the lacing members **20** and **22** with the latter so disposed as the result of their end abutting relation with the corner members **12** etc. to provide a step at the point of abutment between the flat ends **24** and the longitudinal edges **26** of the corner members **12** etc. The welded fillets **28** integrally join ends **24** to the edges **26** to complete the box section. It will be understood that in welding the fillet **28** that welding will also take place at the joint at the point of abutment between the end surface of the end **24** and the edge surface of the edge **26**.

The corner members **12** etc. are conveniently formed from sheet or strip material into the desired angular section by rolling or through the use of a metal break. The lacing members **20** and **22** are preferably formed in a die from sheet metal strip of uniform thickness and width with the flat ends **24** conforming to the width of the material and the channel shape between the ends **24** providing the necessary structural shape to provide the necessary compressive strength. It will be understood that the transverse extent of the welds **28** substantially corresponds to the formed perimeter of the members **20** and **22** between the ends **24**. The lacing members **20** and **22** have formed on their ends **24** an abutment edge perpendicular to the planar end edge, as shown in FIGURE 3.

Referring to FIG. 7, it will be observed that the stepped relation between the butt welded parts **24** and **26** enable the weld **28** to be flush with the outside face **30** of the member **12**. Also, it will be appreciated that all welding of the box section **10** is capable of taking place from the outside of the structural member and it is not necessary for the welding operator to perform any welding operations from within the structural member and thus an expensive and time-consuming step of the manufacture of built-up structural members has been avoided.

Having thus described my invention what I claim is new and desire to cover by Letters Patent is:

A built-up structural member of aluminum components comprising elongated corner members of angular section, adjacent members having exterior coplanar faces and longitudinal planar edges, diagonal lacing members interposed between said corner members maintaining said corner members in spaced relation to form a structural member of closed cross-section, said diagonal lacing members having planar end portions terminating in a planar end edge and formed with a channel section intermediate said end portions, the entire end edges of said lacing members abuttingly engaging the planar longitudinal edge of said corner members, said lacing members being formed of sheet aluminum of a lesser wall thickness than the wall thickness of said corner members and engaging said longitudinal edges at a location to define a step between the external surface of the lacing planar end portions and the

adjacent external corner member surface, a fillet weld located within said step joining said lacing and corner members, said weld and lacing members lying within the boundaries of the structural member defined by the planes of the exterior faces of said corner members, a planar abutment edge formed on said lacing member planar end portions perpendicularly disposed to said planar end edge, said abutment edges of adjacent lacing members affixed to a common corner member longitudinal edge being in abutting relation.

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