Feb. 14, 1939. L. SAIVES 2,147,552

METALLIC CONSTRUCTION

Filed Aug. 30, 1937

Fig. 1

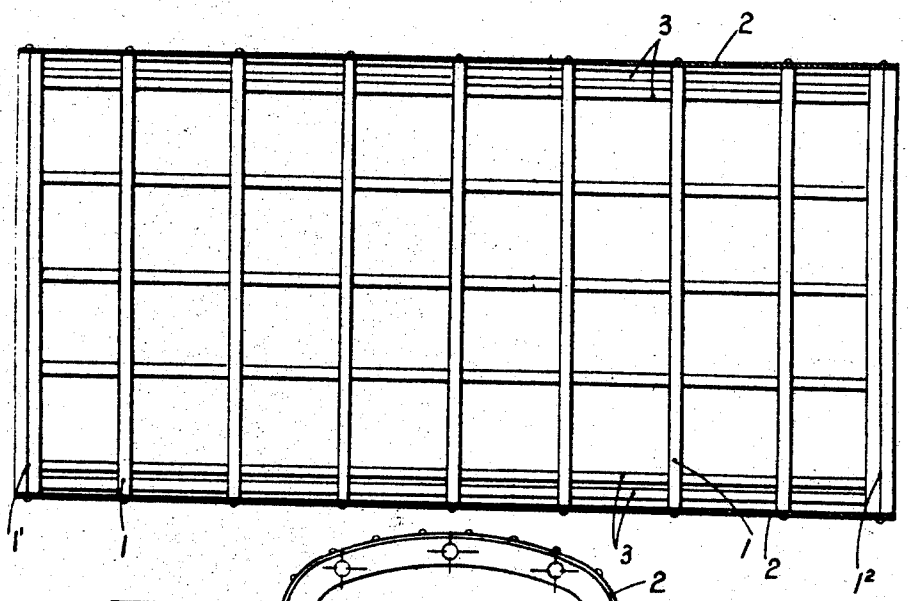


Fig. 2

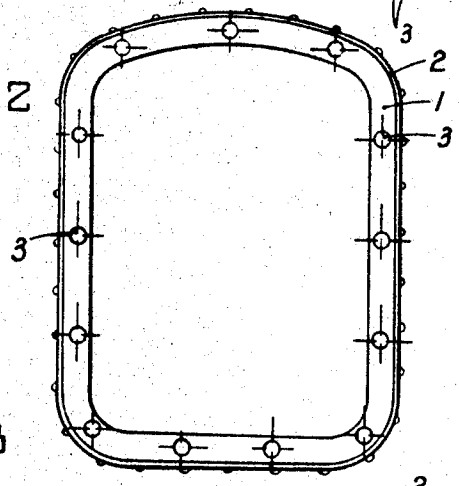


Fig. 3

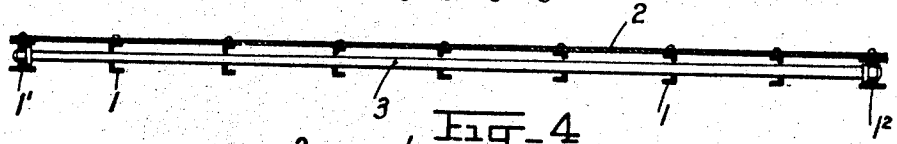
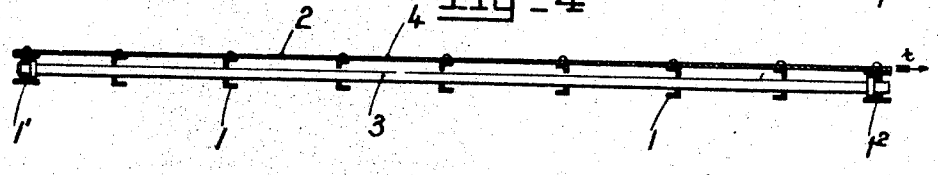


Fig. 4



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METALLIC CONSTRUCTION

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In France October 7, 1936

1 Claim. (Cl. 189—34)

The present invention relates to improvements in metallic constructions, which are characterized by the use of very thin sheet metal pieces, which are preliminarily subjected to tension and thus provide for the construction of assembled devices which are perfectly rigid, while at the same time very light.

The said improvements have chiefly for their object the construction of metallic hollow bodies, in the form of prisms, cones, or cylinders, and the assembling of the same, these being adapted for use as fuselages or wings for aircraft, carriage-work for vehicles, etc., and the construction thus obtained will give the maximum volume available in the interior of the body and will permit the operation of the whole of the outer metallic covering.

In conformity with the invention, the hollow structure consists essentially of transverse members termed frames, to which the sheet metal covering is secured by welding or riveting. The said frames and covering are constructed in a manner resembling a "hull" construction in which the covering acts as a resistant element and is subjected to tension. The difference consists in the nature and the function of the longitudinal members or bars. In the known "hull" construction, the bars are secured to the frames and to the covering, and they provide for the rigidity of the latter, but in my present construction, the said bars pass loosely through all of the intermediate frames, and are secured to the end frames, but they are not secured to the covering.

As the rigidity of the covering is no longer insured by the stiffening grating formed by the frames and the bars, this rigidity is obtained in the following manner.

The covering is secured to the frames, and in a more substantial manner to the end frames, and the whole set of bars is put in place through all of the intermediate frames, being then secured at one end to one of the frames situated at the end. Then, by means of the end frames, the covering is subjected to a longitudinal tension which is distributed upon the periphery. This longitudinal tension, which is produced by means of a suitable outfit, may be uniformly distributed on the periphery of the covering or may be distributed in a variable manner. The rate of variation of this longitudinal tension will depend upon the subsequent stresses to which the covering is subjected. The tension is observed by measuring the differences in the distances of the checking holes which are properly drilled in the sheet metal of the covering before the assembling operation.

When the entire covering has been placed under tension, and when the measurements of the tensions have been made, the bars are secured at their ends which were left free. This may be effected either permanently by welding or riveting, or removably, by the use of mechanical assembling means. By this latter method of assembling, the apparatus can be taken apart at a later date, for repairs, or for again placing the covering under tension.

When the securing operation is finished, the tension exercised by the tool outfit is removed, and owing to the compression of the rods and to their consequent shortening, the tension of the covering is reduced, this depending upon the ratios between the cross sections of the bars and the corresponding sections of the covering. During the preliminary study, it is possible to calculate the tensions which should be exercised by the tool outfit in order to obtain, after the assembling, the definite tensions desired.

The thickness of the covering will depend upon the stresses to which it is subjected in service, taking due account of the coefficient of safety. The tension during the construction should be such that it will not be annulled by the compression in any case. For the parts subjected to traction, the sum of the two traction effects should be less then the stress allowed.

After the description of the method, it will be easy to understand the application of this method.

The covering of the hollow body should consist of a metal having most approved mechanical features, such as rustless nickel-chrome steel, cold rolled, and the metal may have a very reduced thickness, which however must be compatible with the strength. A study of the "hull" construction has shown that this thickness may be very small, owing to the distribution of the material at the periphery.

For the better understanding of the invention, it is particularly described with reference to the accompanying drawing.

Fig. 1 is a lengthwise view of a hollow body of this construction.

Fig. 2 is a corresponding end view.

Figs. 3 and 4 are explanatory views.

As shown in Fig. 1, the hollow structure which is obtained, consists essentially of transverse members 1, in suitable number, to which the covering 2 is secured by welding or riveting.

The transverse members 1 are maintained by

longitudinal members or bars 3, which are secured to the end pieces 1^1 and 1^2, Figs. 3 and 4.

As the rigidity of the covering is no longer insured by the stiffening grating consisting of the cross-frames 1 and the bars 3. I proceed in the following manner. The covering 2 being fixed to the frames 1, and more securely to the end frames 1^1 and 1^2, the bars 3 are inserted through the frames 1, and are secured at one end to one of the end frames, for instance to the frame 1^1. Then, through the medium of the frame at the other end 1^2, and by the use of a suitable outfit, the covering 2 is subjected to a longitudinal tension t (Fig. 4) which is distributed uniformly or variably upon the whole periphery.

Checking holes 4 which are drilled before the assembling, in the sheet metal of the covering 2, provided for the observation of the tension which is applied, by measuring the distance between them.

After measuring the tensions thus produced, the free ends of the bars 3 are secured to the end frame 1^2 (Fig. 3), either definitely, by welding or riveting, or removably, by mechanical means for assembling.

This construction is more simple than the "hull" construction which is now in use, owing to the fact that the bars are not secured to the covering, and that this latter does not require to be stiffened.

On the other hand, the designing and the utilization of this construction are facilitated by the fact that it is always possible to verify the tensions by means of suitable checking holes provided in the covering.

The alternate stresses due to vibrations or to other causes, do not produce changes of sign of the action in the units which make up the construction, as the stresses have always the same direction. Hence this property provides for a better preservation of the metal.

On the other hand, this construction permits the use of steel of great strength, and by its possibility of welding, it affords, in the aeronautic industry, better cost prices than the known constructions.

Obviously, the longitudinal tension may be completed by transverse tensions which are obtained either by a forced fitting of the frames, or by producing the tension of the sheet metal by suitable tools.

I claim:

A hollow metal body comprising a very thin sheet metal plate which is subjected to tension in the longitudinal direction, substantially annular transverse units secured to said thin plate and having openings therein, longitudinal bars passing freely through said openings in the intermediate transverse members and placed in compression and secured only to the transverse members situated at the ends of the plate and said bars being aranged at the periphery of the transverse members so as to leave a free space at the center of the hollow body.

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