Dec. 27, 1932. R. G. MILLER 1,892,070

SOUND ABSORBING MONOCOQUE FUSELAGE

Filed Jan. 14, 1932

Fig. 1

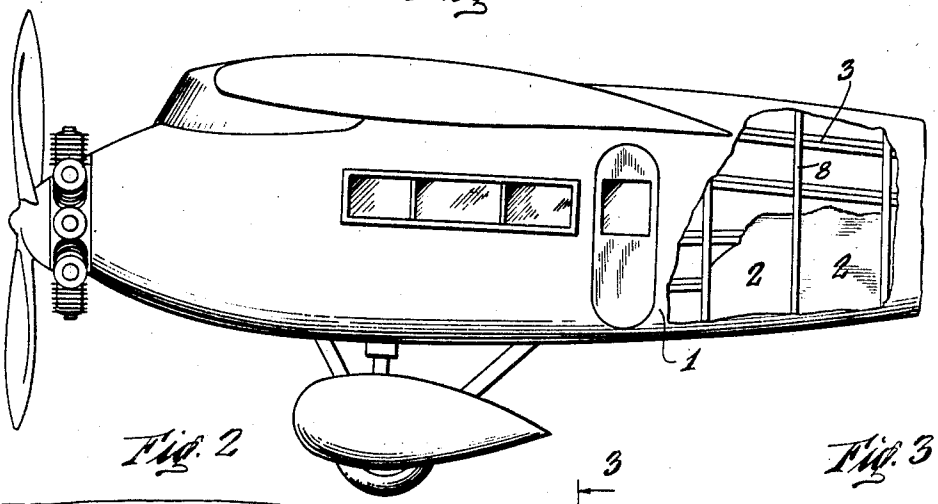

Fig. 2

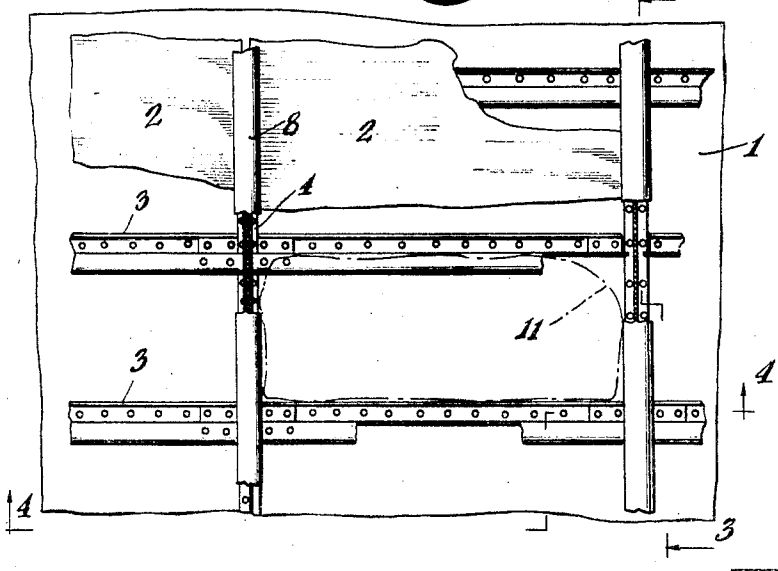

Fig. 3

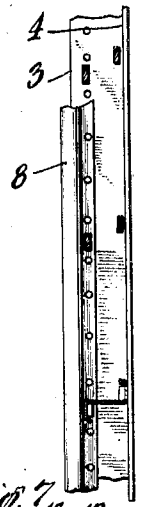

Fig. 4

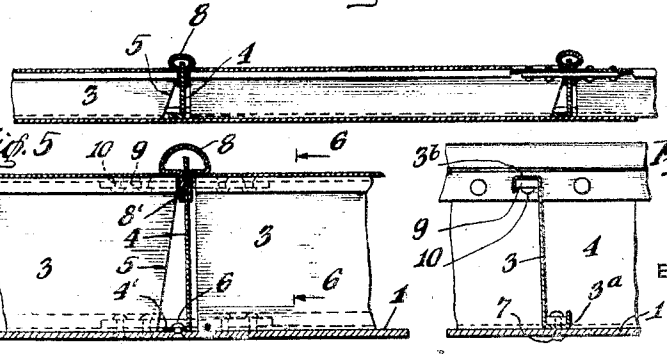

Fig. 5

Fig. 6

Fig. 7

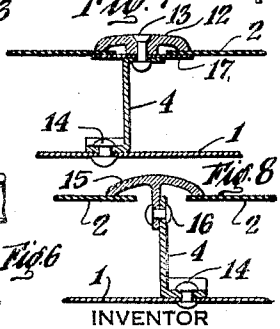

Fig. 8

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UNITED STATES PATENT OFFICE

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SOUND ABSORBING MONOCOQUE FUSELAGE

Application filed January 14, 1932. Serial No. 586,500.

This invention relates to wall constructions for fuselages of aeroplanes and more particularly to wall constructions of aeroplane cabins.

An object of the invention is to provide a wall construction which will be of light weight durable construction for resisting stresses and strains in all directions, ornamental, easy to assemble, which will allow for expansion and contraction and yet insure against heat exchange between the cabin exterior and interior and also which will absorb sound and be a fire preventative.

It is a further object of this invention to provide a panelled conical wall construction which will be ornamental in appearance in which the panels and the retaining means will constitute a structural part of the bracing construction and exclude from view all fixtures and connections and which will further allow for expansion and contraction of the panels themselves.

With the foregoing and other objects in view, the invention consists in the combination of parts and in the details of construction hereinafter set forth in the following specification and appended claims, certain embodiments thereof being illustrated in the accompanying drawing, in which:

Figure 1 is a view in side elevation partly in section of a portion of a cabin aeroplane.

Figure 2 is an interior view in elevation of one of the side walls of the cabin.

Figure 3 is a view in section taken along line 3—3 of Figure 2.

Figure 4 is a view in section taken along line 4—4 of Figure 2.

Figure 5 is an enlarged detailed view of that shown in Figure 4.

Figure 6 is a view in section taken along line 6—6 of Figure 5.

Figure 7 is a view in section through the fuselage wall showing a modified form of that shown in Figure 5.

Figure 8 is a similar view showing a modified form of that shown in Figure 7.

Referring more particularly to the drawing, the wall is composite in construction consisting of an inner and outer sheet between which there are arranged longitudinal and cross bracing members which by their intersection form pockets for receiving fibrous material so treated as to have such characteristics as will tend to absorb sound, prevent heat transfer and be fireproof.

The fuselage may be of metal monocoque construction in which the outer metal skin 1 will present a smooth exterior surface so as to offer the minimum aerodynamic resistance. To aid the skin in carrying the longitudinal stresses there are provided longitudinal stringers 3 which may be intercostal or continuous throughout. In the form shown they are intercostal and the frame webs 4 are continuous. This arrangement may be reversed so that the webs may be intercostal and the stringers continuous.

As shown, the intersection of the intercostal stringers with the frame webs is provided for by forming the stringer with an inclined edge 5 so that a space is arranged between the inclined edge and the adjacent straight edge of the adjacent stringer to allow the web 4 to pass through. This web is provided with a flange 4′ which is riveted at 6 to the outer metal skin. Each stringer 3 is built in the form of a Z having inner and outer flanges as shown in Figure 6. The flange 3*a* may be riveted to the outer skin 7.

As shown in Figure 5, the inner end of each frame web 4 has riveted thereto a frame chord 8 of substantially curved cross-section with flanges 8′ which form the means of rivet connection to the web. As a means of added strength and to give the intercostal stringers an effect of being continuous, there may be provided metallic splices 9 riveted at 10 to the inner flange 3*b* and extending through a small aperture through the flanges

8′ and the web 4 and connected for a short distance to the corresponding flange of the adjacent stringer.

The inner covering 2 may be of wood veneer or like material and may be in the form of semi-flexible panels. These panels are adapted to be slipped into or sprung into place so as to rest upon the stringer flanges 3*b* and extend past the curved walls of the adjacent frame chords, the edges of each panel extending close to but not quite against the frame chord flanges 8′ and held there by the overlapping curved walls of the frame chord. This arrangement provides for contraction or expansion of the panels under thermal or humidity variations.

It will be seen that by the intersection of the stringers with the webs there are provided a series of hollow parallelograms or pockets which may be filled with fibrous material so treated as to have such characteristics as will tend to absorb sound, prevent heat transfer and be fireproof. This material may be inserted loosely or may be placed in bags, such as indicated at 11, and then inserted into the space thus provided.

The interior panels besides being ornamental in appearance really function as a part of the structure as a bracing element, especially to prevent lateral buckling of the stringers upon which they rest. The frame chords also aid in the interior ornamental appearance as while they form a part of the bracing structure they conceal the means of their connection to the webs and also conceal the edges of the panels which they overlap. The frame chords also form a means for quick attachment and detachment of the panels while allowing for their expansion and contraction due to thermal variations.

The frame chord may differ in design as shown in Figures 7 and 8. In Figure 7 particularly, instead of arranging the frame chord in a semi-circular form, as shown in Figure 5, it may take the form of that shown in Figure 7 in which the web 4 is attached to a frame chord 12 by means of a countersunk rivet with a small plate 17 arranged under the panel 2, there being allowed a slight space between the edges of the two panels and the frame chord itself. The outer extremity of the frame web may be attached by means of the rivet 14 to the outer skin.

As shown in Figure 8 another modified form may be used in which the web itself is attached to the outer skin by means of a rivet 14, and the frame chord 15 of a slightly different design may be attached together by means of an internal rivet 16. In this modification the panels 2 may derive their support from the fact that they rest on the longitudinal stringers, in case it is not desired to have them otherwise retained except by the overlapping edges of the frame chord 15.

I claim:

1. In an aeroplane fuselage construction, a plurality of web frames having enlarged chord members a plurality of intercostal longitudinal stringers intersecting said frames, an outer skin connected to said webs and stringers, an inner covering of non-metallic material adapted to rest on said stringers and be removably secured thereto under the overlapping edges of said chord members.

2. In an aeroplane fuselage of composite double wall structure, a plurality of web frames and a plurality of intercostal longitudinal stringers intersecting said frames, said stringers being provided with bracing elements attached thereto and extending from one end of each stringer to the adjacent end of the adjacent stringer and extending through the web frame at the point of intersection, an outer skin connected to said webs and stringers, said web frames being provided with enlarged frame chords, the edges of which substantially overlap both sides of the frame webs, an inner covering of non-metallic semi-flexible material adapted to be placed under the overlapping edges of said frame chords and to rest on and be removably secured to said stringers.

3. In an aeroplane fuselage construction, a plurality of web frames having enlarged chord members a plurality of intercostal longitudinal stringers intersecting said frames, an outer skin connected to said webs and stringers, an inner covering of non-metallic material adapted to rest on said stringers and be removably secured thereto under the overlapping edges of said chord members, each space bounded by the inner and outer covering and the intersecting stringers and frame webs being filled with fibrous material having sound absorbing, heat insulating and fire resisting characteristics.

4. In an aeroplane fuselage of composite double wall structure, a plurality of web frames and a plurality of intercostal longitudinal stringers intersecting said frames, said stringers being provided with bracing elements attached thereto and extending from one end of each stringer to the adjacent end of the adjacent stringer and extending through the web frame at the point of intersection, an outer skin connected to said webs and stringers, said web frames being provided with enlarged frame chords, the edges of which substantially overlap both sides of the frame webs, an inner covering of semi-flexible ornamental material adapted to be placed under the overlapping edges of said frame chords and to rest on and be removably secured to said stringers, each space bounded by the inner and outer covering and the intersecting stringers and frame webs being filled with fibrous material having sound absorbing, heat insulating and fire resisting characteristics.

5. In an aeroplane fuselage of composite double wall construction, a plurality of intercostal stringers, an outer skin connected thereto, an inner covering comprising separate panels, web bracing members having enlarged frame chords of ornamental characteristics for retaining said panels under its overlapping edges and on said stringers and so as to conceal all attachment devices, said panels and frame chords constituting bracing elements of the fuselage supporting structure.

In testimony whereof, I have signed my name to this specification this 12th day of January, 1932.

ROY G. MILLER.