

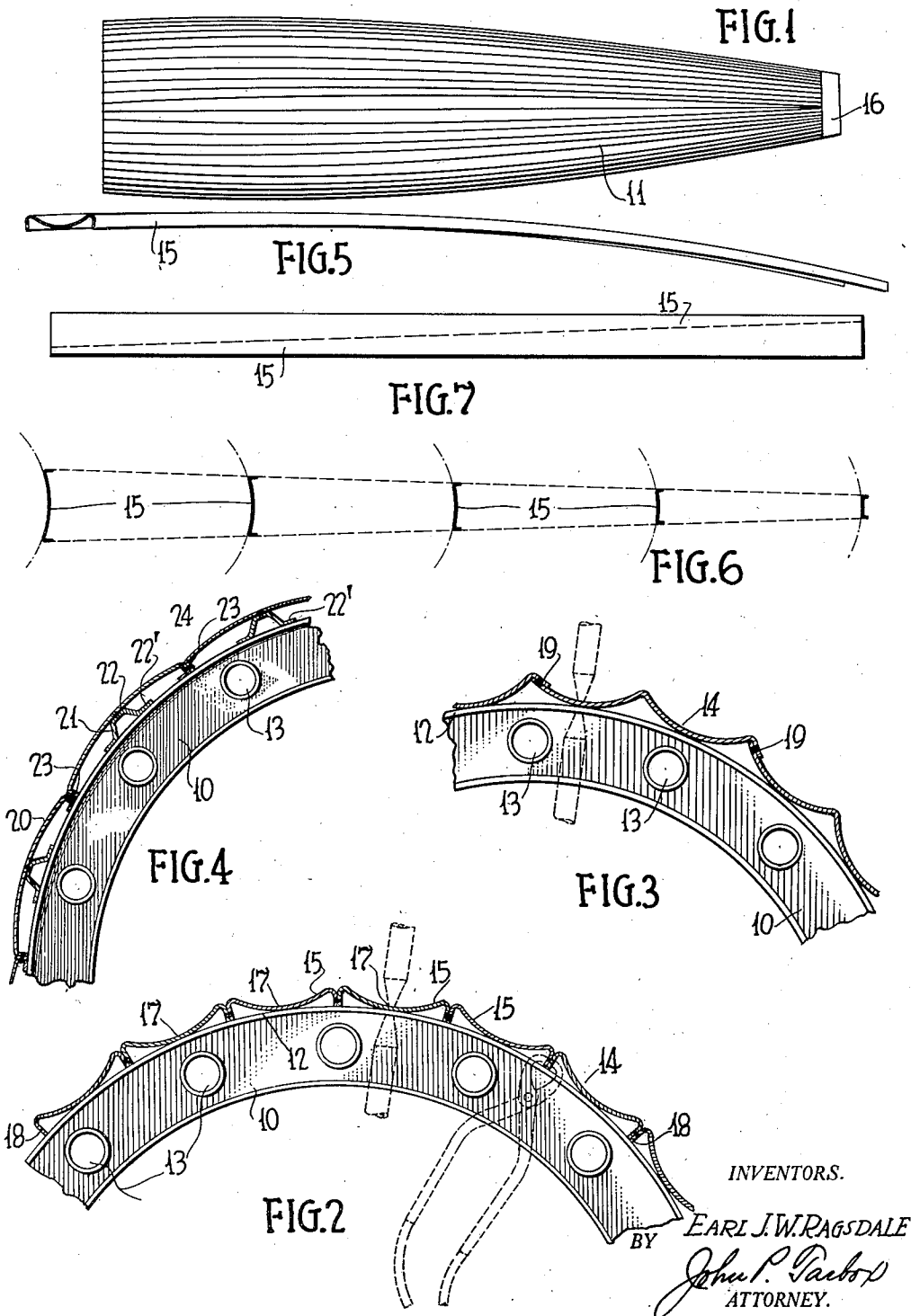
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AIRPLANE BODY

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## UNITED STATES PATENT OFFICE

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## AIRPLANE BODY

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5 Claims. (Cl. 244—30)

My invention concerns aircraft body structures, particularly of the monocoque type, but doubtless it has other applications to other types of bodies.

5 Adequate strength, lightness and ease of fabrication of monocoque bodies or fuselages have been difficult to attain, due to difficulties attending the appropriate forming of the covering of these bodies. My invention has been directed to the elimination of these difficulties, and in this  
10 aim I have been successful. In addition, I have sought to effect economies in the fabrication of the covering.

The outstanding object of my invention is to  
15 construct a monocoque body which will possess ample inherent strength and yet be very light. Further, it is my object to manufacture this body economically and on a production basis. In addition, I seek to increase the aerodynamical efficiency of this type of body. The method as  
20 well as the structure comprise my invention.

The structure comprises, in combination, frame members in the form of transverse bulkheads or the like, a longitudinally extending  
25 covering comprised of longitudinally extending paneling in a peripheral series of sections having adjoining or overlapping edges, through which the sections or panels are attached to each other. The panels are preferably of uni-  
30 form transversely curved cross section throughout their entire longitudinal extent, and are preferably attached to the bulkheads through the central portion of their curved section. This curvature makes the panels concave outwardly,  
35 according to a preferred embodiment. The panels in this form may be attached directly to the bulkheads through the bottoms of their concavities.

40 The aforementioned objects of my invention, together with other objects of detail will be rendered clear by a reading of the sub-joined specification, in the light of the drawing, in which

Fig. 1 is a side elevation view of a monocoque aircraft fuselage or body.

45 Fig. 2 is a vertical transverse section of a preferred embodiment of my invention, showing part of a bulkhead, and the outer covering, and illustrating diagrammatically the manner of assembly.

50 Fig. 3 is a view similar to Fig. 2, showing another embodiment of my invention.

Fig. 4 is likewise a view similar to Figures 2 and 3, showing yet another embodiment of my  
55 invention.

Fig. 5 shows a perspective view of a single panel, of the type illustrated in Figure 2.

Fig. 6 illustrates how each panel decreases in transverse cross section in proportion to its length, but yet retains the degree of curvature  
60 throughout its longitudinal extent.

Fig. 7 shows a blank from which two or more panels may be made economically.

In the drawing the numeral (10) designates the transversely disposed bulkheads of the interior framework of monocoque body (11). In the  
65 usual practice there are a series of these bulkheads from front to rear of the body, of a perimeter which varies with the length of the body, giving it a torpedo-like shape. These bulkheads are made  
70 of sheet metal, flanged at the edges to give them a channel section presenting longitudinally. The outer of these flanges is designated (12). Suitable holes (13) are provided in the body of the channel section for lightening it up and for the  
75 passage therethrough of control connections and the like. It will be understood that the bulkheads may well be formed otherwise, as by coiling channel section strip stock and joining the ends.

The covering, designated generally by numeral  
80 (14) comprised of a peripheral series of panels (15), envelopes the bulkheads (10), and not only covers them but spaces them apart, constituting, in effect, longitudinal strength elements of the body itself. The panels (15) abut each other  
85 closely and are of decreasing transverse cross section in proportion to the length of the body, as illustrated in Figures 1 and 6. This construction of Figure 1 is that of a body which terminates in a vertically extending tailpost (16). It will at  
90 once be apparent that the decrease in transverse cross section, together with the curvature of the panels, enables an extremely efficient body to be made, not only from the standpoint of appearance, but from the standpoint of strength as well, the  
95 assembled panels comprising in effect, a corrugated covering. The transverse cross section decreases so uniformly that it may be a general production practice to form two panels (15) from one blank, as in Figure 7. This expedient makes  
100 for economy of manufacture.

The panels (15) are made of uniform transverse curvature as shown in Figure 6 thus simplifying the step of fabricating them from sheet metal, and also making them efficient as longitudinal  
105 load members by distributing the load uniformly over their entire longitudinal extent.

The panels (15), as illustrated in Figure 2, are attached to the outer flanges (12) of bulkheads (10) by spot-welding as shown, or by riveting,  
110

and are preferably attached thereto through the bottoms (17) of their concavities.

Each panel is provided with an inwardly extending flange (18) at each longitudinal edge. Flanges (18) of adjoining panels abut each other throughout the entire longitudinal extent of the panels, and provide an excellent zone of securement therefor. This securement may be effected by spot-welding, as shown. Thus, it will be seen that at each bulkhead station (10), the panels will be secured to the bulkheads at (17) and, intermediate these stations, they will be secured to each other through their adjoining flanges (18). In addition it will be seen that the adjoining flanges (18) constitute in effect, longitudinal ribs, affording great strength to the body as a whole.

The modification of Figure 3 presents a different manner of attaching the panels (15) to each other. In this form, the panels (15) are of multiple width, and are secured to each other in zones (19), in which their adjoining edges overlap. The bottoms (17) of the concavities of panels (15) are secured to the outer flanges (12) of bulkheads (10) in the same manner as that illustrated in Figure 2. This form is likewise illustrative of an efficient cross section, in that a high degree of inherent strength resides in the continuous corrugated effect of the covering. This result obtains, even with the very simple manner of attachment shown.

A further modification is shown in Figure 4, presenting a still different type of paneling, and a different manner of attachment therefor. In this form, the panels (20) are likewise of uniform transversely curved cross section, but are outwardly convex instead of concave, as in Figures 2 and 3. Inasmuch as the central body portion of each panel (20) is relatively remote from the flanges (12) of bulkheads (10), the main securement is afforded through longitudinally extending stringers (21), of flanged channel section. The bottom (22) of each stringer (21) is secured to the center of the panel as by spot-welding, as shown, and the outwardly turned flanges (22') thereof are in turn spot-welded to flanges (12) of bulkheads (10). The longitudinal edges of each panel (20) are provided with inwardly turned flanges (23) which are respectively spot-welded or otherwise attached to an angle section strip (24), which is in turn attached to the flange (12) of bulkheads (10). The double longitudinals (21) and (24) provide this type of paneling with additional strength of an appreciable amount. It will be understood that this form of the invention may include strip (24) or may not, as in Figure 2.

Summarizing, it will be seen that I have achieved the objects of my invention. By the provision of uniform transversely curved panels I have produced in effect a corrugated covering, possessing great strength with a minimum of weight. By such uniform curvature, I have

cheapened and simplified panel fabrication. By flanging and nesting adjoining panels, I have provided a simple manner of attachment. These and other objects have been attained in full.

My invention is obviously susceptible of modification, and I do not, therefore, wish to be limited by the circumstantial terminology of the specification, but only by the scope of the appended claims.

What I claim is:

1. An aircraft body comprising transverse bulkheads and a longitudinal covering comprised of separate relatively narrow longitudinally extending sheet metal panels of transversely curved cross section throughout the length of the panels and flanged inwardly in their edges, the said panels being attached to the bulkheads through the central portion of their curved section, and attached to each other through the inwardly extending flanges adjacent their longitudinal edges.

2. An aircraft body comprising transverse bulkheads and a longitudinal covering comprised of separate relatively narrow longitudinally extending sheet metal panels of transversely curved cross section throughout the length of the panels and flanged inwardly in their edges, the said panels being attached to the bulkheads through the central portion of their curved section, and further attached to said bulkheads and to each other through the inwardly extending flanges adjacent their longitudinal edges.

3. A monocoque aircraft body comprising transverse bulkheads and longitudinal covering comprised of separate relatively narrow longitudinally extending outwardly concave sheet metal panels and flanged inwardly in their edges, the said panels being attached to the bulkheads at the bottoms of their concavities, and to each other through their adjacent flanged edges.

4. A monocoque aircraft body comprising transverse bulkheads, longitudinal angle strips secured thereto, and longitudinal covering comprised of separate relatively narrow longitudinally extending transversely curved sheet metal panels flanged inwardly in their edges, the said panels being attached to the bulkheads at the bottoms of their concavities, and having their inwardly extending flanges through which they are attached to each other secured also to said longitudinal angle strips.

5. An aircraft body comprising transverse bulkheads, longitudinal stringers secured thereto, and a longitudinal covering comprised of separate relatively narrow longitudinally extending sheet metal panels of transversely curved cross section throughout the length of the panels and flanged inwardly in their edges, the said panels being attached to the longitudinal stringers through the central portion of their curved section, and secured together and to the bulkheads through said inwardly extending flanges.

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