May 5, 1942. J. S. OTT 2,281,792

TOY AIRPLANE CONSTRUCTION

Filed May 24, 1941 2 Sheets-Sheet 1

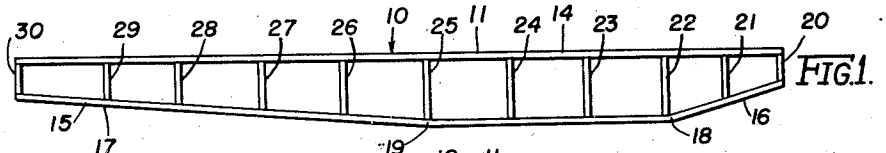


FIG. 1.

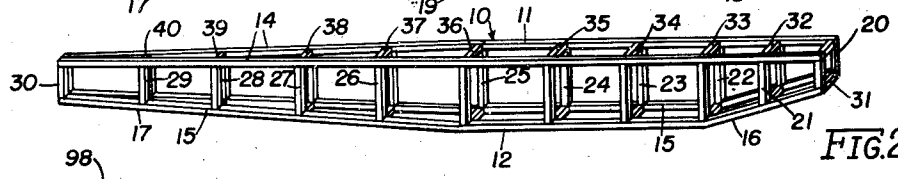


FIG. 2.

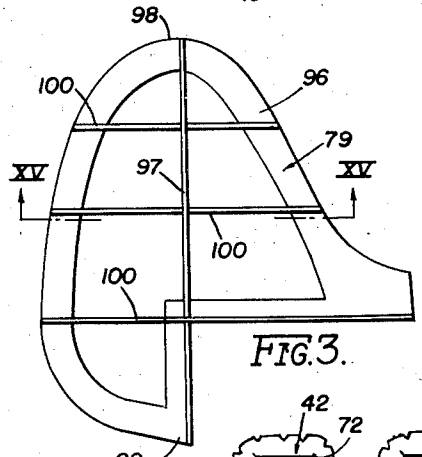


FIG. 3.

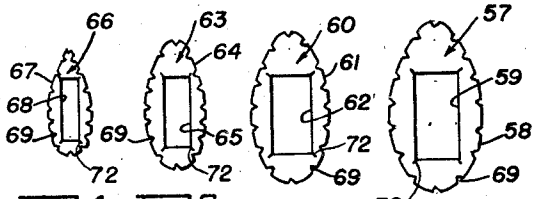


FIG. 4. FIG. 5. FIG. 6. FIG. 7.

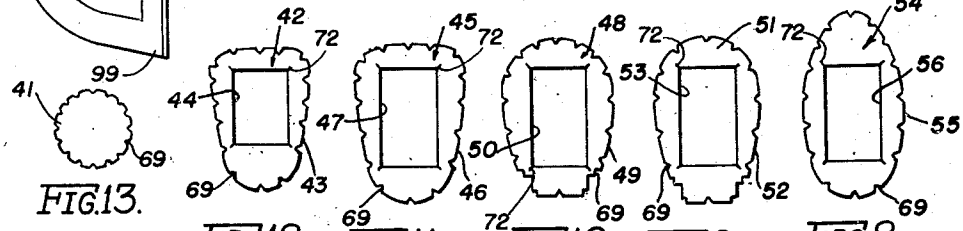


FIG. 13. FIG. 12. FIG. 11. FIG. 10. FIG. 9. FIG. 8.

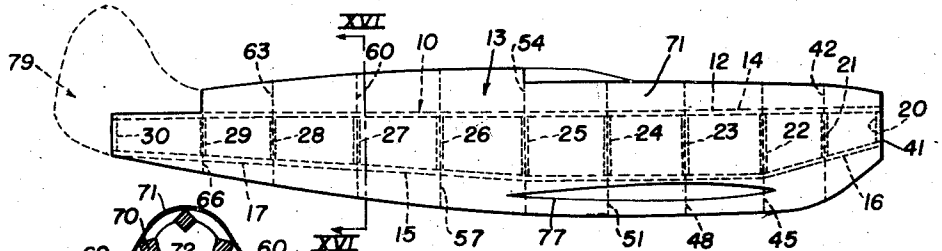


FIG. 14. FIG. 16.

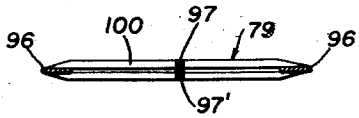


FIG. 15.

INVENTOR.
JOSEPH S. OTT.
BY Harry C. Hunter
ATTORNEY.

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TOY AIRPLANE CONSTRUCTION

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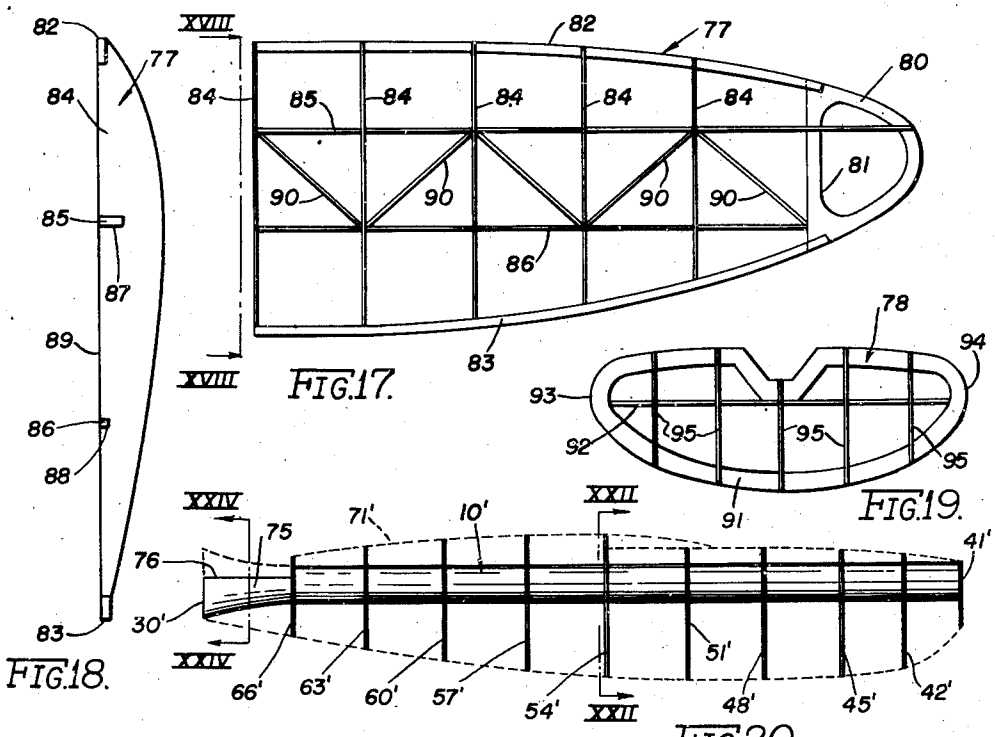


FIG. 18.

FIG. 17.

FIG. 19.

FIG. 20.

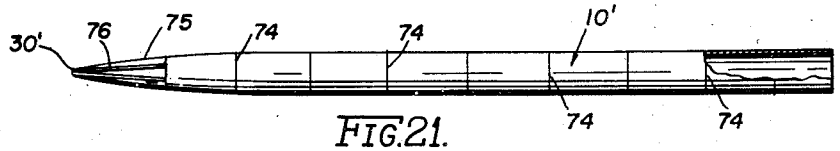


FIG. 21.

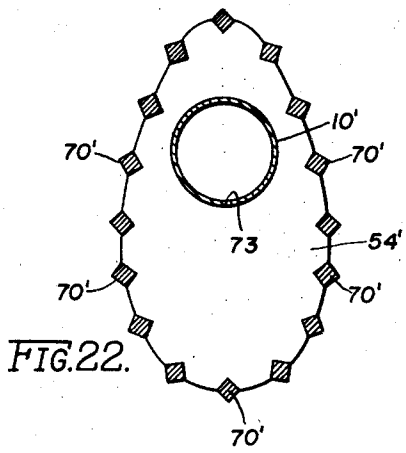


FIG. 22.

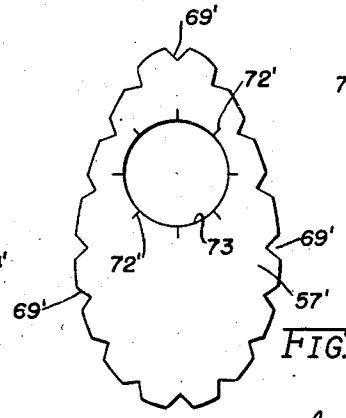


FIG. 23.

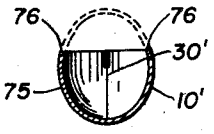


FIG. 24.

INVENTOR.
JOSEPH S. OTT.

BY Harry C. Hunter.

ATTORNEY.

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UNITED STATES PATENT OFFICE

2,281,792

TOY AIRPLANE CONSTRUCTION

Joseph S. Ott, Chicago, Ill., assignor to Joe Ott Manufacturing Co., Chicago, Ill., a corporation of Illinois

Application May 24, 1941, Serial No. 395,035

12 Claims. (Cl. 46—76)

This invention relates to knockdown structures and more particularly to hollow structures such as toy airplanes and the like, although certain features thereof may be employed with equal advantage for other purposes.

It contemplates more especially the provision of improved hollow bodies that render it possible to manufacture these structures more easily, uniformly, and much more rapidly without requiring any appreciable skill or experience.

Miniature knockdown structures such as toy airplanes and the like having hollow bodies have been commercially exploited for many years as a kit containing parts with instructions for assembling. The parts that are supplied together with the instructions entail a great deal of labor, time and skill in order to result in a structure conforming to the design for which the parts are supplied. It is customary to furnish elements of a miniature structure so that each will be segmented by the purchaser from the sheet of material having the segmented parts imprinted thereon. This involves cutting out operations that are tedious, require skill and entail appreciable time which usually discourages all but the very experienced.

Then, too, the degree of success attained in producing a miniature structure is largely dependent upon the skill of the assembler so that the miniature toy building industry while substantial in extent, has not been as widespread as would otherwise be possible with the elimination of appreciable amounts of time, labor, skill in the building and assembling operations, and the assurance of uniformity so that the resultant structure will conform to the design for which it was originally intended in shape, exact contour, operating qualities and appearance.

The assembly of hollow bodies has proven difficult and this is especially true in knockdown toy structures which interests youngsters of inexperience, lacking judgment, and limited skill. With the teachings of the present invention, hollow bodies including appendages thereto can be readily shaped, quickly assembled and uniformly produced without entailing any appreciable labor, skill and time. Simple expedients that accomplish these results are especially advantageous in knock-down toy structures owing to the inability of providing any expensive tools, jigs, extended instruction or other requirements that are taken into consideration on full size devices for commercial and useful purposes.

One object of the present invention is to simplify the construction and improve the formation of hollow bodies for miniature knockdown bodies.

Another object is to provide improved formers for hollow bodies in order to enable their structure without entailing any appreciable labor, time or skill.

Still another object is to provide improved integral formers capable of ready application to a frame so that a body defining skin or cover may be readily applied thereto.

A further object is to provide improved integral formers capable of adjustable association with a frame to define the external contour of a hollow body.

A still further object is to provide body formers stamped or otherwise shaped from inexpensive sheet material to provide for adjustable telescopic association thereof with the frame serving as a support therefor.

Still a further object is to provide an improved frame structure for hollow bodies to afford the assembly thereof without entailing any appreciable labor, time, expense or skill.

Other objects and advantages will appear from the following description of an illustrative embodiment of the present invention.

In the drawings:

Figure 1 is a side view in elevation of a frame structure for a hollow body.

Figure 2 is a perspective view of a fuselage frame element comprising spaced side members of the type shown in Figure 1.

Figure 3 is a side view in elevation of a rudder structure for toy airplanes embodying features of the present invention.

Figures 4 to 13 inclusive comprise integral formers capable of adjustable telescopic association with the frames shown in Figures 1 and 2.

Figure 14 is a side view in elevation of a model airplane fuselage and wings assembled in accordance with the teachings of the present invention.

Figure 15 is a sectional view taken substantially along line XV—XV of Figure 3.

Figure 16 is a sectional view taken substantially along line XVI—XVI of Figure 14.

Figure 17 is a fragmentary plan view of a wing structure showing the frame in a manner embodying features of the present invention.

Figure 18 is a sectional view taken substantially along line XVIII—XVIII of Figure 17.

Figure 19 is a plan view of a stabilizer embodying features of the present invention.

Figure 20 is a modified embodiment of the

fuselage construction made in accordance with the teachings of the present invention.

Figure 21 is a side view in elevation of a hollow body frame of modified design.

Figure 22 is a sectional view taken substantially along line XXII—XXII of Figure 20.

Figure 23 is a front view in elevation of a former of the type shown in Figure 22.

Figure 24 is a sectional view taken substantially along line XXIV—XXIV of Figure 20.

The structure selected for illustration comprises a frame element 10 assembled from side members 11—12 corresponding in shape, size and construction to comprise the major structures of a hollow body frame such as a fuselage 13 of a toy airplane. Each of the frame elements 10—11 comprise, in this instance, elongated top rail 14 which is vertically spaced from a bottom rail 15 having a horizontal portion that merges with a short upwardly inclined forward portion 16 and a comparatively longer upwardly inclined rear portion 17. The rails 11—15 are preferably though not essentially of soft and yieldable balsa wood to enable slight curvatures and bends, especially with the aid of slits 18 and 19 provided at the point at which the angularity is changed to facilitate the shaping to impart the desired contour to the frame.

The top rail 14 and bottom rail 15 are maintained in their desired vertically spaced relation by a plurality of equi-distantly spaced uprights 20, 21, 22, 23, 24, 25, 26, 27, 28, 29 and 30, in this instance eleven, disposed therebetween and adhesively joined therewith by suitable adhesives such as transparent glue. The end uprights 20—30 enclose the side members 10—11, the intermediate uprights 21 to 29 and end uprights 20—30 being sized to correspond with the variation in vertical distance between the top rails 14 and bottom rails 15 of each side member 10—11. The side members 10—11 are maintained in horizontally spaced relation to define a rectangular framework by means of a plurality of uniformly spaced and intermediate cross-members 31, 32, 33, 34, 35, 36, 37, 38, 39 and 40 disposed between the top rails 14 and bottom rails 15 in alignment with the uprights 20 to 29 inclusive.

The intermediate cross-members 31, 32, 33, 34, 35, 36, 37, 38, 39 and 40 are adhesively joined at their extremities to provide a framework of rectangular cross-section of varying width in that the top rails 14 start to converge at the point 19 where the bottom rails 15 start to incline upwardly toward the rear end 30. With this arrangement, the top rails 14 and bottom rails 15 meet at the rear end upright 30 which serves to vertically space both top rails 14 and bottom rails 15 at their point of contact with each other. It will be apparent, therefore, that the rectangular cross-section of the framework 10 varies in width from the intermediate uprights 25 to the end upright 30 and in depth between the uprights 20—22 and 25—30.

In order to define the exterior contour of the fuselage 13, a plurality of body formers, in this instance ten, are provided for pre-arranged association with the frame element 10 as will appear more fully hereinafter (Figures 4 to 13 inclusive). The body formers comprise, in this instance, a fuselage end defining disc 41 (Figure 13) which, in this instance, is of substantially circular configuration for adhesive application to the forward end defined by the uprights 20 and cross-members 31. The next body former consists of an integral plate 42 stamped or otherwise shaped from sheet material such as cardboard to provide an exterior periphery 43 of the desired contour, size and shape to conform with the rectangular cross-section of the frame element 10 along the uprights 21 and cross-members 32.

To this end, the body former 42 is provided with a substantially rectangular opening 44 therein which corresponds in cross-section to the size of the frame 10 along the second upright 21 which is in alignment with the cross-members 32. The exterior shape 43 of the body former 42 is controlled by the exterior contour of the body along the cross-section defined by the uprights 21 and cross-members 32. This will necessarily vary depending upon the miniature structure for which it is designed. In the present embodiment, the body former 42 is substantially acorn shaped to correspond with the fuselage 13 at that particular cross-section.

The next succeeding body former 45 is similarly shaped, but has a somewhat larger periphery 46 and a correspondingly larger rectangular opening 47 that substantially corresponds with the rectangular cross-section along uprights 22 and cross-members 33. The next succeeding body former 48 is substantially the same general size as the body former 45, but has a more or less elliptical periphery 49 and a corresponding rectangular opening 50 conforming to the cross-section of the fuselage 13 along uprights 23 and cross-members 34. The next succeeding body former 51 is of substantially the same shape, but has a somewhat larger periphery 52 and a correspondingly larger rectangular opening 53 that substantially corresponds with the rectangular cross-section along uprights 24 and cross-members 35.

The next succeeding body former 54 is substantially egg-shaped and has a somewhat larger periphery 55 and a correspondingly larger rectangular opening 56 that substantially corresponds with the rectangular cross-section along uprights 25 and cross-members 36. The next succeeding body former 57 is substantially egg-shaped and has a somewhat smaller periphery 58 than the former 54 and a correspondingly smaller rectangular opening 59 that substantially corresponds with the rectangular cross-section along uprights 26 and cross-members 37. The next succeeding body former 60 is substantially egg-shaped and has a somewhat smaller periphery 61 and a correspondingly smaller rectangular opening 62 that substantially corresponds with the rectangular cross-section along uprights 27 and cross-members 38. The next succeeding body former 63 is also substantially egg-shaped and has a somewhat smaller periphery 64 and a correspondingly smaller rectangular opening 65 that substantially corresponds with the rectangular cross-section along uprights 28 and cross-members 39. The next succeeding body former 66 is bullet-shaped and has a somewhat smaller periphery 67 and a correspondingly smaller rectangular opening 68 that substantially corresponds with the rectangular cross-section along uprights 29 and cross members 40.

The body members 42 to 66 inclusive are telescoped over the frame 10 and positioned to correspond with the specified uprights and cross members in order to impart an exterior fuselage contour conforming to the streamlined design which is scientifically outlined at the factory and desired for the builder to reproduce from the parts

in the kit provided and sold for that purpose. It is desired that the body formers 42 to 66 should be placed at pre-designated positions along the top and bottom rails 14—15 so that the aligned uprights 20 to 29 inclusive and cross members 31 to 40 inclusive serve to index the position of each.

These body forming members will be numbered to correspond with the position of the aligned uprights and cross-members so that the builder regardless of experience, skill or capacity will create a structure of the desired outline and configuration to function most successfully in accordance with established laws of aerodynamics as well as present a uniform streamlined appearance. The formers 41, 42, 45, 48, 51, 54, 57, 60, 63 and 66 have their peripheries provided with a series of uniformly spaced notches 69 that serve to index the position of and as a seat for the rectangular longerons 70 (Figure 16) that extend longitudinally of the top and bottom rails 14 and 15 for adhesive joinder with each of the body formers 41, 42, 45, 48, 51, 54, 57, 60, 63 and 66.

These longerons 70 extend around these body formers to define an exterior tubular body for the skin or cover 71 which preferably though not essentially consists of thin paper. The skin or cover 71 is adhered to the longerons 70 by means of a suitable transparent adhesive that serves as a support therefor and defines the outline of the fuselage 13 together with the other portions of the circular body. It will be observed that the builder has nothing to do in determining the outline of the fuselage 13 or circular body 13 other than to see that the body formers 41, 42, 45, 48, 51, 54, 57, 60, 63 and 66 are in proper sequence and applied at the intended position indexed therefor by the numbers or identifying indicia thereon and the aligned uprights 20 to 29 and cross members 31 to 40 inclusive.

So that the body formers 42, 45, 48, 51, 54, 57, 60, 63 and 66 may be capable of application to the correct position along the top and bottom rails 14 and 15 even though there may be a variation in the cross-sectional dimension thereof, the rectangular openings 44, 47, 50, 53, 56, 59, 62, 65, and 68 in each of the body formers 42, 45, 48, 51, 54, 57, 60, 63 and 66 are, in this instance, provided with diagonal slits 72 provided in the corners thereof so that they may yield to variations in the cross-section of the frame 10. Consequently, it will be a comparatively easy matter for the builder to apply the body formers 42, 45, 48, 51, 54, 57, 60, 63 and 66 to their correct telescoped position relative to the frame 10 even though variations result in the assembly of the latter owing to inexperience, neglect or incapacity to be limited to the desired accuracy.

It should be appreciated, however, that the body formers 42, 45, 48, 51, 54, 57, 60, 63 and 66 are integral and furnished by the factory in their final shape so that the exterior formation of the body will, nevertheless, conform to the desired configuration irrespective of variations in the framework 10. This arrangement also enables the speedy building of knockdown structures to define the limits of accuracy without entailing any appreciable time, experience or care.

In the modified embodiment shown in Figures 20 to 24 inclusive, the body formers 41', 42', 45', 48', 51', 54', 57', 60', 63' and 66' are provided with circular openings 73 preferably though not essentially of uniform diameter for telescopic association with a cylindrical paper tube 10' serving as the frame instead of the rectangular frame 10 in the previously described embodiment. The paper tube 10' may be of standard construction conforming with small cardboard mailing tubes now available on the market. Should commercial practice so dictate the circular openings 73 in the body formers 41', 42', 45', 48', 51', 54', 57', 60', 63', and 66' may be provided with a circumferential series of radial slits 72' so that they may be readily displaced over the tube 10' to occupy indexed positions inscribed thereon such as a mark 74 that may be suitably numbered to correspond with the corresponding identifying marks on the body formers 41', 42', 45', 48', 51', 54', 57', 60', 63' and 66'.

The body formers 41', 42', 45', 48', 51', 54', 57', 60', 63' and 66' are provided with a circumferential series of notches 69' to receive the longerons 70' that are seated therein for adhesive joinder therewith (Figure 22). In this instance, the tubular frame 10' is flattened in the rearward region 30' to present a converging tail portion 75 which receives the stabilizers and rudder. To this end, the tail portion 75 is horizontally cut as at 76 to present converging edges which serve to support the stabilizer and rudder that will be described more fully hereinafter. This presents a very simple, efficient and inexpensive substitute for the rectangular framework 10 which is more expensive and conforms substantially to the standard practice of miniature airplane knockdown structures.

It should be observed that the body formers 41', 42', 45', 48', 51', 54', 57', 60', 63' and 66' are, in this instance, adhesively attached to the tubular frame 10' in much the same manner as described in connection with the previous embodiment wherein the body former openings are rectangular to conform with the correspondingly shaped cross-section of the frame 10. In both embodiments, wings 77 are attached in the usual manner with stabilizers 78 and a rudder 79 occupying their usual positions for adhesive joinder to the frame 10 or 10' depending upon the particular type of hollow body structure that is utilized.

In the instance of the wing structure 77, a great deal of time and labor can be minimized by providing integral wing tips 80 that are stamped or otherwise shaped from sheet material such as cardboard. The wing tips 80 are substantially of triangular configuration and present an opening 81 for substantially reducing the weight of the wing tip and imparts better balance thereto. The wing tips 81 are adhesively joined to the leading edge 82 and the trailing edge 83 of the wing 77. A plurality of wing formers 84 extends between the leading and trailing edges 82—83 for connection thereto.

Transverse ribs 85 and 86 extend from end to end for reception in notched cut-outs 87 and 88 provided in the bottom edge 89 of the wing formers 84. These are reinforced by braces 90 extending diagonally between the wing formers 84 and the transverse ribs 85—86 so that there is sufficient framework for a skin or covering to be applied thereover. The stabilizer 78 is provided with an integral exterior peripheral rim 91 stamped or otherwise shaped from sheet material such as cardboard to assume the desired configuration thereof. A transverse rib 92 extends between the extreme edges 93—94 of the rim 78 for unlocked engagement with confronting spaced formers 95 serving as a framework for the skin or cover.

The rudder 79 is similarly formed by providing

an integral peripheral rim 96 stamped or otherwise shaped from sheet material to receive a confronting cross-ribs 97 and 97' which extends between the extreme edges 98—99 of the rim 96, there being a plurality of confronting spaced formers 100 internotched therewith for adhesive joinder to both surfaces of the rim 96 (Figure 15). The former ribs and braces of the wing 77, stabilizer 78 and rudder 79 may be stamped or otherwise shaped from sheet material such as cardboard, paper, balsam wood or applied thereto depending upon the dictates of commercial practice.

Various changes may be made in the embodiment of the invention herein specifically described without departing from the invention or sacrificing any of the advantages or features thereof, and nothing herein shall be construed as a limitation of the invention, its concept or structural embodiment as to the whole or any part thereof except as defined in the appended claims.

I claim:

1. In a toy airplane structure and the like, the combination with a rigid elongated member to define the tubular frame of a structure, of enclosed former elements having openings therethrough conforming substantially with the cross-sectional shape of said tubular frame which is received therethrough and frictionally retained thereon to support said former elements in pre-arranged spaced relation with said tubular frame, and longeron ribs adhesively joined to said former elements to define a body of any selected contour.

2. In a toy airplane structure and the like, the combination with a rigid elongated member to define the frame of a structure, of a plurality of enclosed former elements having openings therethrough conforming substantially with the cross-sectional shape of said frame, the opening in each of said former elements corresponding substantially to the cross-section of said frame which is received therethrough and frictionally positioned therealong intermediate the length thereof to support said former elements in pre-arranged spaced relation, and longeron ribs adhesively joined to said former elements to define a body of any selected contour.

3. In a toy airplane structure and the like, the combination with a rigid elongated member to define the frame of a structure, of enclosed former elements having openings therethrough conforming substantially with the cross-sectional shape of said frame which is received therethrough to support said former elements in pre-arranged spaced relation, means provided adjacent said former openings to render the latter adjustable to the exact cross-sectional size of said frame, and longeron ribs adhesively joined to said former elements to define a body of any selected contour.

4. In a toy airplane structure and the like, the combination with a rigid elongated member to define the frame of a structure, of enclosed former elements having openings therethrough conforming substantially with the cross-sectional shape of said frame, the opening in each of said former elements corresponding substantially to the cross-section of said frame which is received therethrough to support said former elements in pre-arranged spaced relation, means provided adjacent said former openings to render the latter adjustable to the exact cross-sectional size of said frame, and longeron ribs adhesively joined to said former elements to define a body of any selected contour.

5. In a toy airplane structure and the like the combination with a rigid elongated member to define the frame of a structure, of enclosed former elements having openings therethrough conforming substantially with the cross-sectional shape of said frame which is received therethrough to support said former elements in pre-arranged spaced relation, slits provided in said former elements to communicate with the openings therein to render the latter adjustable to the exact cross-sectional size of said frame, and longeron ribs adhesively joined to said former elements to define a body of any selected contour.

6. In a toy airplane structure and the like, the combination with a rigid elongated member to define the frame of a structure, of enclosed former elements having openings therethrough conforming substantially with the cross-sectional shape of said frame, the opening in each of said former elements corresponding substantially to the cross-section of said frame which is received therethrough to support said former elements in pre-arranged spaced relation, means provided adjacent said former openings to render the latter adjustable to the exact cross-sectional size of said frame, slits provided in said former elements to communicate with the openings therein to render the latter adjustable to the exact cross-sectional size of said frame, and longeron ribs adhesively joined to said former elements to define a body of any selected contour.

7. In a toy airplane structure and the like, the combination with a rigid elongated member to define the frame of a structure, of enclosed former elements having rectangular openings therethrough conforming substantially with the cross-sectional shape of said frame which is received therethrough to support said former elements in pre-arranged spaced relation, diagonal slits provided in said former elements to communicate with the corners of the rectangular openings therein to render the latter adjustable to the exact cross-sectional size of said frame, and longeron ribs adhesively joined to said former elements to define a body of any selected contour.

8. In a toy airplane structure and the like, the combination with a rigid elongated member to define the frame of a structure, of enclosed former elements having rectangular openings therethrough conforming substantially with the cross-sectional shape of said frame, the opening in each of said former elements corresponding substantially to the cross-section of said frame which is received therethrough to support said former elements in pre-arranged spaced relation, diagonal slits provided in said former elements to communicate with the corners of the rectangular openings therein to render the latter adjustable to the exact cross-sectional size of said frame, and longeron ribs adhesively joined to said former elements to define a body of any selected contour.

9. Tubular body forming elements comprising a solid sheet of material having an exterior peripheral shape substantially corresponding with the cross-sectional shape of the resultant body at spaced points along the body frame, there being an opening in said forming elements to receive the body frame therethrough for frictional positioning at predetermined points therealong.

10. A body forming element comprising a solid sheet of material having an exterior peripheral

shape substantially corresponding with the shape of the resultant body, there being an opening in said forming element to receive a frame therethrough for frictional positioning thereon, and means on said forming element adjacent said opening to render the latter adjustable to the exact cross-sectional size of said frame.

11. A body forming element comprising a solid sheet of material having an exterior peripheral shape substantially corresponding with the shape of the resultant body, there being an opening in said forming element to receive a frame therethrough for frictional positioning thereon, said opening having slits provided in said forming element to communicate with the opening therein to render the latter adjustable to the exact cross-sectional size of said frame.

12. A body forming element comprising a solid sheet of material having an exterior peripheral shape substantially corresponding with the shape of the resultant body, a rectangular opening in said forming element to receive a frame therethrough for frictional positioning thereon, diagonal slits provided in said forming element to communicate with the corners of said rectangular opening therein to render the latter adjustable to the exact cross-sectional size of said frame.

JOSEPH S. OTT.