

Sept. 23, 1958

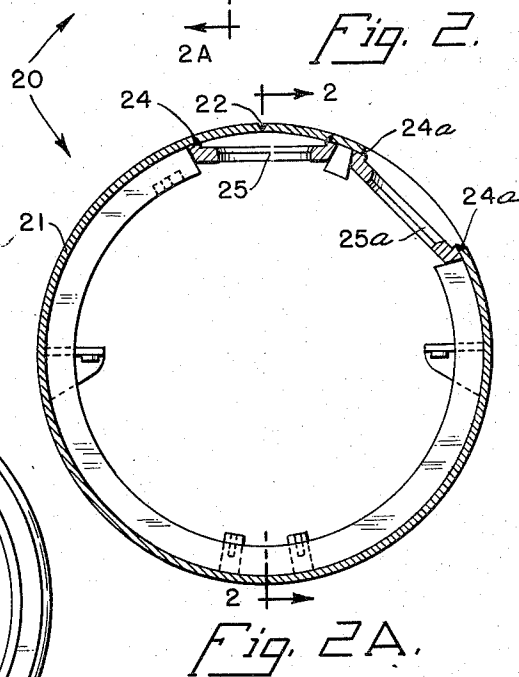
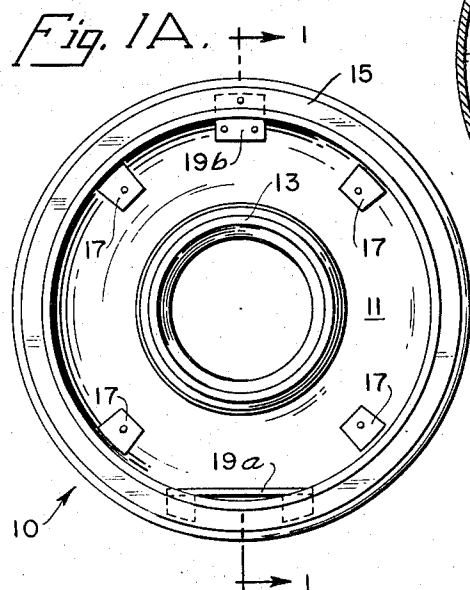
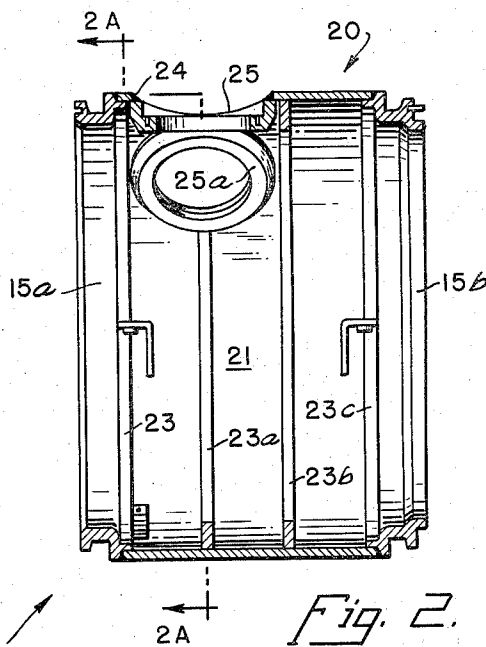
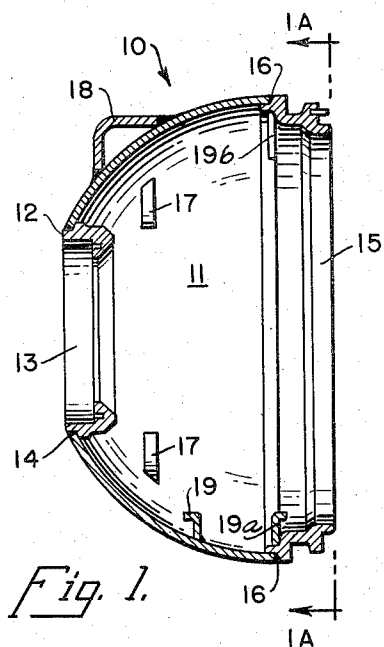
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FABRICATED ALUMINUM SHELL STRUCTURE FOR A TORPEDO

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4 Sheets-Sheet 1



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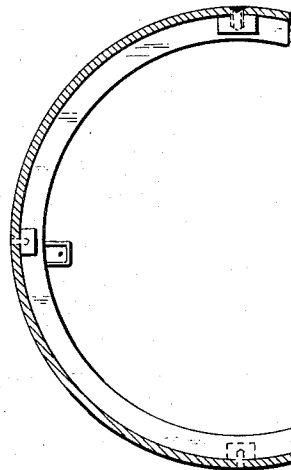
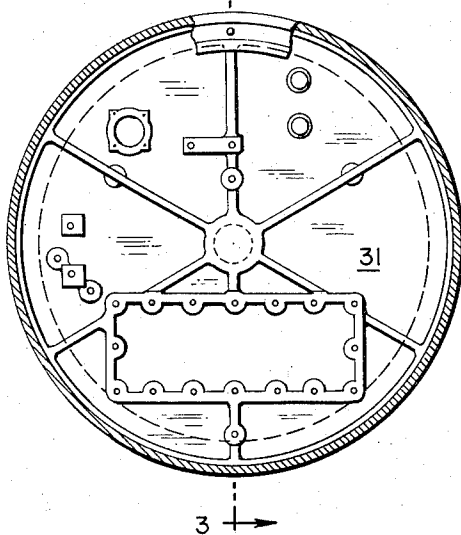
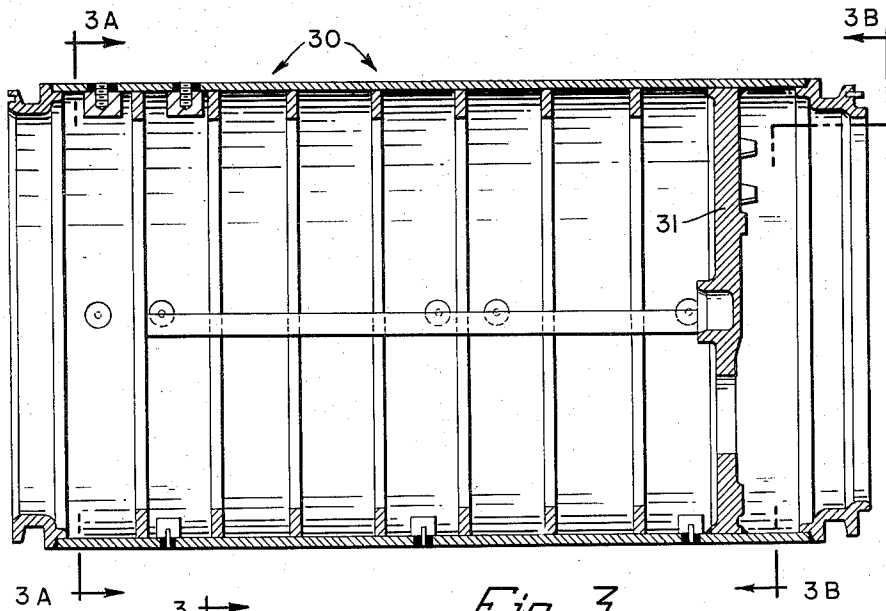
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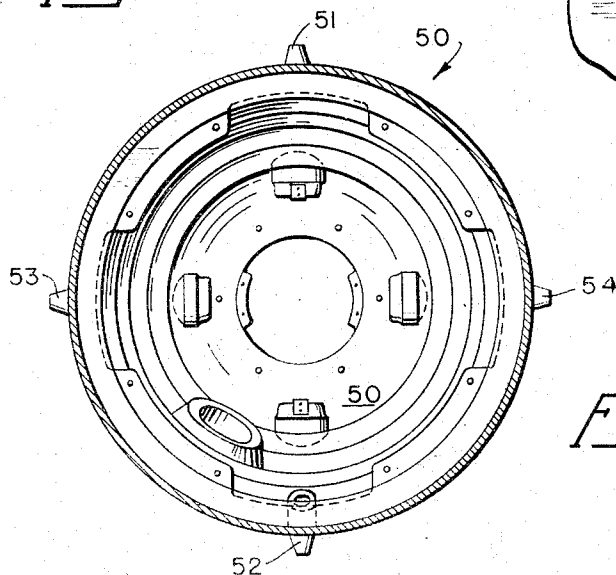
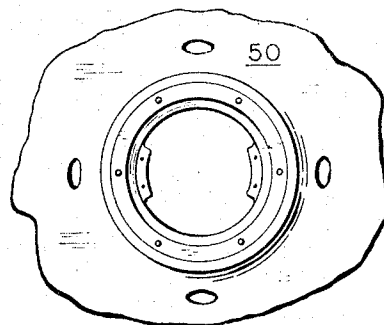
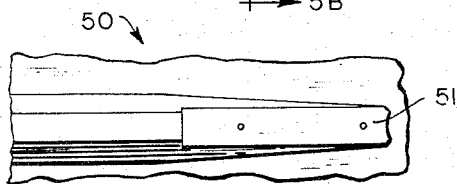
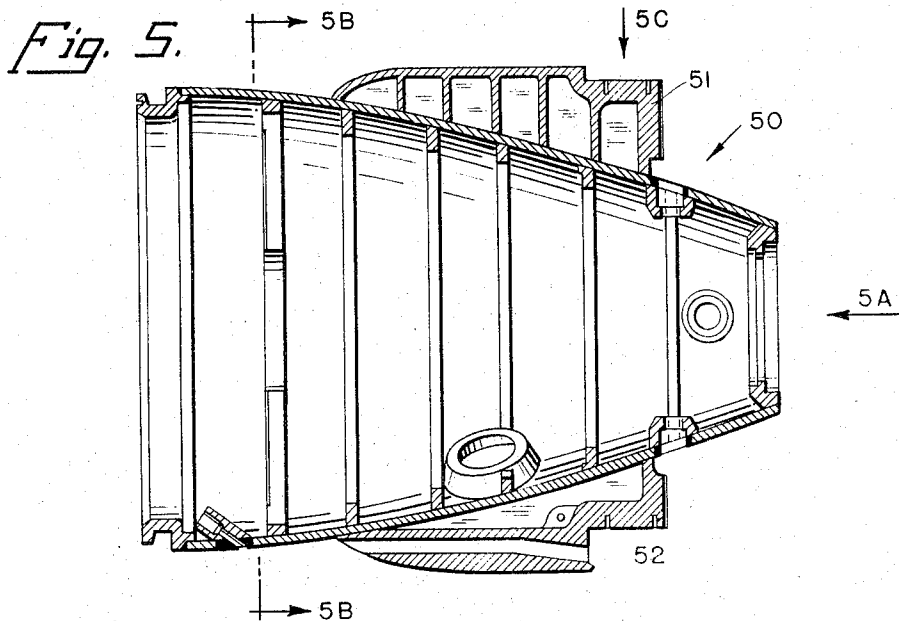
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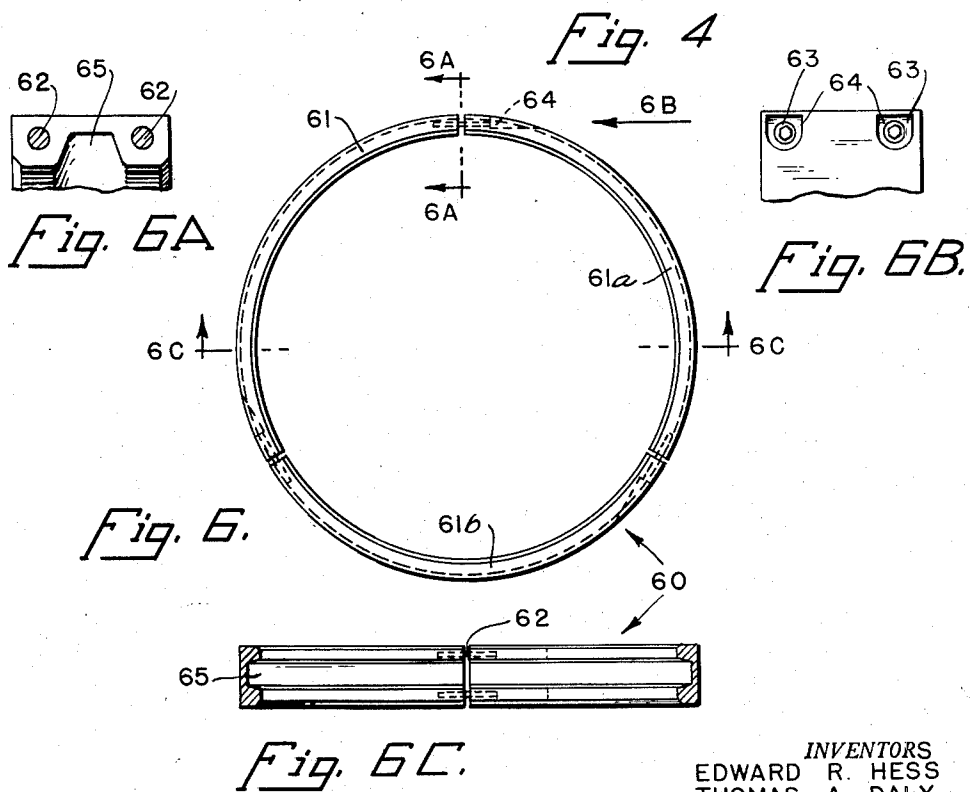
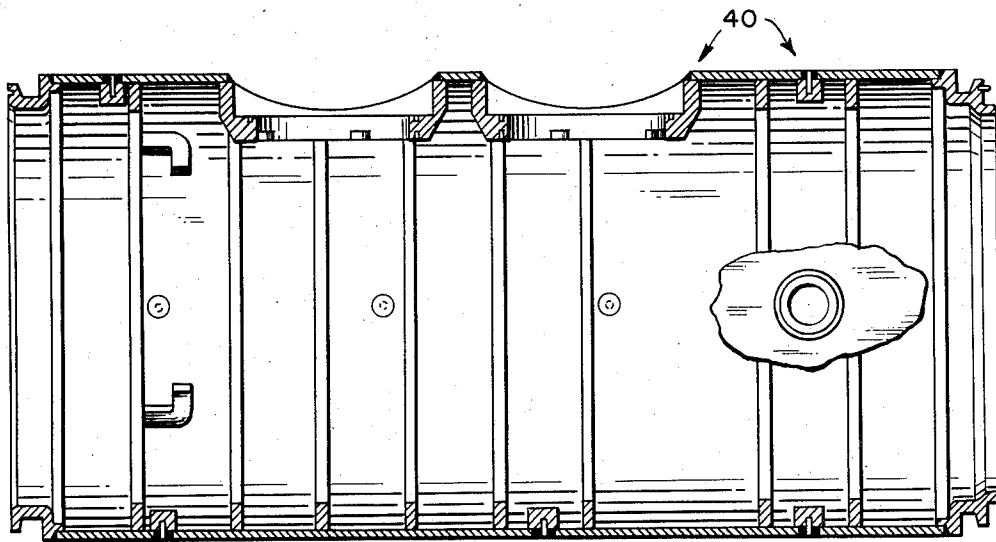
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4 Sheets-Sheet 4



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1

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FABRICATED ALUMINUM SHELL STRUCTURE FOR A TORPEDO

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Application August 18, 1952, Serial No. 304,893

2 Claims. (Cl. 114—20)

This invention relates to torpedoes and more particularly to improvements in shell construction for same.

In the prior art it has been the practice to construct torpedo shells of various metals including steel and heat treated cast aluminum. For certain uses, the cast shell has been preferable to steel shells due to its lighter weight but has had the disadvantages of porosity, stress cracking, etc.

One of the objects of the invention is to provide a torpedo shell formed of a plurality of sections, each section being constructed of high tensile rolled sheet aluminum alloy, the various portions of each section being secured together by welding.

Another object is to provide a reinforced welded aluminum alloy shell construction of comparable strength to a cast shell but considerably lighter in weight.

A further object is to provide novel methods of making a rolled sheet aluminum torpedo shell.

Still further objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is a longitudinal section of an exercise nose section, taken on line 1—1, Fig. 1A;

Fig. 1A is a rear elevation of Fig. 1, as viewed from plane 1A—1A, Fig. 1;

Fig. 2 is a longitudinal section of the second or exercise section, taken on line 2—2, Fig. 2A;

Fig. 2A is a section taken on line 2A—2A, Fig. 2;

Fig. 3 is a longitudinal section of the third or battery compartment section, taken on line 3—3, Fig. 3B;

Fig. 3A is a fragmentary section taken on line 3A—3A, Fig. 3;

Fig. 3B is a section taken on line 3B—3B, Fig. 3;

Fig. 4 is a longitudinal section of the fourth or afterbody section, a portion of the outer surface of the near side thereof being shown in side elevation;

Fig. 5 is a longitudinal section of the fifth or tail cone section;

Fig. 5A is a fragmentary rear elevation of Fig. 5 as viewed in the direction of arrow 5A, Fig. 5;

Fig. 5B is a section taken on line 5B—5B, Fig. 5;

Fig. 5C is a fragmentary top plan of Fig. 5, as viewed in the direction of arrow 5C;

Fig. 6 is a side elevation of a connector ring employed between the various adjacent sections for securing same together;

Fig. 6A is an enlarged section taken on line 6A—6A, Fig. 6;

Fig. 6B is an enlarged fragmentary section as viewed in the direction of arrow 6B, Fig. 6; and

Fig. 6C is a section taken on line 6C—6C, Fig. 6.

Referring in detail to the drawing, and particularly Figs. 1 and 1A, the nose section 10 comprises a generally hemispherical shell portion 11 having an aperture 12 therein which telescopically receives the front end of a circular nose flange 13. A circumferential weld 14 in-

2

tegrally joins the flange and portion 11. The rear end of portion 11 telescopically receives a projecting flange or an annular joint ring 15 and is welded thereto by a circumferential weld 16. In the fabrication of this section, shell portion 11 is pressed to shape between suitable dies, pads 17, towing eye 18 and bracket 19, are welded thereto, flange 13 is then welded to the shell and joint ring 15 finally welded thereto. Any brackets 19a, 19b which must be secured to joint ring 15 are welded thereto prior to application and welding of the joint ring to the shell. After completion of all welding the entire unit is heat treated and thereafter the nose flange and joint ring finally finish machined to the required dimensions.

Exercise section 20 shown in Figs. 2 and 2A comprises in general a cylindrical shell 21 having a longitudinal weld 22, front and rear joint rings 15a, 15b, respectively, reinforcing ring-shaped ribs 23, 23a, 23b, 23c and hand hole flanges 25, 25a. In the fabrication of this section it will be assumed that the various reinforcing ribs have been rolled to cylindrical shape and adjacent ends thereof butt welded, except for the ring 23a which has a gap between its ends; that the joint rings have been semi-machined; and that the shell has been rolled to substantially cylindrical shape with a gap between adjacent longitudinal edges thereof. The reinforcing ribs are disposed in desired spaced relation within the shell and the latter clamped thereon with strap clamps extending thereabout. Ring 23b is tack welded to the shell at several angular positions, for example at four positions 90° apart. Joint rings 15a, 15b are then applied to the ends of the shell and similarly tack welded. The longitudinal seam of the shell is then tack welded after which openings 24, 24a are machined in the shell and flanges 25, 25a, respectively, applied adjacent thereto and similarly tack welded at several spaced points. Ring 23a is then adjusted to its proper position and tack welded to the shell at several angularly spaced points. The shell is then checked for size with the strap clamps and all of the reinforcing rings welded thereto, first by tack welding and then by welding at alternate areas to minimize heating of the materials. A similar procedure is employed for the flanges and joint rings and finally the longitudinal seam is welded together. The unit is then heat treated and the flanges and joint rings finished machined in the same manner as described for the nose section.

Battery compartment section 30 shown in Figs. 3, 3A and 3B is similar to section 20 except that it is somewhat longer and is provided with a bulkhead 31. The procedure of fabricating is essentially the same as described for section 20.

Afterbody section 40 shown in Fig. 4 is also similar to sections 20 and 30 and the procedure of fabricating is essentially the same as described in connection therewith.

Tail cone section 50 shown in Figs. 5, 5A, 5B and 5C is fabricated in a manner similar to that described for sections 20, 30 and 40, the only essential difference being that the shell is formed to a somewhat frusto-conical shape rather than cylindrical. This section also differs from those previously described in that it is provided with vanes 51, 52, 53 and 54 welded thereto.

The various sections are secured together by a plurality of split clamp rings 60, one of which is shown in Figs. 6, 6A, 6B and 6C. This ring comprises three sections 61, 61a and 61b secured together by three pairs of screws such as 62, 62 the heads 63 of which are disposed in recesses 64 in one section and the opposite ends of which threadedly engage the adjacent section. The tapered annular groove 65 corresponds to the shape of adjacent ends of the joint rings, when two sections are disposed in end to end abutting relation. When screws 62 are tightened a clamp ring wedgingly engages adjacent joint rings and draws them axially together.

3

The warhead employed with the torpedo is substantially the same shape and length of the combined exercise nose section 10 and exercise section 20, the parts being secured together with a joint ring as previously described or the joint ring omitted and the parts integrally secured together by a circumferential weld between the rear end of the nose shell and front end of the rearward adjacent shell.

To withstand comparable pressures, the shell thickness of the construction described may be reduced to approximately 60% of a cast shell and thus save considerable weight which latter is important to render the shell and complicated propulsion machinery and controls therein a buoyant unit so that it may be readily recovered after a run.

While certain sequences of fabrication and welding have been described it will be understood that the sequences may be varied and it is not intended to limit the invention to any particular sequence described except as defined within the scope of the appended claims.

What is claimed is:

1. A method of making a sectional torpedo shell which includes the steps of forming a nose section by shaping a sheet of aluminum alloy to a tubular generally hemispherical shape, forming at least one intermediate section by shaping a sheet of aluminum alloy to a tubular shape substantially the same diameter at all cross sections thereof and with the longitudinal edges adjacent each other, welding said longitudinal edges together, forming a tail section by shaping sheet aluminum alloy to a tubular shape to approach the shape of an imaginary truncated cone disposed therewithin, forming a plurality of annular rolled aluminum alloy reinforcing ribs and butt welding the ends of each together, forming a plurality of annular

4

aluminum alloy joint rings, disposing one of said joint rings adjacent the larger end of said tail cone and welding same thereto, disposing some of said reinforcing ribs within the tail cone in spaced axial alignment and welding same thereto, similarly disposing some of said reinforcing ribs within an intermediate section and welding same thereto, and similarly disposing one of said joint rings adjacent at least one end of an intermediate section and welding same thereto.

2. A method of making a unitary section of a torpedo shell which includes the steps of forming a plurality of reinforcing ribs, each rib being formed by rolling a solid rectangular aluminum alloy bar to annular shape and butt welding ends of same, rolling a sheet of aluminum alloy to tubular shape with spaced longitudinally extending adjacent edges, disposing the ribs within the rolled sheet in axial relationship, contracting the rolled sheet onto the ribs and narrowing the space between said edges, forming an annular joint ring and disposing same adjacent an end of the rolled sheet, welding the ribs and joint ring to the rolled sheet, welding said edges together, heat treating said unitary structure, and subsequently machining the joint ring to its finished dimensions.

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