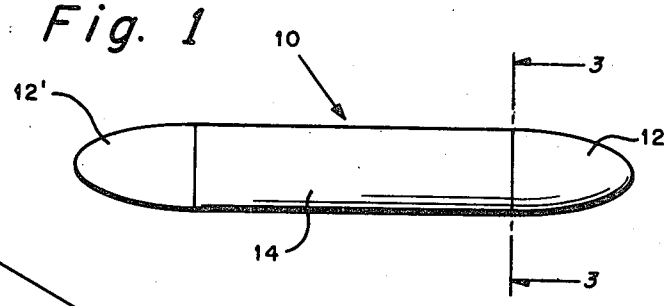
May 21, 1957 E. H. GRANFELT 2,792,962

MULTI-CELLULAR ROCKET PACKAGE

Filed Oct. 21, 1955

Fig. 1



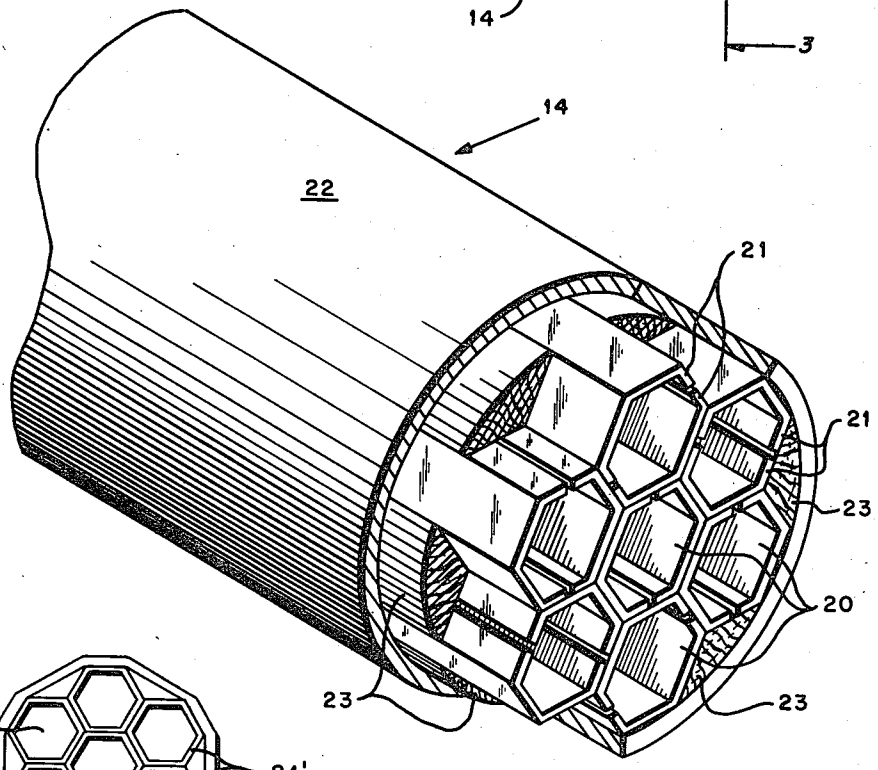


Fig. 2

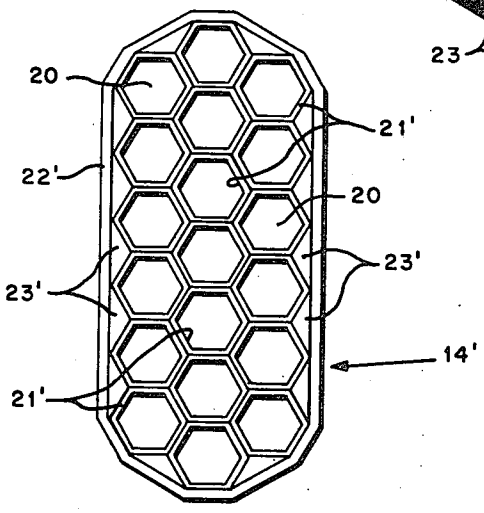


Fig. 3

INVENTOR.
ERNEST H. GRANFELT
BY
L. M. Smith, Jr.
ATTORNEYS

United States Patent Office

2,792,962

Patented May 21, 1957

2,792,962

MULTI-CELLULAR ROCKET PACKAGE

Ernest H. Granfelt, Huntingdon Valley, Pa., assignor to the United States of America as represented by the Secretary of the Navy

Application October 21, 1955, Serial No. 542,122

7 Claims. (Cl. 220—21)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to a multi-cellular rocket package, and more particularly to a multi-cellular rocket package comprising a light weight disposable container for airborne rockets characterized by conservation of weight, space and materials, yet capable of withstanding the substantial stresses induced therein by the high loads imposed thereon during flight.

Airborne expendable rocket launchers have been built previously using heavy pasteboard tubes enclosed in a plastic sheathing material. However, this type of expendable rocket launcher has numerous inherent disadvantages in addition to the relatively costly and time-consuming procedure by which they are fabricated. The inherent tendency to absorb moisture characteristic of pasteboard tubing causes considerable dimensional variation in tubing diameters with changes in humidity and exposure in flight to concentrations of water vapor which result in difficult rocket insertion, or alternatively, in considerable rocket-tube clearance with attendant variations in the launching load. Moreover, the dipping technique used in assembling the paper tube launchers presently available causes the deposit of a plastic on firing contacts which frequently results in launcher malfunctioning when an attempt is made to fire rockets enclosed therein.

The instant invention contemplates an expendable rocket launcher package composed of a plurality of polygonal elongated units made from moisture resistant material and secured together by a suitable adhesive.

An object of the present invention is the provision of expendable rocket launcher packages highly resistant to the adverse effect of moisture and temperature changes accompanying atmospheric changes.

Another object is to provide an expendable rocket launcher package composed of high strength, light weight structural elements occupying a minimum space.

Still another object is the provision of an expendable rocket launcher package suitable as a shipping container for rockets.

A final object is the provision of an expendable rocket launcher package subject to low fatigue effects due to the absence of rivets or other concentrated fastening means therein.

Other 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 simplified plan view of a rocket launcher package incorporating the instant invention,

Fig. 2 is an isometric view partly broken away, of the central section of a rocket launcher package showing details of a preferred embodiment of the instant invention, and

Fig. 3 is a sectional view taken on line 3—3 of Fig. 1 showing another embodiment of the instant invention.

Referring next to the drawings wherein like reference numerals refer to like or corresponding parts, and particularly to Fig. 1, the reference numeral **10** generally designates a typical airborne rocket launcher package including a faired forward end portion **12** and a faired rearward end portion **12'** releasably attached to the opposite ends of and thus enclosing an open ended central body portion **14** to enclose and support a plurality of rockets.

Referring next to Fig. 2 which illustrates structural details of a central body portion **14** of a rocket launcher package **10** which has been constructed according to the teachings of the instant invention, the central body portion shown includes a plurality of elongated chambers formed by a series of semi-hexagonal stampings arranged in pairs and nested together to enclose and support a plurality of rockets (not shown). These semi-hexagonal stampings **21** may be fabricated from a relatively light but strong material such as aluminum or other light metallic or non-metallic material having suitable characteristics as to its weight, strength and rigidity. Alternatively, the respective chambers **20** may be formed by lengths of hexagonally shaped extruded tubing **21'**, as shown in Fig. 3, made of suitable material, such as aluminum. The pairs of semi-hexagonal stampings **21**, or the lengths of hexagonally shaped extruded tubing **21'** which may be substituted therefor, are preferably interconnected in the manner described below by the use of a high strength metal adhesive sprayed on all external surfaces thereof. The plurality of chambers **20** formed in this manner is enclosed in a pre-shaped external shell **22** composed of suitable sheet material such as aluminum or a suitable plastic and secured to the elements defining the respective chambers **20** by the metal adhesive applied to all mating surfaces. In order to fill the irregularly shaped voids immediately beneath the shell **22**, suitably shaped filler strips **23** may be combined with the shell **22** as shown in Fig. 2 to form an outer shell assembly having an inner surface complementary to the peripheral outer surfaces of the grouped stampings **21**. These filler strips **23**, which may be fabricated from balsa wood or other suitable light weight material, such as foamed plastic or the like, serve to maintain the faired contours of the shell **22** under aerodynamic loads and also serve to protect and support rockets contained within their respective chambers **20**, particularly when the central body portion **14** is used as a shipping container. In addition, these filler strips **23** are effective to absorb induced shear stresses.

Aside from the numerous advantages of the instant invention with respect to savings in space and weight and with respect to its inherent resistance to dimensional variations in the various chambers, the configuration of the instant invention lends itself to simplified fabricating procedures resulting in a substantial saving in man-hours. For example, the semi-polygonal stampings or polygonally shaped extruded tubing may be assembled on floating mandrels after all external surfaces thereof have been sprayed with a metal adhesive. Thereafter, the pre-shaped external shell may be clamped around the assembled elements after its inner surface is likewise sprayed with a metal adhesive and after the respective filler strips **23** have been inserted, as shown in Fig. 2. With all of the elements thus secured in mutual engagement, the resultant assembly may be oven cured at the proper temperature and for the period necessary to cure the adhesive used, thereby completing the fabrication of the central body portion **14** which forms the major component of the rocket launcher package illustrated in Fig. 1.

Thus, the instant invention provides a rocket launcher

package which is compact and light weight and impervious to the adverse effects of moisture and temperature changes in the surrounding atmosphere, yet capable of withstanding both the shock loads encountered when it is used as a shipping container for rockets and the aerodynamic loads encountered in flight and the loads imposed thereon when the rockets are fired therefrom. Tolerance variations are inherently well controlled in either the semi-polygonal stampings or in the lengths of extruded tubing due to the manner in which these elements are interfitted and bonded on all mating surfaces and the resulting assembly is subject to negligible variation with changes in the moisture content or temperature of the surrounding atmosphere, so that the proper clearance for a rocket is initially provided and permanently maintained in each chamber of the central body portion of a rocket launcher package constructed according to these teachings. In addition, the use of an adhesive over the entire area of all mating surfaces instead of rivets or other concentrated fastening means results in extremely light weight structural elements highly resistant to fatigue failure.

The paired semi-polygonal stamping illustrated in Fig. 2 may be replaced with accurately formed lengths of polygonally shaped extruded tubing **21'**, as shown in Fig. 3, to eliminate the joints between the stampings and thereby provide increased strength of the assembly. Fig. 3 also illustrates one alternate configuration capable of accommodating an increased number of rockets comprising an enlarged central body portion **14'** with a modified cross-sectional shape in which an increased number of chambers **20** formed by lengths of tubing **21'** are enclosed by an enlarged pre-shaped external shell **22'**. As in the embodiment illustrated in Fig. 2, this embodiment may also be provided with filler strips **23'** shaped to fill the spaces between the assembled elements **21** and the shell **22'**. This configuration will also require modified end portions, not shown.

Obviously, many modifications and variations of the present invention are possible in the light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A light weight high strength multi-cellular structure for use as a container and supporting means for a plurality of elongated generally cylindrical objects, said structure including a plurality of elongated polygonal hollow members open at both ends each consisting of shaped thin sheet material and grouped together in mutually adjacent positions, a tubular outer shell assembly open at both ends and having an inner surface shaped and arranged to encircle and interengage the peripheral outer surfaces of the grouped hollow members, said hollow members being arranged so that the entire outer surface of each hollow member is disposed in contact with portions of the outer surface of adjacent hollow members or portions of the inner surface of the outer shell assembly, and a suitable adhesive coating extending over the entire outer surface of each hollow member and over the entire inner surface of said outer shell assembly and effective to permanently interconnect all contacting surfaces and thereby form an open ended rigid unitary structure.

2. A device as described in claim 1, in which each elongated polygonal hollow member includes an identical pair of opposed half sections composed of angularly intersecting generally planar portions shaped and arranged so that the adjacent edges of the respective half sections spaced apart by a substantially uniform small amount lie in a common plane, and in which all of the hollow members are so disposed that the discontinuities between the respective half sections of each hollow member coincide with the uninterrupted planar surfaces of adjacent hollow members.

3. A light weight high strength multi-cellular structure for use as a container and supporting means for a plurality of elongated generally cylindrical objects, said structure including a plurality of elongated polygonal hollow members each consisting of shaped thin sheet material and grouped together in mutually adjacent parallel positions, a plurality of elongated solid filler elements disposed parallel to and in engagement with peripherally disposed hollow members, an outer shell composed of sheet material, said hollow members and said solid elements being arranged so that the entire outer surface of each hollow member and each solid element is disposed in contact with portions of the outer surface of adjacent hollow members or portions of the outer shell, and a suitable adhesive coating extending over the entire outer surface of each hollow member and each filler element and over the entire inner surface of said outer shell and effective to permanently interconnect all contacting surfaces and thereby form a rigid unitary structure.

4. A device as described in claim 3, in which each elongated polygonal hollow member includes an identical pair of opposed half sections shaped and arranged so that the adjacent edges of the respective half sections lie in a common plane, and in which all of the hollow members are so disposed that the discontinuities between the respective half sections of each hollow member do not coincide with the discontinuities between the respective half sections of any adjacent hollow member.

5. A device as described in claim 3, in which each elongated polygonal hollow member consists of a pair of opposed half sections shaped and arranged so that the adjacent edges of the respective half sections lie in a common plane, and in which all of the hollow members are so disposed so that the discontinuities between the respective half sections of each hollow member coincide with uninterrupted surfaces of adjacent hollow members.

6. A light weight high strength multi-cellular structure for use as a container and supporting means for a plurality of elongated generally cylindrical objects, said structure including a plurality of elongated hexagonal hollow members each consisting of shaped thin sheet material and grouped together in parallel positions, a plurality of elongated solid filler elements disposed parallel to and in engagement with said hollow members, a faired outer shell composed of sheet material, said hollow members and said solid elements being arranged so that the entire outer surface of each hollow member and each solid element is disposed in contact with portions of the outer surface of adjacent hollow members or portions of the outer shell, and a suitable adhesive coating extending over the entire outer surface of each hollow member and each filler element and over the entire inner surface of said outer shell effective to permanently interconnect all contacting surfaces annd thereby form a rigid unitary structure.

7. A device as described in claim 6, in which each elongated hexagonal hollow member includes an identical pair of opposed longitudinally extending half sections shaped and arranged so that the adjacent edge portions of the respective half sections lie in a common plane, and in which all of the hollow members are so disposed that the edge portions of the respective half sections of each hollow member engage the central portions of the adjacent half sections of juxtaposed hollow members.

References Cited in the file of this patent

UNITED STATES PATENTS

376,321	Lankford	Jan. 10, 1888
1,791,417	Lilienfield	Feb. 3, 1931
2,396,061	Stewart	Mar. 5, 1946

FOREIGN PATENTS

566,758	Great Britain	Jan. 12, 1945