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Hans et al.

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[54] **FINLOCK ALIGNMENT MECHANISM FOR ROCKETS**

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[51] **Int. Cl.**[5] **F42B 10/06**

[52] **U.S. Cl.** **244/3.25**; 244/33

[58] **Field of Search** 244/3.24, 3.25, 3.3

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,691,495	10/1954	Chiroky	244/3.3
2,842,058	7/1958	Küller et al.	244/3.25
2,851,950	9/1958	Van Aken et al.	244/3.25
3,032,857	5/1962	Lyon	244/3.24
3,117,520	1/1964	Kerr et al.	244/3.24
3,158,100	11/1964	Finley	244/3.24
3,687,398	8/1972	Beuschel	244/3.24

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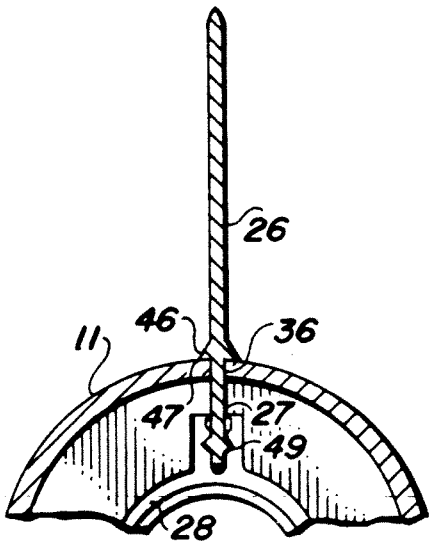
[57] **ABSTRACT**

A finlock mechanism for recreational rockets having a pair of finlock ring members disposed in spaced relationship to each other in circumscription about the motor tube in the rocket, each ring member having a plurality of finlock receptors disposed on the perimeter thereof in equispaced relationship to each other for receiving a finlock root extending through the rocket housing in snaplock engagement therewithin.

14 Claims, 1 Drawing Sheet



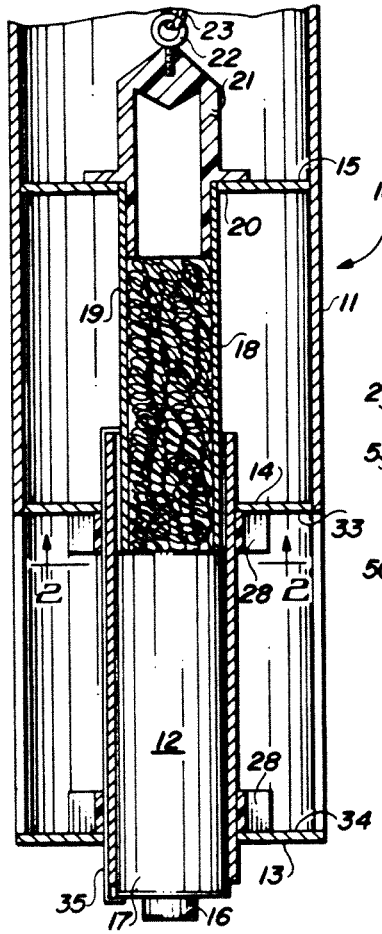


FIG. 1

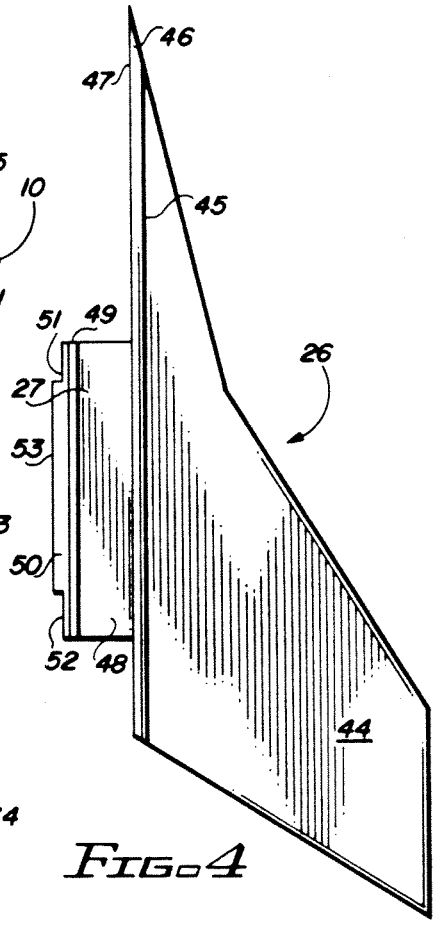


FIG. 4

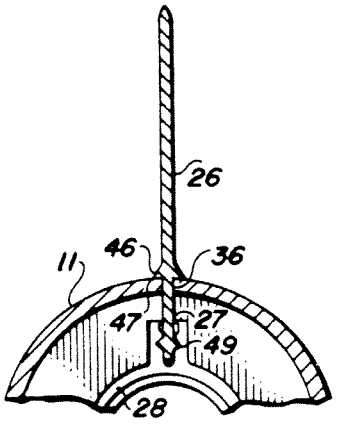


FIG. 6

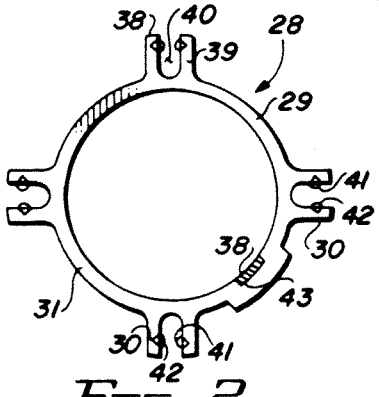


FIG. 2

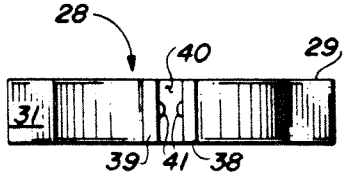


FIG. 3

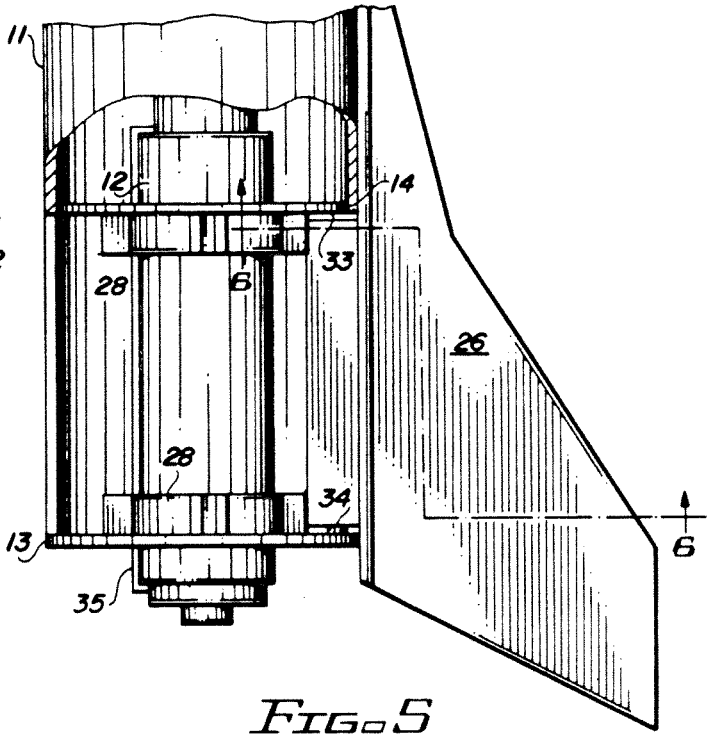


FIG. 5

FINLOCK ALIGNMENT MECHANISM FOR ROCKETS

INTRODUCTION

This invention relates to finlock alignment mechanism for rockets and more particularly to means for firmly mounting and accurately aligning stabilizing fins for rocket assemblies to accurately align the propulsion system within the rocket body and insure that the aerodynamic stress forces created by rocket travel and motor thrust are contained by the mounting systems and aberrant flight is avoided.

BACKGROUND OF THE INVENTION

The firing of prototype experimental rockets requires that the rocket is capable of true flight so that aerodynamic studies are not flawed by structural artifacts created by guiding fin misalignment or rocket body distortion. In the case of recreational rockets, it is of paramount importance that the rocket remain on a true course to insure safety and the desired display effect. The use of bolts, screws, or welding techniques to anchor guiding fins to insure fin rigidity greatly increases the cost of manufacture and may be unsuitable for rocket component assembly by the end user. The use of cement to hold the fins to the rocket body may not provide sufficient strength and adequate fin alignment.

Prior art efforts to employ a receptacle having a plurality of slots defined therein to effect the proximal position of fin members are shown in Van Aken et al (U.S. Pat. No. 2,851,950), Lyon (U.S. Pat. No. 3,032,857), and Kerr et al (U.S. Pat. No. 3,117,520). Van Aken et al (U.S. Pat. No. 2,851,950) teaches a rocket fin assembly comprising a rocket casing having a plurality of axially extending slots formed therein and opening through one end of the casing, each being adapted to receive a fin from the fin assembly therein to be secured thereby. The fin assembly further comprises a central core having a pair of obially spaced rings to which the several fins are secured to form an integral unit therewith. The rings have an outer diameter substantially equal to the inner diameter casing.

Lyon (U.S. Pat. No. 3,032,857) teaches apparatus for forming integral ribs upon the circumference of a rigid tubular shape. Each rib member comprises a pair of upwardly and radially inwardly extending rib elements of a predetermined length and thickness. Between each of the rib elements, there is received a shaped base portion of each of the fins. The base portion has, along its length, a pair of outwardly extending wings or arms received in notches in each of the rib elements to restrain movement of the fins.

Kerr et al (U.S. Pat. No. 3,117,520) also teaches an arrangement for attaching a fin to the surface of a missile in which the fin is seated in a channel defined on the outer surface of the missile and transversely extending pin members lock the fin member in its desired position.

While each of the prior art devices achieved to a degree its desired goal, none were able to attain complete interlocking stress paths for the aerodynamic and motor thrust forces especially needed for safe and effective operation of hobby-class rockets in neighborhood surroundings.

Accordingly, a need exists for rocket assembly components which are user friendly, which can be constructed from light and essentially non-metallic parts

and which, when assembled, will result in a rocket capable of true flight.

BRIEF SUMMARY OF THE INVENTION

The present invention relates to means and methods for the simplified manufacture of rockets having the capability of true flight comprising centering rings which are secured to ring clips which in turn are attached to the internal motor tube body contained within the external rocket body. The fin design employed herein permits each fin to be readily snapped into the ring clips at a ninety degree angle to the rocket body to create a rigid rocket structure capable of withstanding the shear forces created during and after the rocket burn. The means and methods hereof enable rocket modules to be assembled by persons having minimal skills in rocket construction.

Accordingly, a prime object of the present invention is to provide a new and improved finlock alignment mechanism for rockets.

Another object of the present invention is to provide improved means and methods to assemble a rocket which requires only minimal skills and yet provides an aerodynamically correct rocket capable of true flight.

A still further object of the present invention is to provide an improved finlock alignment mechanism for recreational rockets which facilitates the integrity of the rocket during flight and recovery.

Still another object of the present invention is to provide user-friendly means and methods for creating and assembling launchable rockets which are authentic in appearance and safe in use.

These and still further objects as shall hereinafter appear are fulfilled by the present invention in a remarkably unexpected fashion as will readily appear from the following detailed description of exemplary embodiments especially when read in conjunction with the accompanying drawing in which like parts bear like numerals throughout the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

In the DRAWINGS:

FIG. **1** is a cross sectional view of a rocket structure embodying the present invention sans nosecone;

FIG. **2** is a cross-section taken on line **2—2** of FIG. **1**;

FIG. **3** is a side view of the locking ring shown in FIG. **2**;

FIG. **4** is a plan view of the fin and fin attachment extension;

FIG. **5** is a cross sectional view showing the fin and ring attachments; and

FIG. **6** is an enlarged detail of the snap in fin attachment.

DESCRIPTION OF PREFERRED EMBODIMENTS

The present invention relates to rockets and more particularly to means and methods for firmly mounting and accurately aligning stabilizing fins in a rocket assembly to insure that the stress forces created by rocket travel and motor thrust are contained by the mounting systems and aberrant flight is avoided.

A suitable rocket, with its nose cone removed for clarity, is shown in FIG. **1** and identified by the general reference numeral **10**. In general, rocket **10** comprises a tubular body portion **11** having a motor tube **12** mounted therewithin and secured in concentric relationship thereto by a plurality of annular centering

means **13**, **14**, **15** disposed in spaced generally parallel relationship to each other. A suitable rocket motor **16** is telescopically inserted in through the lower end **17** of motor tube **12** and secured thereto for use in the conventional fashion. Suitable means **18** for dissipating heat from the combustion gases generated by firing rocket motor **16** is disposed in the upper portion **19** of motor tube **12** which in turn is capped at the upper end **20** thereof by a ventilation means **21** which may include a suitable anchor **22** for securing the tether **23** of an accompanying parachute (not shown).

In normal practice, body portion **11** is made of fiberboard or like strong light-weight material to form a tube of various lengths and diameters depending on the size of the rocket desired.

The present invention relates particularly to a fin and ring assembly for use with rockets which, as will appear below, enables a rocket fin **26** to be readily aligned and secured by the coaction of the fin root **27** thereof with a plurality of finlock ring members **28**.

As shown in FIGS. **2** and **3**, a finlock ring member **28** comprises an annular body portion **29** having a plurality of fin-root receptors **30** defined on the outer perimeter **31** of body portion **29** in equi-space relationship to each other. In a conventional four-finned rocket, four receptors **30** will be provided, each being spaced 90° from each adjacent receptor **30**. In a three-finned rocket, three receptors **30** will be provided, each being spaced 120° from each adjacent receptor **30**. In the present discussion, a four-finned rocket will be used o exemplify the present invention it being understood that the principals hereof are equally applicable to other fin arrangements.

In one practice of the present invention as shown in FIG. **1**, motor tube **12** is mounted in true concentric relationship to and within body portion **11** by the action of centering rings **13**, **14** and **15** thereupon. Finlock ring members **28** are disposed between rings **13**, and **14** and are suitably secured, as by glue or cement, to the motor tube **12**. Metallic motor hook **35** extends axially along motor tube **12** and is secured by centering rings **13**, **14**, and finlock rings **28** by passing through slots **43** defined therein. Motor hook **35** keeps motor **16** in its desired position relative to motor tube **12** during the burn of the propellent and ejection charges.

Fin **26** is readily and easily attached to tubular rocket body portion **11** by inserting fin root **27** through an axially extending slot **36** defined in body portion **11**, as shown in FIG. **6**, for locking engagement in the finlock ring receptor **30** corresponding thereto as will now be described in detail. A number of slots **36** equal to the number of fins **26** required for a given rocket are cut through body portion **11** in exact alignment with receptors **30**.

Referring again to FIGS. **2** and **3**, each receptor **30** is integrally formed with body portion **29** and extends radially outward from the outer perimeter **31** of ring member **28**. Each receptor **30** comprises a first arm member **38** and a second arm member **39** coacting with each other to define fin root receiving channel **40** therebetween. Each arm member, for example, arm member **38** has a transverse slot **41** formed therein in registry with a like slot **42** formed in arm member **39**. Slots **41**, **42** coact to receive fin root **27** in snap fit engagement when root **27** is inserted into channel **40** in accordance with the present discussion.

Each fin **26** comprises an aerodynamically shaped polyhedral body portion **44** terminating in an elongated vertical edge **45** having a triangular base portion **46** formed therewith and extending axially therealong. Base portion **46** has a planar surface **47** on the bottom thereof which surface **47** substantially conforms to the exterior contour of body portion **11**.

Fin **26** further comprises a fin root **27** extending perpendicularly from surface **47** and has a generally rectangular body portion **48** having a ridge portion **49** disposed longitudinally thereacross on both sides thereof. As will hereafter appear, ridge portions **49** respectively coact with and engage slots **41**, **42** in receptor **30** to provide a snap-lock fit when fin root **27** is properly inserted into channel **40**.

Generally rectangular extension portion **50** abuts ridge portions **49** and extends outwardly therefrom. Portion **50** has a first seat **51** and a second seat **52** defined therein to define a tab of key **53** therebetween. Each seat **51**, **52** corresponds to the, receptor **30** disposed in registered relationship thereto while key **53**, formed therebetween, engages the outer surface of motor tube **12** intermediate the receptors **30** and in axial abutment therewith. Similar connections are made at each of the remaining receptor sites until the desired number of fins have been installed.

To assemble a rocket fin **26** to rocket **10**, as shown in FIG. **6**, fin root **27** is passed through slot **36** until seats **51**, **52** enter into and are secured by corresponding receptor **30** whereupon ridges **49** are by the action of ridges **49** enterring slots **41**, **42** where they are locked.

While the exemplary embodiment shown herein employs two finlock ring members **28**, it is further contemplated that in certain sized rockets having proportionately different sized fins, a single ring member or a plurality of ring members operating in the manner hereof will properly mount and align the fin. The assembled rocket is thus ready to be mounted in a rocket launcher for ignition, flight, parachute deployment and spent rocket recovery.

From the foregoing, it becomes apparent that new and useful finlock alignment mechanism for rockets has been herein described and illustrated which fulfill all of the aforestated objectives in a remarkably unexpected fashion. It is of course understood that such modifications, alterations and adaptations as may readily occur to an artisan having the ordinary skills to which this invention pertains are intended within the spirit of the present invention which is limited only by the scope of the claims appended hereto.

Accordingly what is claimed is:

1. For use in a recreational rocket having a body portion and a motor tube mounted therewith, a finlock mechanism comprising a finlock ring member disposed in circumscription about the motor tube within the body portion, a plurality of rocket fins, each said fin having a body portion and a root portion, said root portion being extendible through said rocket body portion for snap-lock engagement within said ring member to hold said fin body portion in truly aligned and secure surface-to-surface engagement with said rocket body portion.

2. A finlock mechanism according to claim **1** having a plurality of finlock ring members disposed in spaced generally parallel relationship to each other.

3. A finlock mechanism according to claim **1** in which each of said finlock ring members comprises a plurality of fin root receptors disposed in equispaced relationship on the perimeter of said ring member.

4. A finlock mechanism according to claim 3 in which each of said receptors comprises a first arm portion and a second arm portion disposed in exact parallel relationship to each other and coacting to define a fin root receiving channel therebetween.

5. A finlock mechanism according to claim 4 in which said fin root has a ridge defined thereon for locking coaction with said receptors when said fin root is inserted into said channel.

6. A finlock mechanism according to claim 5 in which each of said arm portions has a slot defined therein and coactive to receive and secure said ridge on said fin root therewithin.

7. A finlock mechanism according to claim 1 in which said fin root comprises a body portion, an extension portion integrally formed with said body portion and extending therefrom, said extension portion having a first and second end portion removed therefrom to define first and second seat having a key therebetween, said key being adapted for interposition between said ring members when said first and second seats of said fin root are seated in the corresponding one said fin root receptors.

8. A finlock mechanism according to claim 3 in which said fin root comprises a body portion, an extension portion integrally formed with said body portion and extending therefrom, said extension portion having a first and second end portion removed therefrom to define first and second seat having a key therebetween, said key being adapted for interposition between said ring members when said first and second seats of said fin root are seated in the corresponding one said fin root receptors.

9. A finlock mechanism according to claim 7 in which each of said receptors comprises a first arm portion and a second arm portion disposed in exact parallel relationship to each other and coact to define a fin root receiving channel therebetween.

10. A finlock mechanism according to claim 8 in which each of said receptors comprises a first arm portion and a second arm portion disposed in exact parallel relationship to each other and coact to define a fin root receiving channel therebetween.

11. A finlock mechanism according to claim 9 in which each of said arm portions has a slot defined therein and coactive to engage and secure said fin root inserted therewithin.

12. A finlock mechanism according to claim 10 in which each of said arm portions has a slot defined therein and coactive to engage and secure said fin root inserted therewithin.

13. A finlock mechanism according to claim 11 in which said fin root has a ridge defined thereon for locking coaction with said slots when said fin root is inserted into said channel.

14. A finlock mechanism according to claim 12 in which said fin root has a ridge defined thereon for locking coaction with said slots when said fin root is inserted into said channel.

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