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Title of Invention: Single Axis Folding Lever Fin

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SINGLE AXIS FOLDING LEVER FIN

DEDICATORY CLAUSE

The invention described herein may be manufactured, used, and licensed by or for the Government for governmental purposes without the payment to us of any royalties thereon.

SUMMARY OF THE INVENTION

A single axis folding lever fin assembly including an inboard fin (secondary fin) and an outboard fin (primary fin) which are mated, in the deployed position, to form a single fin. A tension spring coacts with a clevis and a link assembly to rotate the outboard fin into mating engagement with the inboard fin in the deployed position.

BACKGROUND OF THE INVENTION

For a number of years, the U. S. Army has used folding fins on missiles in order to save space with associated items such as launchers, packing containers and logistic handling equipment. The effect is to produce missiles which occupy a small volume prior to launch. These fin concepts typically produce an aerodynamically "un-clean" airframe since the springs and actuators required to deploy them are on the external airfoil surfaces. This reduces the aerodynamic effectiveness of the airfoil and in some cases contributes to an increased drag coefficient for the missile

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airframe.

The present invention describes a fin structure which is capable of being folded in either of two directions and is an aerodynamically clean design since it has no external
5 deployment hardware. Also, the fin structure is self locking and requires no special detents. Additionally, the deployment mechanism is simple.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an aft elevational view of a missile having
10 the fins of the present invention in folded position.

Figure 2 is an elevational view, partially in section, of the fin assembly of the present invention in folded position.

Figure 3 is an end elevational view taken along line 3-3
15 of Figure 2.

Figure 4 is an elevational view, partially in section, of the fin assembly of the present invention in deployed position.

Figure 5 is an end elevational view of the fin in
20 deployed position taken along line 5-5 of Figure 4.

Figure 6 is a plan view, partially in section, of the primary airfoil of the fin assembly of the present invention.

Figure 7 is a plan view of the secondary airfoil of the
25 fin assembly of the present invention.

Figure 8 is an elevation view taken along line 8-8 of Figure 7.

Figure 9 is a plan view of the clevis used in the fin

assembly of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As seen in Figure 1, a missile 10 is provided with a plurality of fin assemblies 12 secured thereto. Each fin assembly includes a primary fin (outboard) 14 and a secondary fin (inboard) 16. Primary and secondary fins 14 and 16 are secured together through a link 18 and clevis 20 which are secured together by a roll pin 22. The secondary fin 16 is secured to the missile by a rod 24. Figures 7 and 8 illustrate the position of link 18 and rod 24 on the secondary fin 16. Link 18 is shown to have openings 26 on a pair of extending portions 28 to receive roll pin 22 therein to secure the clevis 20 (Figure 9) to link 18 as shown in Figure 1. The clevis is also provided with an opening 29 to receive roll pin 22 as seen in Figure 9.

Figures 1, 2 and 3 show the fin in the folded position. A spring 30 is in tension and exerts a force to pull the clevis 20 and link 18 into a fin socket 32 of the primary fin. Normally the fin is restrained in this position against the missile fuselage (Figure 1) by launch rails, the launcher inclosure or a wire and cable cutter. As the missile clears the launcher, these restraint forces no longer act and the tension spring 30 starts to pull the clevis 20 up into the fin socket 32. At this point the base 34 of the outboard fin 14 reacts against link 18 to produce a turning moment which acts upon the outboard fin 14 about the roll pin 22. The outboard fin thus rotates until the clevis 20 and link 18 are in-line. At this point the link is

pulled up into the fin socket 32 which prevents any rotation of the outboard fin 14 about the inboard fin 16. Figure 4 illustrates a fully deployed fin locked into position.

5 In order to fold the fin, an operator has to pull the outboard fin shown in Figure 4 straight out off the link 18 to clear the roll pin 22 and then rotate the outboard fin 14 either clockwise or counter clockwise depending upon his folding direction preference. The missile with the folded fins may then be repositioned in a missile launcher or
10 packing container.

From application discloses

ABSTRACT OF THE DISCLOSURE

5 A folding fin assembly disposed for folded relation on a missile body prior to launch and for extended relation from the body of the missile responsive to launch thereof. The fin assembly includes a first fin rigidly secured to the missile and a second fin which is extended from a folded position to mating engagement with the first fin to form a fin assembly extendign perpendicular to the missile axis. *R*

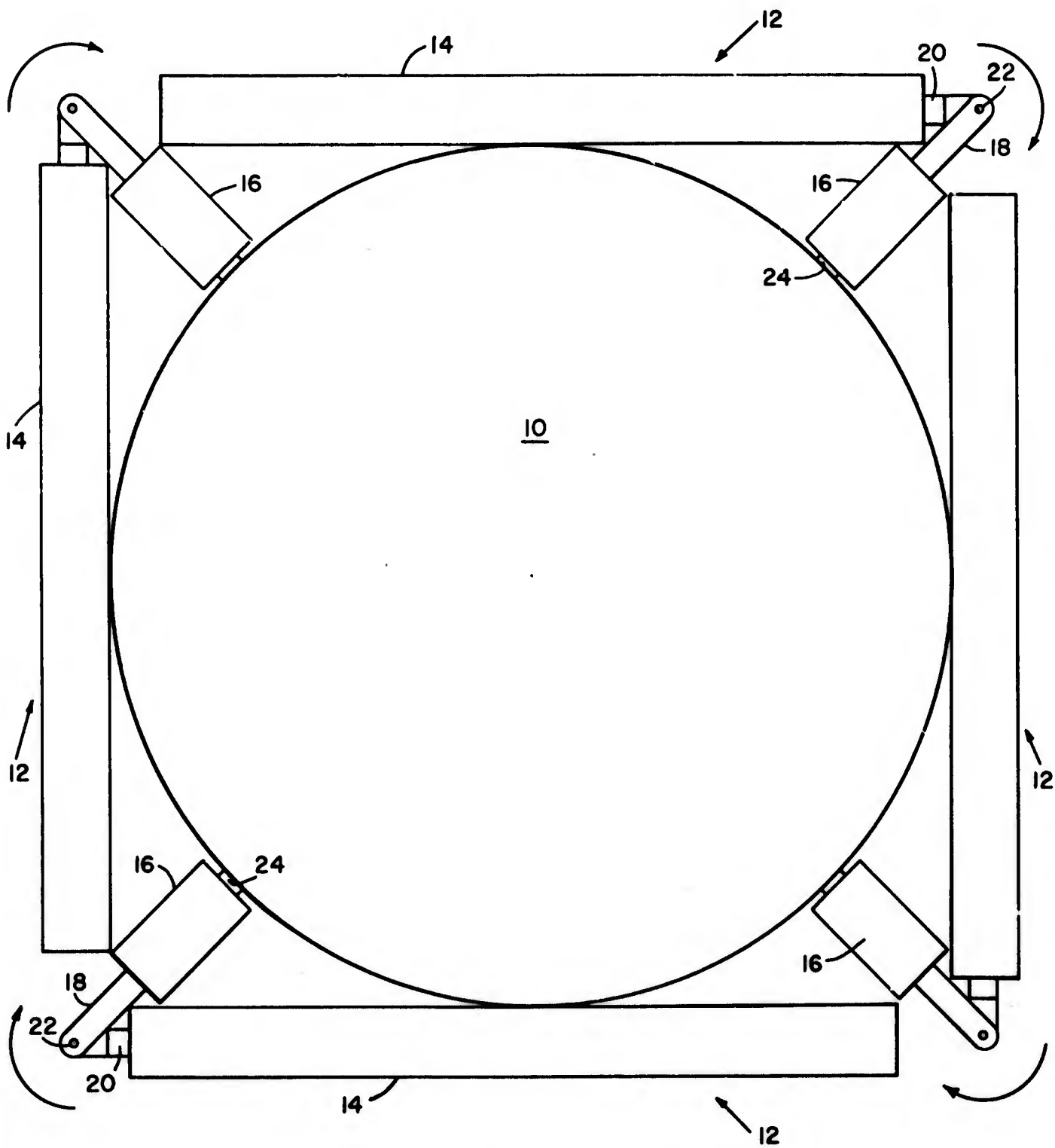
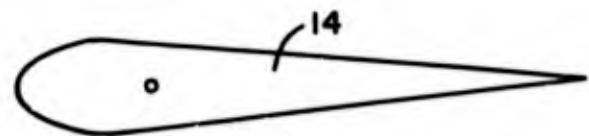
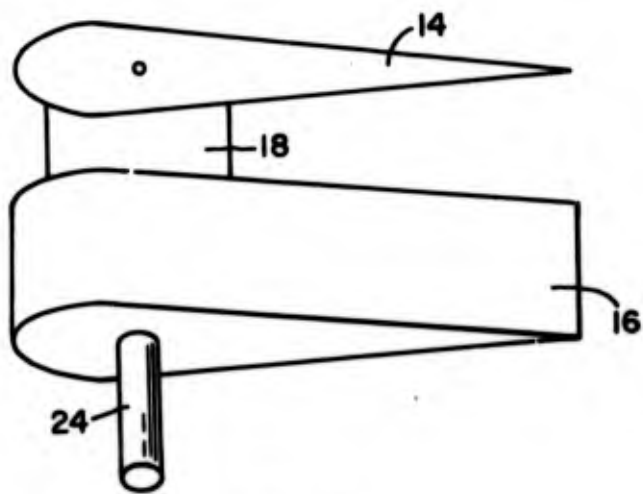
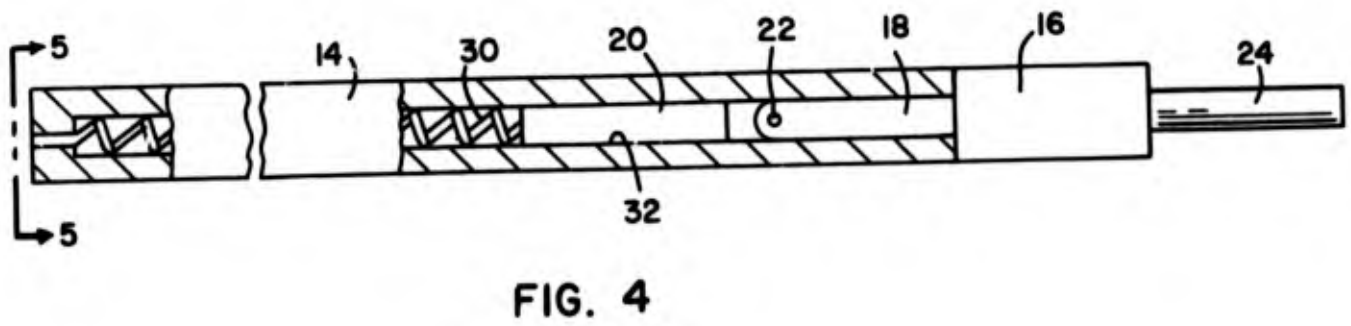
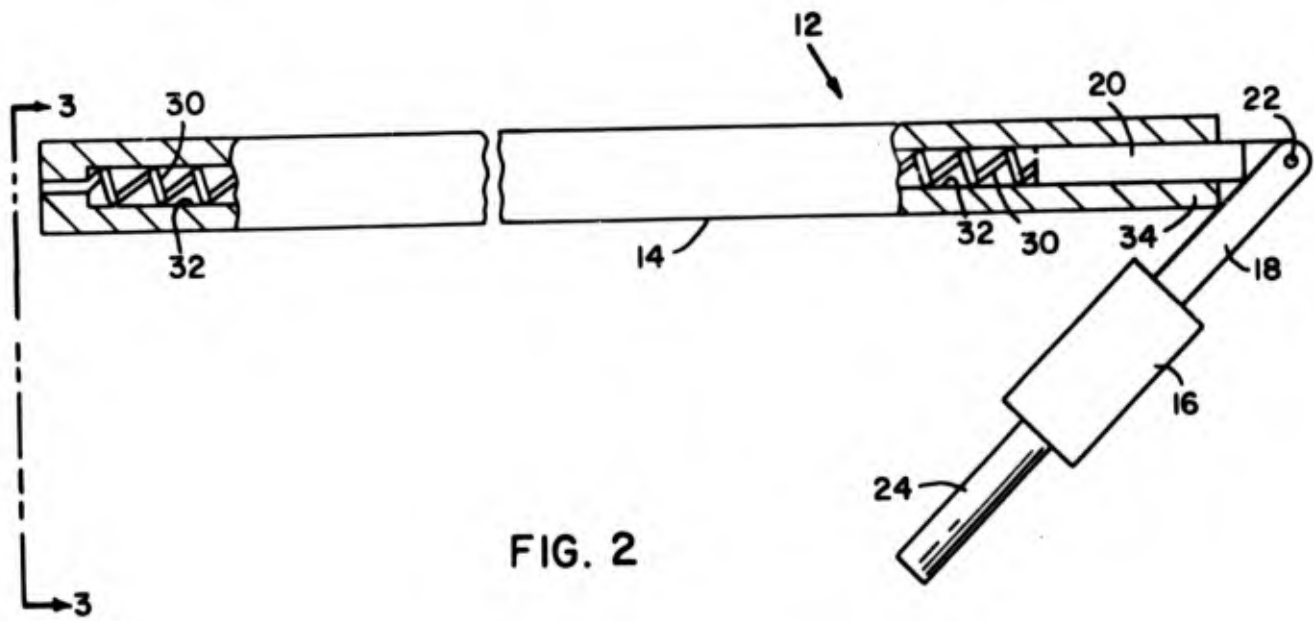


FIG. 1



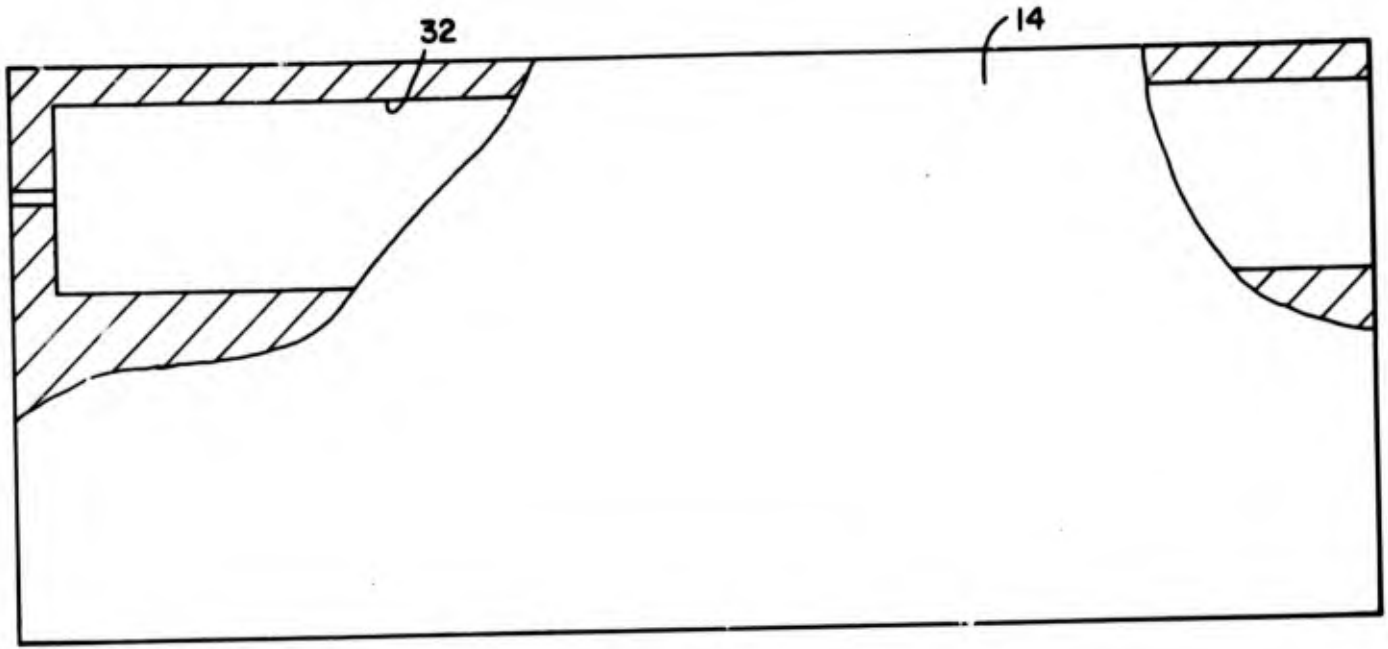


FIG. 6

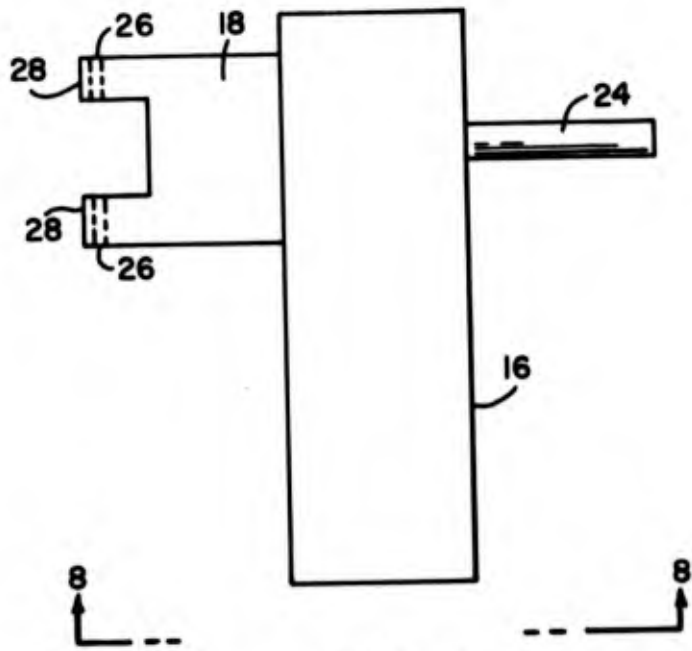


FIG. 7

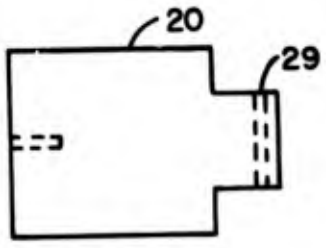


FIG. 9

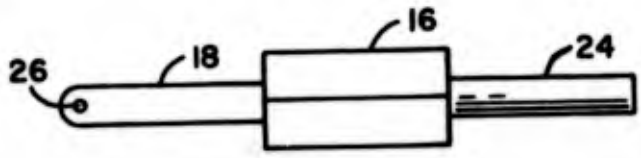


FIG. 8