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Spencer et al.

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(54) **FLY BACK BOOSTER**

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patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

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Related U.S. Application Data

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1999.

(51) Int. Cl.⁷ **B64G 1/00**

(52) U.S. Cl. **244/158 R**; 244/190; 244/172;
244/63

(58) **Field of Search** 244/158 R, 190,
244/172, 2, 63

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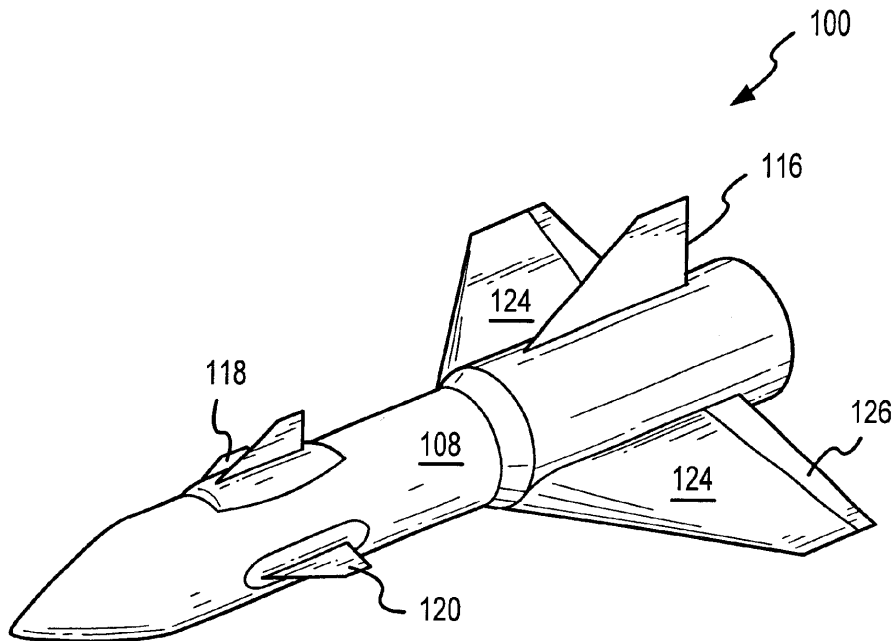
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(57) **ABSTRACT**

A reusable first stage (100) includes a booster engine system (102) for providing thrust during launch, a structural assembly (108), canards (118), jet engines (122), wings (124), elevons (126) and retractable landing gear (130). After separation, the jet engines (122) and aerodynamic control surfaces are used to return the first stage to a landing strip. The booster system (102) includes a structurally stable outer skin system such as an isogrid structure. The first stage (100) is thereby adapted for controlled descent and recovery with minimal structural enhancement or added mass.

19 Claims, 6 Drawing Sheets



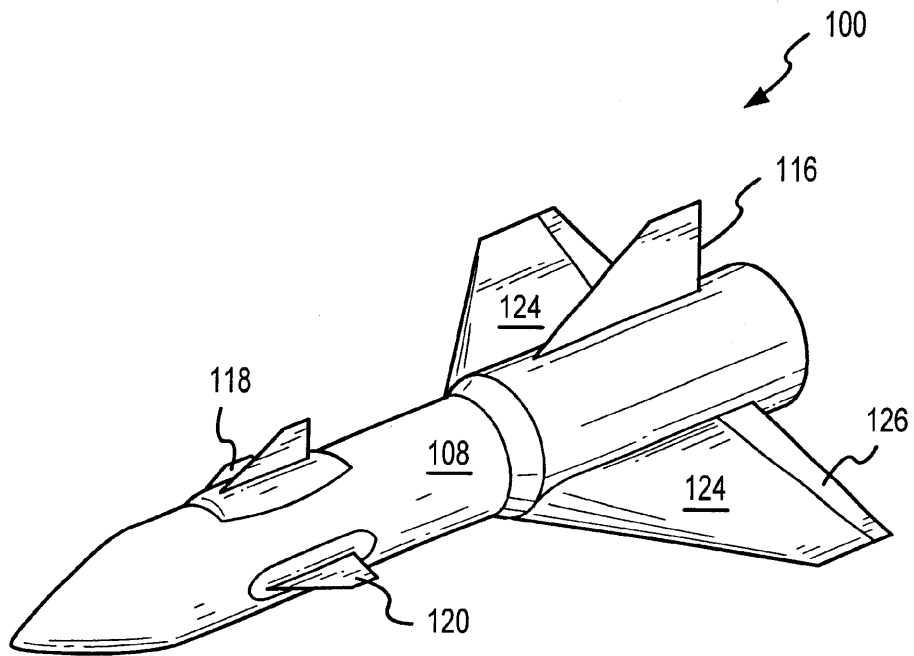


FIG. 1

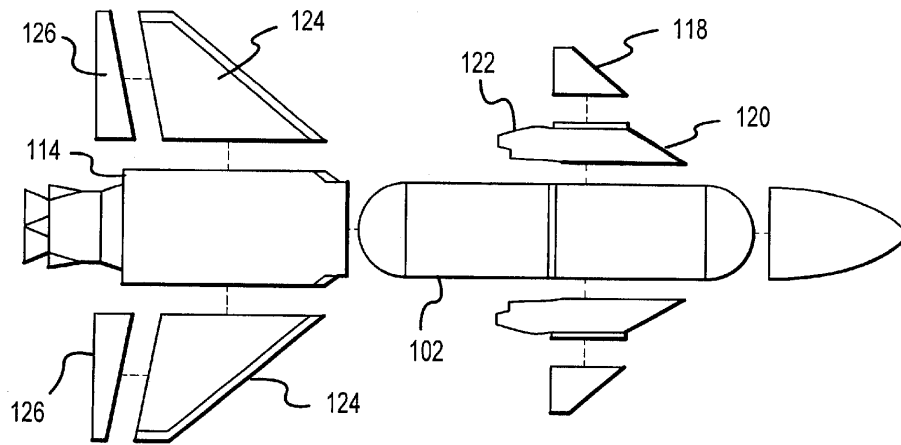


FIG. 2

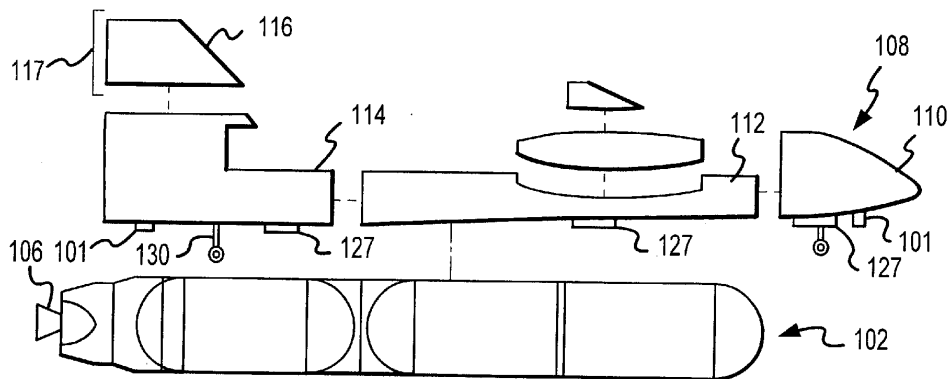


FIG. 3

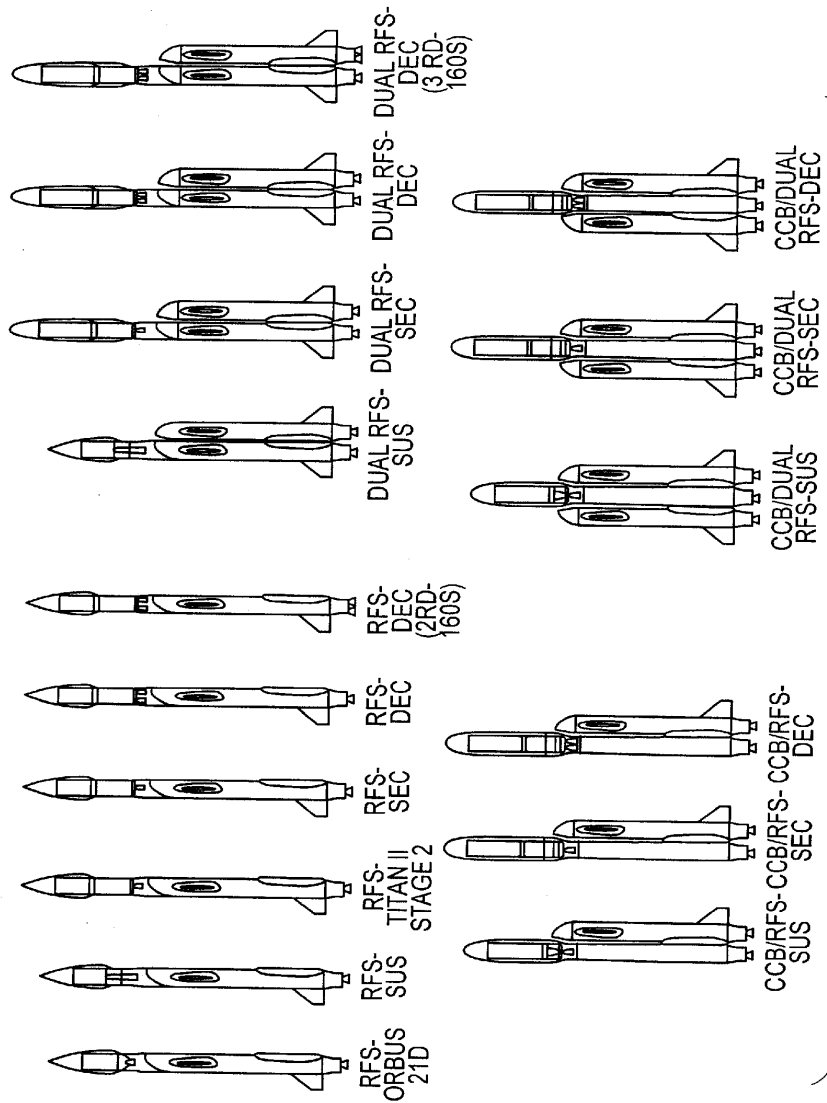


FIG. 4

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