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# United States Patent [19]

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**Taleyarkhan**

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[54] VARIABLE THRUST CARTRIDGE

|           |         |                   |      |
|-----------|---------|-------------------|------|
| 5,565,649 | 10/1996 | Tougeron et al. . |      |
| 5,586,597 | 12/1996 | Taleyarkhan .     |      |
| 5,703,322 | 12/1997 | Tidman .....      | 89/7 |

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[21] Appl. No.: **09/057,127**

[22] Filed: **Apr. 8, 1998**

### FOREIGN PATENT DOCUMENTS

|         |         |                         |         |
|---------|---------|-------------------------|---------|
| 37952   | 7/1909  | Austria .               |         |
| 220556  | 5/1987  | European Pat. Off. .... | 89/7    |
| 407581  | 12/1924 | Germany .....           | 89/7    |
| 641900  | 7/1962  | Italy .                 |         |
| 6101996 | 4/1994  | Japan .....             | 102/430 |
| 6180199 | 6/1994  | Japan .....             | 102/430 |
| 6241687 | 9/1994  | Japan .....             | 89/7    |
| 2001378 | 10/1993 | Russian Federation .    |         |
| 2081427 | 2/1982  | United Kingdom .        |         |
| 2218495 | 11/1989 | United Kingdom .....    | 102/430 |
| 2241563 | 9/1991  | United Kingdom .....    | 102/430 |

### Related U.S. Application Data

[63] Continuation-in-part of application No. 08/738,672, Oct. 28, 1996, abandoned, and a continuation-in-part of application No. 08/573,813, Dec. 18, 1995, Pat. No. 5,586,597.

[51] Int. Cl.<sup>7</sup> ..... **F42B 12/56**

[52] U.S. Cl. .... **89/7; 42/84; 102/440**

[58] Field of Search ..... **89/7; 102/443, 102/430, 439, 440; 42/84**

### OTHER PUBLICATIONS

Long, George, "Explosions of Molten Aluminum in Water—Cause and Prevention," *Metal Progress*, May 1957, p. 107–112.

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*Attorney, Agent, or Firm*—Kirk A. Wilson

### [56] References Cited

#### U.S. PATENT DOCUMENTS

|           |         |                           |         |
|-----------|---------|---------------------------|---------|
| 667,435   | 2/1901  | Friese-Greene et al. .... | 89/7    |
| 1,358,296 | 11/1920 | Csanyl .....              | 89/7    |
| 2,995,987 | 8/1961  | Fitzpatrick .....         | 89/7    |
| 3,494,249 | 2/1970  | Choate .....              | 102/439 |
| 4,036,141 | 7/1977  | Korr et al. ....          | 102/443 |
| 4,656,092 | 4/1987  | Haman et al. .            |         |
| 5,052,272 | 10/1991 | Lee .                     |         |
| 5,072,647 | 12/1991 | Goldstein et al. ....     | 102/440 |
| 5,355,764 | 10/1994 | Marinos et al. .          |         |
| 5,429,030 | 7/1995  | Tidman .....              | 89/7    |
| 5,431,105 | 7/1995  | Wilkinson .               |         |

### [57] ABSTRACT

The present invention is a variable thrust cartridge comprising a water-molten aluminum reaction chamber from which a slug is propelled. The cartridge comprises a firing system that initiates a controlled explosion from the reaction chamber. The explosive force provides a thrust to a slug, preferably contained within the cartridge.

**8 Claims, 5 Drawing Sheets**

