

Separation Portable Locking Instant Technology

S.P.L.I.T.

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Description

The majority of launches of large rockets are separated by stages. Mainly, the rocket stages have different purposes, and the conditions for an effective work. Then separators are used, an array of devices that allows the stage to separate. Usually, the separators are made in the form of an explosive, when activated, the explosive bolt is released. Explosive bolt is a disposable device and cannot be recharged. So, there is the problem of reusing the rocket stages. The solution to this problem is S.P.L.I.T. a separation system that does not use explosive substances, based on the principle of separation of lock mechanism. It is he who makes it possible to implement the concept of reusable step.

Key words: Separator; lock; strength.

Introduction

The document describes the principle of work of the device S.P.L.I.T. Its characteristics and technical solutions. Information on load rates and test results in a simulated - Fusion 360 environment will be provided. Also included: load graphs, graphic illustrations, animations. Materials and manufacturing processes will also be described, exact alloys with the described required characteristics will be given.

Structure Details

The design is a hollow cylinder with two parallel beveled edges (Fig.1). The lock mechanism works according to the principle of tightening (pressing) two parts relative to each other (Fig.2). Such a mechanism is extremely durable, and is able to survive more than one launch. The strength of titanium ASTM Grade 5 (Ti-6Al-4V) allows the part to be slightly deformed. The case is also made of titanium, the same alloy in the bag provides a low friction coefficient. A damper, a part that provides the part with a resource, for reusable use. There are pins on the cornus for anti-rotation protection (Fig.3). The fastening system consists of two lugs fixed to the wall of the part (Fig.4). To increase the strength, a rubber coupling has been added to the bar shaft. To provide emergency actuation in the motor housing, two independent windings are used. A system is also mounted on the body to prevent excessive rotation of the lock.

Tests

The tests were carried out in a Fusion 360 environment. The part has been optimized to withstand maximum loads with minimum weight. Perforation were made to facilitate detail. Stiffeners were also added, and thickenings in places of high load. The attachment points of the part are also lightened. As a result of the tests, it turned out that the motor was not able to turn the shaft under outlet loads, therefore a gearbox and graphite lubricant were added to the design in places of increased friction.

Specifications

The working load for one part of the separator is 400kg. The ultimate load for one part is 500kg. The mass of one device is 78 grams. The size of the device is 20mm in diameter and 140mm in height. The optimum temperature for robots is from -20 to +40. The gear ratio of the reducer is 3:1.