United States Patent

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[54] PYROTECHNIC ASSEMBLY
9 Claims, 3 Drawing Figs.

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[51] Int. Cl. G06d 1/04
[50] Field of Search 102/76, 35.6, 34.4, 37.6, 37.4; 89/1.5

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ABSTRACT: A pyrotechnic assembly including a safety device to prevent the ignition of the main pyrotechnic load until the load has been completely expelled from an associated launch tube. The safety device is biased to operate only upon the explosive launch of the load from the launch tube.

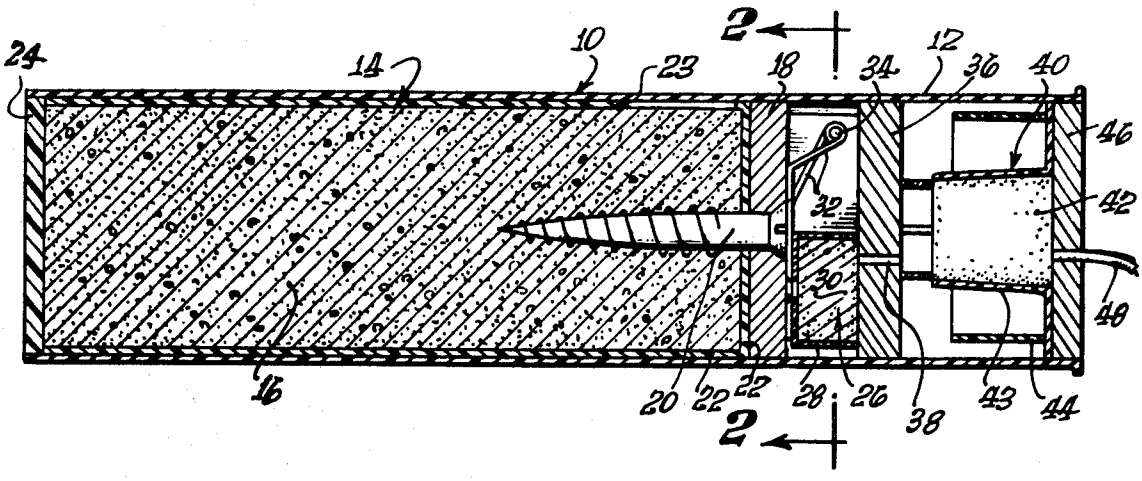


FIG. 1.

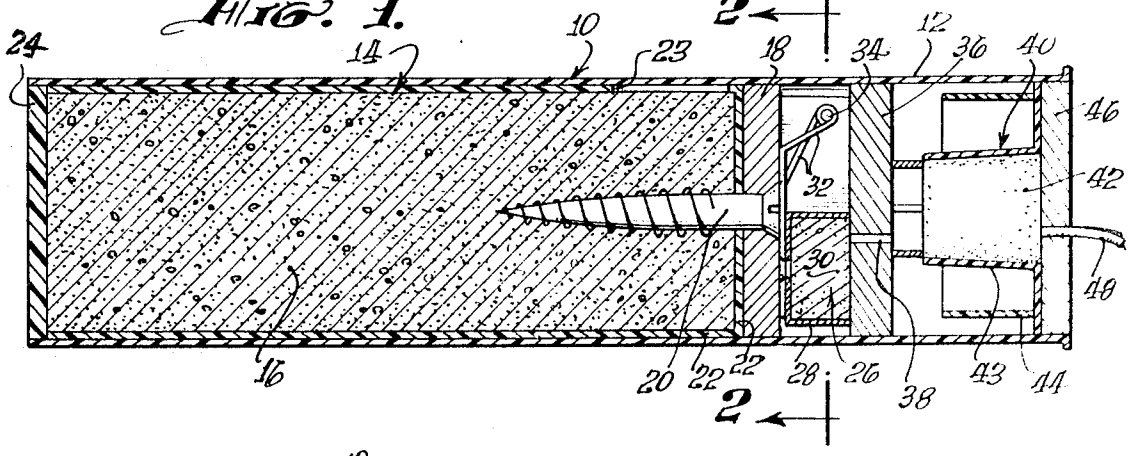


FIG. 2.

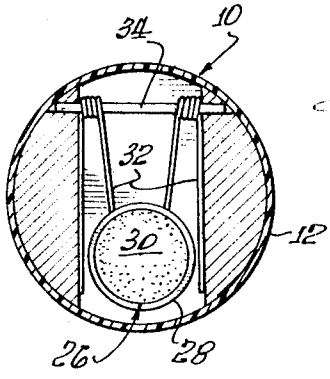
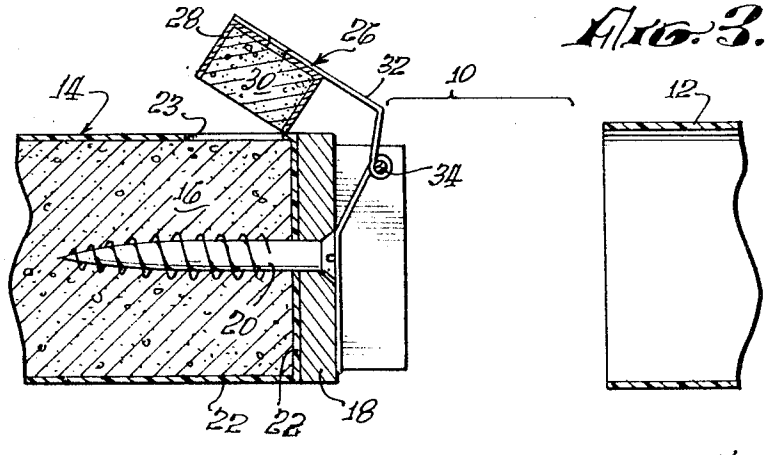


FIG. 3.



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PYROTECHNIC ASSEMBLY

BACKGROUND OF THE INVENTION

In pyrotechnic and explosive assemblies in which a flare decoy or other pyrotechnic material is launched from a tube, it is imperative that a safety device be present to prevent the premature ignition of the pyrotechnic material before it is expelled from the tube. While many devices such as pull ignitors and complex acceleration devices have been employed for this purpose, all have the disadvantage of being not entirely fail-safe and they are oftentimes unduly complex and difficult to produce and/or assemble.

SUMMARY OF THE INVENTION

The invention comprises a pyrotechnic assembly in which the load of pyrotechnic material is separated from its launching charge by a piston member and a base member having a biased ignitor member. The biased ignitor member is lit by the launching charge and will ignite the pyrotechnic material once the round has cleared its associated launch tube.

Therefore, it is an object of the invention to provide a pyrotechnic assembly which includes a safety device to prevent the ignition of the main pyrotechnic load without the explosive launch of the load from an associated launch tube.

Another object of the invention is to provide a safety device for a pyrotechnic assembly which is simple, inexpensive and easy to manufacture and assemble.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional view of a pyrotechnic assembly of the present invention.

FIG. 2 is a sectional view of the pyrotechnic assembly of FIG. 1 taken along line 2–2.

FIG. 3 is a partial sectional view of the pyrotechnic assembly of FIGS. 1 and 2 illustrating ignition of the load of pyrotechnic material immediately following its launch from the associated tube.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As illustrated in FIG. 2, the pyrotechnic assembly **10** includes a launch tube **12** of polyethylene or other suitable structural material which encloses the remainder of the pyrotechnic assembly **10**. A pyrotechnic round **14** is contained within the launch tube **12** at one end thereof. The pyrotechnic round **14** includes a load of pyrotechnic material **16** supported upon a base **18** of structural material such as steel. The pyrotechnic material **16** may consist of an illuminating flare material, high-energy radiating particles, infrared radiating material, infrared radiating flash pellets, electromagnetic wave reflective material, other similar material or combinations of the above. The load of pyrotechnic material **16** may be physically connected to the base member **18** by means of a suitable device such as the fastener **20** which may be a wood screw or metal rod. Also, the interior of the pyrotechnic material **16** adjacent to the base member may be filled with gun powder or other explosive substances. A thin wall pyrotechnic tube **22** may be necessary to enclose the load of pyrotechnic material **16** if the pyrotechnic material **16** is not capable of supporting itself. Since, however, the pyrotechnic material **16** will in most instances be highly compacted, it can be utilized without a supporting tube **22**. If, however, the tube **22** is utilized, an opening **23** must be provided in line with the pivotally mounted biased ignitor member **26**. The open end of the pyrotechnic tube **22** may be closed by a plastic end cap **24**.

The biased ignitor member **26** is positioned on the opposite side of the base member from the pyrotechnic material **16**. As illustrated, this member **26** may comprise a cylindrical cup **28** of pyrotechnic ignition material **30** supported by a spring **32** mounted upon a spring rod **34** positioned in the base member **18**. A piston member **36** is provided adjacent to the biased ignitor member **26** of the base member **18** and holds the closed end of the ignitor cup **28** against the base member **18**. A small opening **38** through the piston member **36** is aligned with the ignition material **30** in the cup **28** to provide communication to the opposite side of the piston member **36**. The piston member **36** may be a single plate or two separate plates physically attached by cement to align the respective holes therethrough.

The pyrotechnic round expulsion assembly **40** is provided on the opposite side of the piston member **36** from the ignitor member **26**. The assembly **40** includes a squib **42** and squib **42** and squib retainer **44**. Round expulsion assembly **40** is held in the launch tube **12** by an end plate **46** and may be electrically actuated by wires **48**. The squib is aligned with the opening **38** in the piston member **36**.

The pyrotechnic round **14** is first assembled and inserted into the launch tube **12** after which the piston member **36** and the round expulsion assembly **40** are inserted.

In operation, the squib **42** is actuated to simultaneously accomplish two things: First, to assert a force upon the piston member **36** so as to expel the piston member **36** and the pyrotechnic round **14** from the launch tube **12** and second, to ignite the ignition material **30** in the ignitor cup **28** with the hot gases and fire from the squib **42** which have proceeded through the opening **38** in the piston member **36**. As shown in FIG. 3, once the pyrotechnic round **14** has cleared the launch tube **12**, the biased spring **32** will act upon the cup **28** containing the ignited material **30** and pivotally rotate the cup **28** so that the ignited material **30** will contact the pyrotechnic material **16** of the pyrotechnic round **14** thereby igniting the pyrotechnic material **16**. If the pyrotechnic tube **22** is utilized to support the pyrotechnic material **16**, the cup **28** will contact the pyrotechnic material **16** through the opening **23**.

In this manner it can be seen that the pyrotechnic material **16** cannot be ignited unless and until the squib **42** has been ignited to expel the pyrotechnic round **12** from the launch tube and simultaneously ignite the ignition material **30** in the cup **28**. Accordingly, the pyrotechnic assembly is not susceptible to premature ignition from acceleration forces or rough handling. If the pyrotechnic round **14** is expelled from the launch tube **12** by any means other than by the explosive force of the squib, the pyrotechnic material **16** cannot be ignited since the ignition material **30** in the cup **28** has not been ignited. Likewise, if the squib **42** only partially ejects the pyrotechnic round **14**, the squib will ignite the ignition material **30** in the cup **28** but the launch tube **12** will prevent the ignition material **30** from contacting the pyrotechnic material **16**. The base member **18** prevents the direct ignition of the pyrotechnic material **16** from the ignition material **30** in the cup **28** or from the hot gases and fire from the squib **42**.

While specific embodiments of the invention have been illustrated and described, modifications and changes can be made thereto without departing from the spirit and scope of the invention and it is intended that the invention be defined in the following claims.

I claim:

1. A pyrotechnic assembly comprising: a launch tube; a pyrotechnic round positioned within said launch tube, said pyrotechnic round including a load of pyrotechnic material, a base member supporting said load of pyrotechnic material, a spring-holding member mounted on said base member on the opposite side of said base member from said load of pyrotechnic material, a biased spring member pivotally mounted on said spring holding member, one end of said spring member braced against said base member on the opposite side of said base member from said load of pyrotechnic material, a cup fixedly mounted on the other end of said spring member, said cup containing pyrotechnic ignition material; a piston member positioned within said launch tube adjacent said base member, said piston member serving to hold said cup in a cocked position with the closed end of said cup held against said base member on the opposite side of said base member from said load of pyrotechnic material, said piston

member having a small opening therethrough communicating with the pyrotechnic ignition material in said cup; and a squib means positioned on the opposite side of said piston member from said cup and aligned with said small opening in said piston member for simultaneously asserting a force on said piston member to expel said piston member and said pyrotechnic round from said launch tube and igniting said pyrotechnic ignition material in said cup through said small opening in said piston member whereby upon expulsion of said pyrotechnic round and said piston member from said launch tube said biased spring member will act upon said cup containing the ignited pyrotechnic ignition material and pivotally rotate said cup up and back so that the ignited pyrotechnic ignition material will contact said load of pyrotechnic material of said pyrotechnic round thereby igniting said load of pyrotechnic round material.

2. The pyrotechnic assembly of claim 1, wherein said cup is cylindrical.

3. The pyrotechnic assembly of claim 1 wherein said squib is electrically actuated.

4. The pyrotechnic assembly of claim 1 wherein said load of pyrotechnic material includes infrared radiating material.

5. The pyrotechnic assembly of claim 1 wherein said load of pyrotechnic material includes illuminating flare material.

6. The pyrotechnic assembly of claim 1 wherein said load of pyrotechnic material includes a plurality of small, high-energy radiating particles.

7. The pyrotechnic assembly of claim 1 wherein said load of pyrotechnic material includes infrared radiating flash pellets.

8. The pyrotechnic assembly of claim 1 wherein said load of pyrotechnic material includes electromagnetic wave reflective material.

9. The pyrotechnic assembly of claim 1, wherein said spring-holding member is a rod.