

[54] **AERIAL SIGNAL UNIT**
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3,720,167 3/1973 Mainhardt et al. 102/34.4

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 [58] **Field of Search** 102/34, 34.1, 34.2, 34.3, 102/34.4, 34.5, 37.4, 37.6, 37.7; 42/1 Z

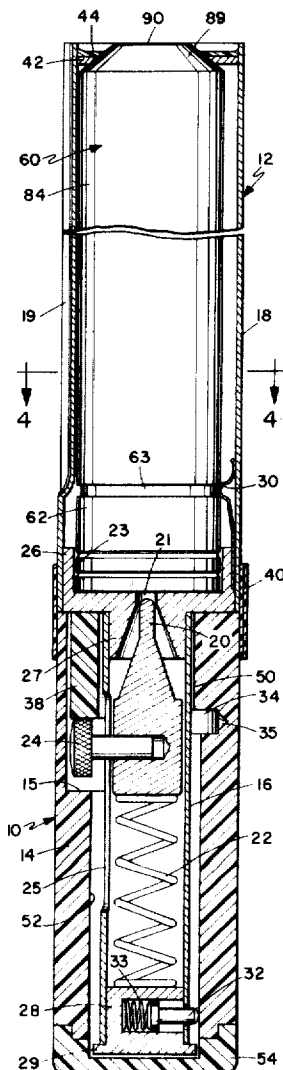
[57] **ABSTRACT**

An aerial signal unit having a rocket propelled signal carried in a disposable launcher in compact, self-contained form. The launcher has a barrel in which the signal is stored and fired, a handle on the launcher being extended telescopically and locked open to expose a thumb actuated firing pin. Safety means is incorporated in the launcher to prevent accidental firing. The signal is adaptable to a variety of payloads and is designed to penetrate obstacles such as overhead foliage and similar minor barriers. The barrel is internally ribbed to guide the signal with minimum friction, while allowing space for escape of exhaust gases, the signal being sealed and securely held in the barrel until fired. At the instant of firing the exhaust gases are trapped to ensure breaking of the seal and proper release of the signal.

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18 Claims, 10 Drawing Figures



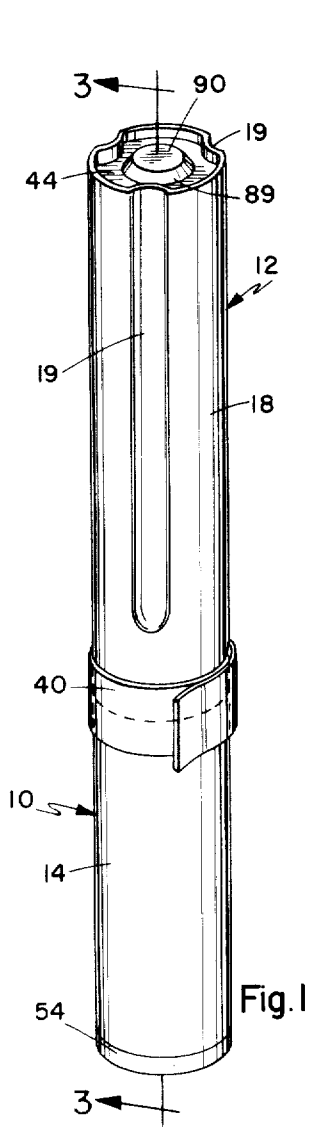


Fig. 1

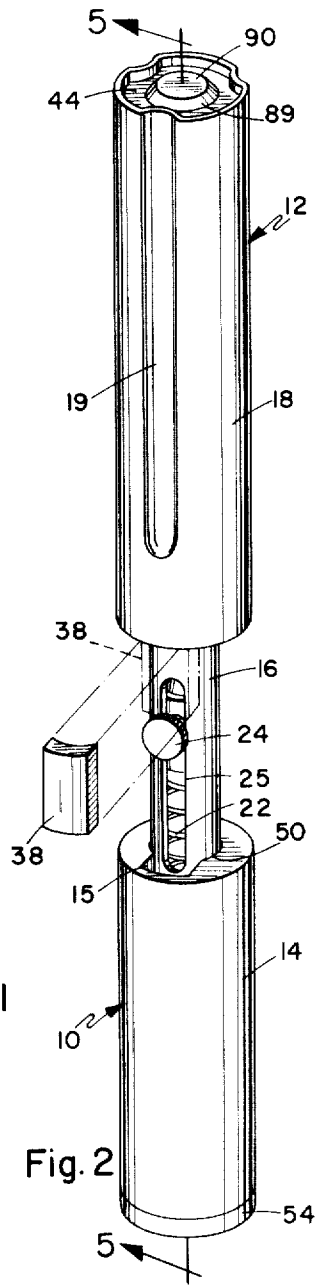


Fig. 2

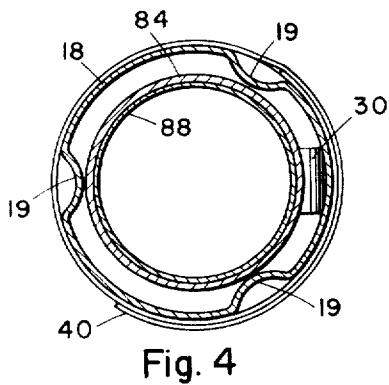


Fig. 4

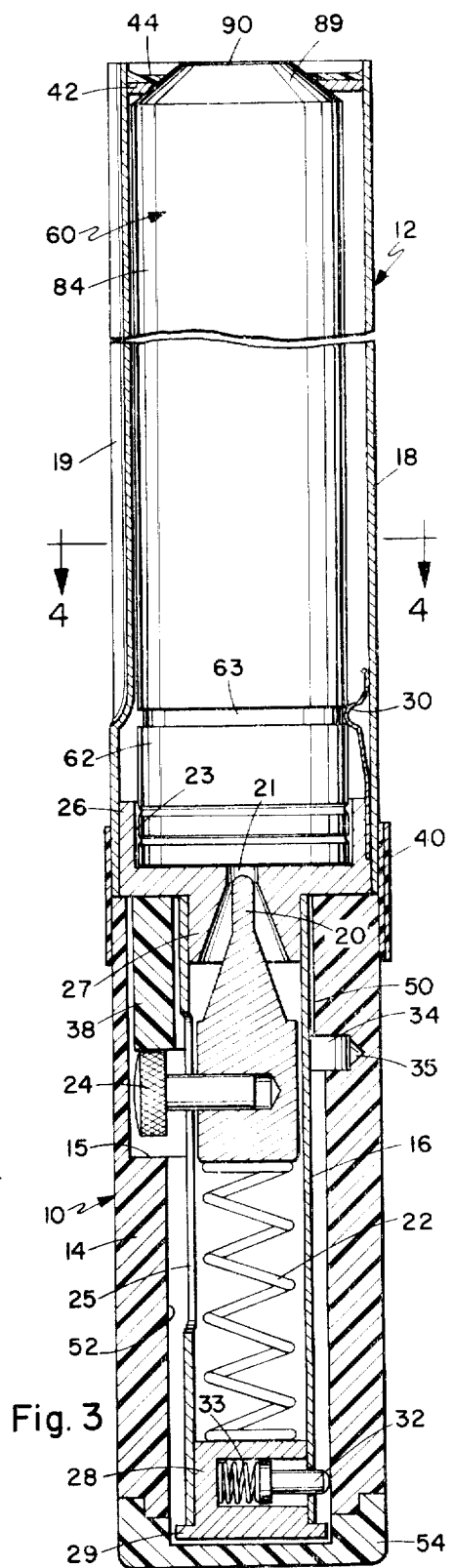


Fig. 3

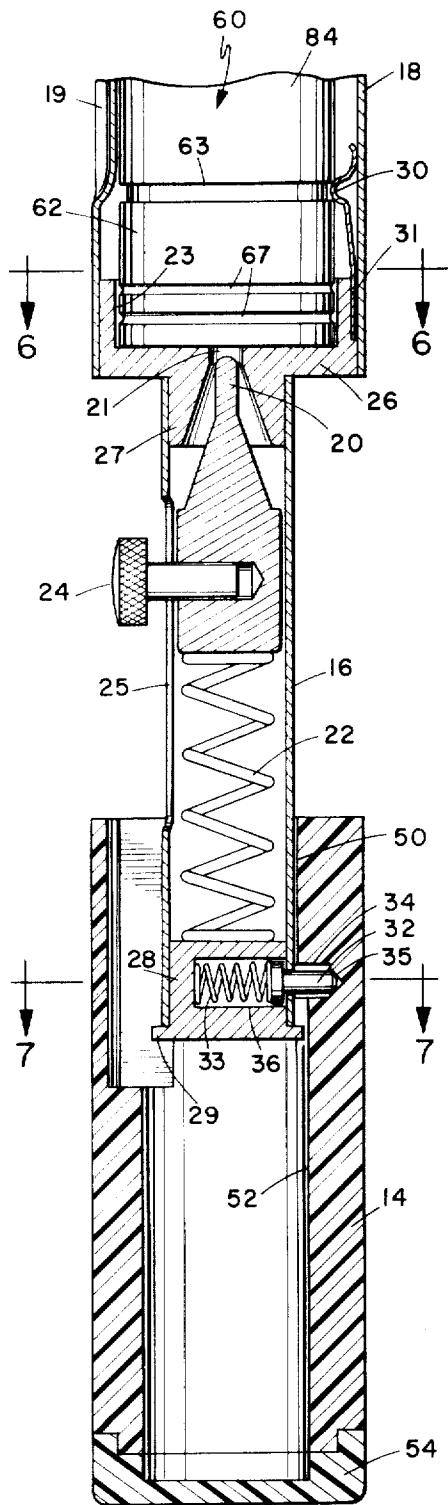


Fig. 5

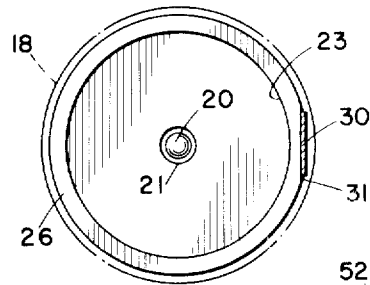


Fig. 6

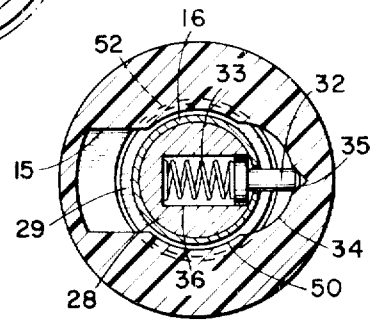


Fig. 7

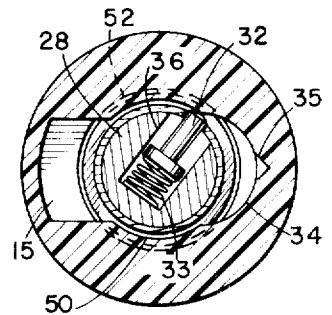


Fig. 8

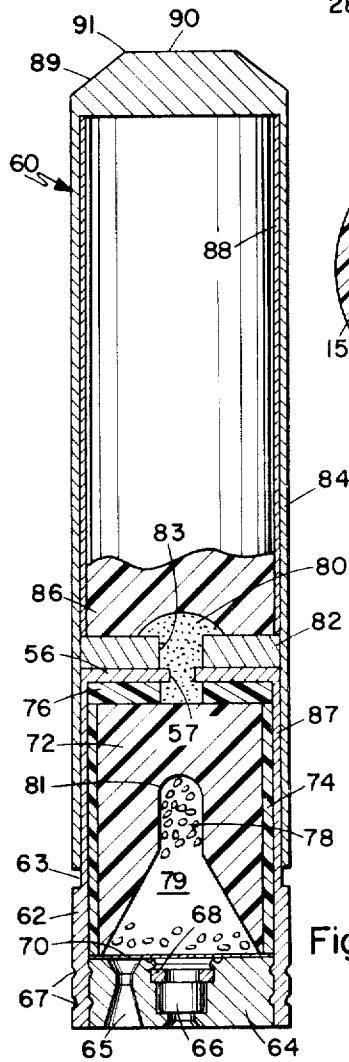


Fig. 9

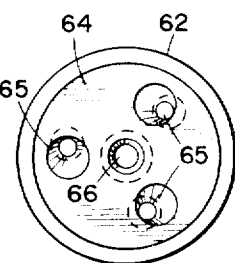


Fig. 10

AERIAL SIGNAL UNIT

BACKGROUND OF THE INVENTION

Aerial signals of the small type operated by hand are either fired from a pistol or from some form of sleeve or barrel. Explosive cartridge powered types with an acceptable recoil have limited useful altitude and the projectiles are easily deflected by small obstacles. Rocket propelled signals are capable of reaching higher altitudes and are used in various forms. However, small pocket types used for emergencies are limited in range and payload, while larger types are less convenient to carry and often have unnecessarily complex and expensive launchers. In an emergency, it is desirable to have a signal which is ready for immediate use and does not require loading or setting up.

SUMMARY OF THE INVENTION

The signal unit described herein is completely self-contained and can be fired in a few seconds when needed, yet is compact and can be carried safely. The launcher portion of the unit has a barrel with a telescopic handle, which is held in closed position by a pull tape. A rocket propelled signal cartridge is sealed in the barrel, making a compact weather resistant unit which is easily carried. For firing, the handle is extended to expose a thumb operated trigger, which is locked by a safety key in the closed position. The handle latches open to provide a convenient holder, with the trigger conveniently positioned for one handed firing. The launcher is of simple, low cost construction and is considered expendable, but can be reloaded and closed if desired.

The barrel is internally ribbed to minimize friction on the signal and provide an escape passage for the rocket exhaust gases. A spring catch holds the signal securely until firing and the barrel guides the signal, which is spin stabilized by using canted rocket nozzles. The base or nozzle end of the signal is held in a cup to trap the initial burst of gases, so that the pressure breaks the seal and releases the signal from the catch. The nose of the signal is of truncated conical configuration to provide a punching action for penetrating minor barriers, without an undue reduction in aerodynamic efficiency. While the size of the unit and the performance of the signal can vary, it has been found that a unit with a closed length of about 6 inches and an outside diameter of less than 1 inch, is capable of projecting a signal to an altitude of about 2,000 feet. Several such units could be carried by each member of an aircrew, or by any personnel liable to have the need for emergency signaling.

The primary object of this invention, therefore, is to provide a new and improved aerial signal unit.

Another object of this invention is to provide a new and improved aerial signal unit which is completely self-contained and ready for immediate use.

Another object of this invention is to provide a new and improved aerial signal unit having a launcher with a barrel in which the signal is stored, and a telescopic handle which is extended to expose the firing mechanism.

A further object of this invention is to provide a new and improved aerial signal unit which is sealed, with the firing mechanism locked for safe handling, but is readily opened and fired without any special preparation.

Other objects and many attendant advantages of the invention will become more apparent upon a reading of the following detailed description together with the drawings, wherein like reference numerals refer to like parts throughout and in which:

FIG. 1 is a perspective view of the closed signal unit.

FIG. 2 is a perspective view of the signal unit opened and ready for firing.

FIG. 3 is an enlarged sectional view taken on line 3—3 of FIG. 1.

FIG. 4 is a sectional view taken on line 4—4 of FIG. 3.

FIG. 5 is an enlarged sectional view taken on line 5—5 of FIG. 2.

FIG. 6 is a sectional view taken on line 6—6 of FIG. 5.

FIG. 7 is a sectional view taken on line 7—7 of FIG. 5.

FIG. 8 is a sectional view similar to FIG. 7, but with the barrel portion rotated to release the open position latch.

FIG. 9 is an axial sectional view of the signal cartridge.

FIG. 10 is an end elevation view as taken from the lower end of FIG. 9.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The complete signal unit 10 comprises a launcher 12, a handle 14 and a rocket propelled signal cartridge 60, in a compact cylindrical configuration which is easily stored and carried. For purposes of description, the end from which the signal emerges will be referred to as the forward end.

The launcher 12 includes a cylindrical barrel 18, the lower end of which is closed by a breech plug 26. A tube 16, smaller in diameter than the barrel, extends axially rearwardly from the barrel and is fixed on a boss 27 integral with breech plug 26. The rear end of tube 16 is closed by an end cap 28 having a radially projecting flange 29. In the tube 16 is a slidable firing pin 20 which can project through an aperture 21 in breech plug 26, the firing pin being propelled by a spring 22. An actuator button 24 extends from the firing pin 20 through a longitudinal slot 25 in tube 16, to facilitate manual actuation of the firing pin.

Barrel 18 has inwardly depressed longitudinal ribs 19 to guide the signal 60 and provide spaces between the signal and the barrel for escape of exhaust gases. The rear end of signal 60 seats with a close fit in a cup 23 in breech plug 26, and is held by a spring catch 30 engaging a circumferential groove 63 in the signal. Spring catch 30 is secured in a flat notch 31 cut in the side of breech plug 26. With reference to FIG. 6, it will be seen that the cross section of the spring catch is such that the corners project very slightly beyond the circumference of the breech plug. When the breech plug is forced with a press fit into the barrel, the corners of the spring catch cut into the inside of the barrel and ensure that the catch is securely held without additional fastening means.

Handle 14 is a cylindrical member having an axial bore 50 which is a sliding fit for tube 16. The rear portion 52 of bore 50 is enlarged to clear flange 29, which prevents complete removal of the launcher 12 from the handle, the rear end of the handle, being closed by a

cap 54 after assembly. In the forward end of handle 14 is a longitudinal clearance slot 15 to receive the actuator button 24 when the unit is closed. In the closed position, as in FIG. 3, a safety block 38 is inserted in slot 15 between the actuator button 24 and breech plug 26, to prevent accidental firing. The safety block need not be a tight fit, but merely prevents the firing pin from moving forward into aperture 21.

In the end cap 28 is a diametrical bore 36, in which is a radially slidable detent pin 32 urged outwardly through the wall of tube 16 by a spring 33. Detent pin 32 rides on the inside of bore 52 and, when the handle is extended, drops into a detent slot 34 near the forward end of the handle, to lock the unit in open position. Detent slot 34 has a shallow socket 35 to receive the tip of detent pin 32 and hold the launcher against rotation in the handle. The detent slot is substantially arcuate radially of the handle and acts as a cam to retract pin 32. When the handle and launcher are twisted forcibly relative to each other, the seating of detent pin 32 in socket 35 is overcome and the pin is retracted, as in FIG. 8, allowing the launcher to be pushed back into the handle to close the unit.

The signal cartridge 60 has a rocket motor housing 62 with a nozzle block 64 secured in the rear end thereof by circumferential crimping 67. As illustrated in FIG. 9, the motor housing 62 has a front wall 56 with a central aperture 57. The propellant grain 72 is surrounded by a burning inhibiting sleeve 74 and is separated from the front wall 56 by a resilient gasket 76. In the rear of propellant grain 72 is a conical cavity 79 with a forward extension 81, to provide a large combustion surface area, the cavity containing a loose granular ignition material 78.

Nozzle block 64 has a plurality of nozzles 65, three being shown which are circumferentially canted to provide spin stabilization, the technique being well known. A combustible frangible sealing disc 70 over the forward face of the nozzle block prevents loss of the ignition granules 78 through the nozzles. Recessed in the center of the nozzle block 64 from the inside is a percussion type primer 66, retained by a washer 68 crimped in place, which prevents rearward blowout on ignition.

The forward portion of signal 60 comprises a payload case 84 containing the payload 86, which may be a pyrotechnic flare, a smoke or incendiary device, radar reflecting chaff, or other such means for producing a detectable signal. At the rear of the payload 86 is a retaining washer 82, with a central aperture 83, which rests against the front wall 56 of the rocket motor. The motor housing 62 has a reduced diameter forward portion 87, and the payload case 84 extends beyond the washer 82 to fit firmly over the reduced diameter portion. The length of the payload case fitting over the rocket motor is such that a space is left between the end of the payload case and the full diameter portion of motor housing 62, to provide the groove 63 in which the spring catch 30 is seated. To ignite or separate the payload, a transfer charge 80 extends from the propellant grain 72, through apertures 57 and 83, into the payload casing. For pyrotechnic payloads the transfer charge would merely be for ignition, but for chaff and the like a small bursting charge would be used to separate the payload section from the rocket motor. As illustrated, the payload is of pyrotechnic type and is sur-

rounded by an inhibitor sleeve 88, to prevent premature burn through of the payload case.

The forward end of payload case 84 has a nose 89 of conical configuration, with a flat truncated end 90 leaving a sharp annular edge 91. This particular shape retains sufficient aerodynamic efficiency to hold the signal on a suitable flight path, but the sharp edged truncated end has the ability to punch through minor barriers, such as overhead foliage.

The forward end of the signal cartridge is sealed in the barrel 18 by a sealing washer 42 fitting closely over nose 82 and secured by any suitable sealing compound 44, the flat end 90 being substantially flush with the end of the barrel. In closed position an adhesive pull tape 40 is secured around the junction of barrel 18 and handle 14, making the unit secure and weatherproof.

To use the signal unit, the pull tape 40 is stripped off and the handle 14 pulled down and latched open. Safety block 38 will fall away, leaving the actuator button 24 free. With the barrel 18 pointed upward, the actuator button is pulled down and released, which can be performed by the thumb in a one handed operation. Firing pin 20 strikes the primer 66, which detonates and ignites the ignition charge 78, which in turn ignites the propellant grain 72. The gas pressure bursts the sealing disc 70 to initiate thrust. With the end of the rocket motor seated closely in cup 23, the initial gases are trapped to build up sufficient pressure to break the seal and the spring catch holding the signal. As the signal lifts clear of cup 23, the gases can vent out of the barrel between ribs 19 to minimize recoil. The seating of detent pin 32 in socket 35 is sufficient to hold the launcher against rotation in the handle due to torque reaction of the gases from the canted nozzles against ribs 19.

As the propellant grain burns, the resilient gasket 76 seals the forward end and prevents pre-ignition of the transfer charge 80, from leakage of combustion gases around the side of the grain. At completion of burning of the propellant grain, the transfer charge is ignited and actuates the payload. The payload separation point in the trajectory of the signal is determined by the delay burning time of the transfer charge, to suit the specific payload. As an example, a typical flare would be ignited about 400 feet above the launch point and, with an apogee of 2,000 feet, would provide a highly visible signal for about 20 seconds, before burning out while still clear of the ground.

While the launcher is intended to be disposable after use, it can easily be reloaded with another signal cartridge. Or, if it is decided not to fire the signal, the launcher can be closed by twisting to unlock the detent pin 32 in cam slot 34, the safety block 38 being replaced to lock the firing pin.

Having described my invention, I now claim:

1. An aerial signal unit, comprising,
 - a substantially cylindrical rocket propelled signal cartridge having a nose end, and a nozzle end with igniting means therein;
 - a launcher having a barrel in which said signal cartridge is slidably held;
 - said launcher having a breech plug;
 - retaining means in said barrel for holding said signal cartridge with said nozzle end on said breech plug;

firing means attached to said breech plug;

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a handle telescopically slidably mounted on said launcher and enclosing said firing means in a closed position; and detent means in said handle for holding the handle in an open position with the firing means exposed.

2. An aerial signal unit according to claim 1, wherein said breech plug has a cup portion in which said nozzle end is a close fit.

3. An aerial signal unit according to claim 2, and including sealing means sealing said nose end to said barrel.

4. An aerial signal unit according to claim 1, wherein said firing means comprises a tube extending axially from said breech plug, a firing pin slidably mounted in said tube, an actuator button fixed to said firing pin and extending externally of the tube, and a spring in the tube urging said firing pin toward the breech block; said breech block having an aperture to receive the firing pin in alignment with said igniting means.

5. An aerial signal unit according to claim 4, wherein said handle is slidably on said tube, the handle having a slot to receive said actuator button in the closed position;

and a safety block removably mounted in said slot between the actuator button and breech plug in the closed position.

6. An aerial signal unit according to claim 5, wherein said detent means includes a spring biased detent pin projecting radially from said tube, said handle having a detent slot to receive the pin in the open position.

7. An aerial signal unit according to claim 6, wherein said detent slot has a cam portion for retracting said detent pin by relative rotation of the handle and tube.

8. An aerial signal unit according to claim 5, and including a removable sealing tape sealing the junction of the barrel and handle in closed position.

9. An aerial signal unit according to claim 1, wherein said barrel has internal ribs spacing said signal cartridge from the barrel with gas escape passages therebetween;

said breech plug having a cup portion in which said nozzle end is a close fit.

10. An aerial signal unit according to claim 1, wherein said signal cartridge comprises a rocket motor and a payload portion; said rocket motor having a reduced diameter portion;

said payload portion having a casing fitting slidably over said reduced diameter portion with the end thereof spaced from the full diameter portion of the rocket motor and defining a circumferential re-

taining groove on the cartridge.

11. An aerial signal unit according to claim 10, wherein said retaining means comprises a spring catch secured in said barrel and seating in said retaining groove.

12. An aerial signal unit according to claim 10, wherein said nose end is substantially conical with a truncated flat end.

13. An aerial signal unit according to claim 12, wherein said flat end has a sharp circumferential edge.

14. An aerial signal unit according to claim 13, and including a sealing washer surrounding said nose end and sealing the signal cartridge to the barrel, with said flat end substantially flush with the end of the barrel.

15. A launcher for a rocket propelled aerial signal, comprising,

a substantially cylindrical barrel with means for retaining a signal cartridge therein;

said launcher having a breech plug;

firing means attached to said breech plug;

a handle telescopically slidably mounted on said launcher and enclosing said firing means in a closed position;

and detent means in said handle for holding the handle in an open position with the firing means exposed.

16. A launcher according to claim 15, wherein said barrel is internally ribbed to space the signal cartridge from the barrel with gas escape passages therebetween;

said breech plug having a cup in which the rocket nozzle portion of the signal cartridge is a close fit.

17. A launcher according to claim 16, wherein said firing means includes a tube extending axially from said breech plug, a firing pin slidably mounted in said tube, an actuator button fixed to said firing pin and extending externally of the tube, and a spring in the tube urging said firing pin toward the breech plug, said breech plug having an aperture to receive the firing pin.

18. A launcher according to claim 17, wherein said handle is slidably on said tube, the handle having a slot to receive said actuator button in the closed position;

and a safety block removably mounted in said slot between the actuator button and breech plug in the closed position.

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