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[54] PYROTECHNIC DEVICES

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[51] **Int. Cl.**.....**C06d 1/10**

[58] **Field of Search**.....102/37.8, 37.6, 39, 90, 32

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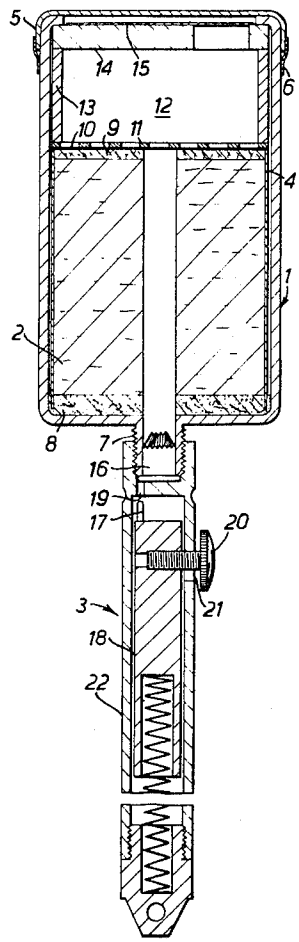
[57] **ABSTRACT**

A signal device comprising signal composition which is housed within a casing and which remains therein during combustion and a firing device which releasably engages the casing and which can be hand-held during the combustion of the composition.

9 Claims, 2 Drawing Figures



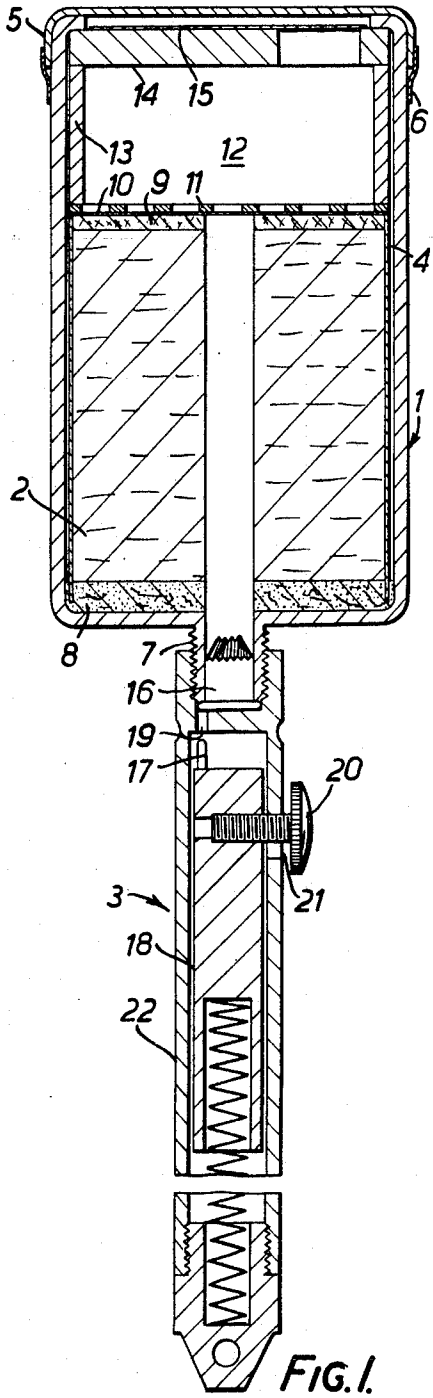


FIG. 1.

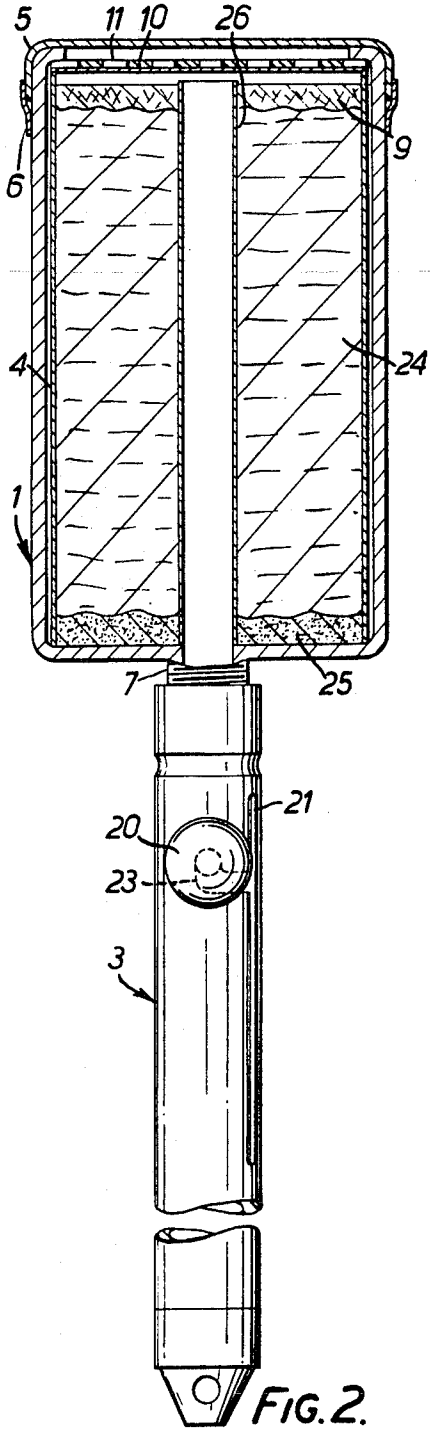


FIG. 2.

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PYROTECHNIC DEVICES

This invention relates to pyrotechnic signal devices suitable for being held in the hand.

The invention provides a pyrotechnic signal device comprising a casing housing a signal composition and within which the composition can undergo combustion, one end of the casing permitting the discharge of combustion products, means, which includes a percussion cap, for igniting the signal composition, and a firing device, which can be repeatedly operated and which has a firing pin for igniting the percussion cap, the firing device being in releasable engagement with the casing, and forming a handle for the signal device.

The provision of a firing device which is in releasable engagement with the casing, which can be operated repeatedly, and which has a firing pin for igniting the percussion cap, enables a number of signal devices to be fired with one firing device while at the same time giving improved reliability of ignition of the signal composition as compared with conventional igniter systems, which are incorporated within the casing itself.

Advantageously, the firing device comprises a spring-loaded firing pin slidably mounted within a casing, and a cocking member which is movable to retract the firing pin against the action of the spring. Preferably, the cocking member can be releasably secured with the firing pin in a semi-retracted position, and the device can then be fired by fully retracting the cocking member and then releasing it. Firing devices of this kink are commonly known as "pen guns", and are used for the ignition of other types of distress signals. The end portion of the casing of a conventional "pen gun" is internally screw-threaded to enable it to be releasably engaged with the signal with which it is to be used. If the firing device of the signal device is a conventional "pen gun", then the end portion of the casing is externally screw-threaded for engagement therewith.

The use of a "pen gun" as a firing device facilitates interchangeability with other signal devices and serves to provide a firm handle for the device while at the same time simplifying the firing operation as compared with conventional small signal devices of the type in which the signal composition remains in the casing when burning.

In the signal device of the invention, the arrangement may be such that (and when the signal composition is a flare composition, preferably is such that) the signal composition is ignited at the end nearer to the end of the casing which permits the discharge of combustion products, (which is preferably merely an open end) that is to say, the signal composition may be made to burn from the top downwards when the device is held in the normal manner. Because the area of contact between the "pen gun" and the casing is small, the "pen gun" does not overheat when the signal is burning. When the signal casing is made of metal, however, it is desirable to provide a layer of thermally insulating material in the lower part of the casing. The choice of thermally insulating material and the thickness of the layer depend on the temperature of the burning composition.

In addition, when the casing is made of metal, it is desirable to provide a layer of thermally insulating material (an inhibiting layer), preferably paper, between the outer surface of the composition and the inner surface of the wall of the casing, to prevent combustion spreading down the outer surface of the composition at a faster rate than that at which the rest of the composition burns.

The percussion cap may be a center-fire or a rim-fire cap, and the firing pin of the "pen gun" is accordingly either central or offset. The majority of "pen guns" have offset firing pins for use with rim-fire caps and, in order to facilitate use of these "pen guns" as the firing device, the percussion cap is preferably a rim-fire cap.

Advantageously, the pyrotechnic composition, which may be a flare or smoke-generating composition, is formed with an axially extending passageway coaxial with the percussion cap, the upper end of the composition being covered by a layer of priming material. Thus when the percussion cap is ignited, the flame from it travels along the passageway and ignites the priming material which in turn ignites the end of the signal composition nearer to the end of the casing which permits the discharge of combustion products.

Preferably, a perforated plate, constrained against movement along the length of the casing, is positioned adjacent to the priming material on the side remote from the percussion cap to prevent the flame or gases from the cap from dislodging the priming material.

Preferably, the end of the casing through which combustion products emerge is sealed by closure means which may be arranged to be released or ruptured by the combustion of the device, enabling the device to be operated with one hand, or which may be arranged to be removed immediately prior to firing the device. Advantageously, the casing is hermetically sealed, which in addition to improving the keeping properties of the contents, is an advantage when the device is used by a person in the sea.

If the signal is a smoke-generating signal and especially if the signal is a colored-smoke-generating signal composition, a cooling chamber is preferably provided for the smoke leaving the burning composition.

The invention also provides a casing which houses a signal composition within which the composition can undergo combustion, which incorporates means, which includes a percussion cap, for igniting the signal composition, and one end of which permits the discharge of combustion products, and the casing being suitable for releasable engagement with a firing device which can be repeatedly operated, and which has a firing pin for igniting the percussion cap, to form a signal device in accordance with the invention, the firing device forming a handle for the signal device.

Two pyrotechnic signal devices constructed in accordance with the invention will now be described in detail, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is an axial cross section of the first signal device, which is a smoke-generating device; and

FIG. 2 shows a view, partly in axial cross section and partly in elevation of the second signal device, which is a signal flare device.

Referring to FIG. 1, of the accompanying drawings, the device comprises a generally tubular casing, the upper end of which is open, indicated generally by the reference numeral 1, containing a hollow cylindrical mass of smoke-generating composition 2, and a firing device, indicated generally by the reference numeral 3, the firing device being in releasable engagement with the casing. The mass of smoke-generating composition 2 is contained within a paper asbestos liner tube 4 which termally insulates the composition from the wall of the casing 1.

The upper end of the casing 1 is closed by an externally fitting cup-shaped member 5 which is sealed to the outside of the casing with adhesive tape 6. The lower end of the casing 1 is formed with an externally screw-threaded neck 7. A mass of plaster of paris 8 is formed in the lower portion of the casing 1, and it is formed with a hole which registers with the passageway in the mass of smoke-generating composition 2 and with the aperture in the neck 7. The upper surface of the mass of smoke-generating composition 2 is covered with a layer of priming composition 9, which is itself covered by a disc of primed cambric 10. A perforated disc 11 bears against the upper surface of the disc of primed cambric 10.

The upper portion of the casing contains a cooling chamber, indicated generally by the reference numeral 12 which is provided to prevent smoke leaving the casing from igniting, as it is apt to do, especially with colored smoke-generating compositions, if allowed to pass directly from the burning composition into the air, and to maintain the color of the smoke. The cooling chamber 12 rests on the perforated disc 11 and is held in position at its upper end by the inwardly turned walls of the casing 1. The cooling chamber 12 consists of an aluminium

collar 13 supporting an aluminium baffle disc 14 which is formed with an off-center hole. The cooling chamber 12 is covered with a shellac-covered paper washer 15.

A rim-fire percussion cap 16 is provided in the neck 7 of the casing and its rim bears against, and is sealed to, the lower end of the neck.

The firing device 3 is a "pen gun" with an offset firing pin 17. The externally screw-threaded neck 7 of the casing 1 is in engagement with the internally screw-threaded cup-shaped upper portion of the "pen gun", and the base of the cup-shaped portion is then flush with the base of the percussion cap 16. The firing pin 17, which is mounted on a spring-loaded plunger 18, registers with a hole 19 formed in the base of the cup-shaped portion and with the rim of the cap 16.

The plunger 18 is formed with a radially extending screw-threaded hole to receive a firing pin bolt or cocking member 20, and the firing pin bolt passes through a slot 21 formed in the wall 22 of the "pen gun" which forms guide means for the firing pin 17. The slot 21 extends axially so that the firing pin bolt 20 together with the plunger 18 can be retracted and the slot is formed with a short parallel branch 23 so that the firing pin bolt and plunger can be retained in a semi-retracted position. To ignite the percussion cap 16, the firing pin bolt 20 is fully retracted and released so that the firing pin 17 strikes the rim of the cap. If the cap 16 does not ignite first time, as sometimes happens with so-called "hard caps", it can be struck repeatedly by successive recocking and releasing of the firing pin bolt 20.

In operation, the casing 1 is engaged with the "pen gun" 3, the firing pin bolt 20 of which is in the semi-retracted position so that the firing pin 17 is clear of the percussion cap 16. The cup-shaped member 5 is removed by hand to provide an outlet for the smoke. The firing pin bolt 20 is then fully retracted and released so that the firing pin 17 strikes the percussion cap 16. The flame emitted from the cap 16 travels along the passageway in the mass of smoke-generating composition 2 and ignites the primed cambric 10, the perforated disc 11 which bears against the primed cambric ensuring that the primed cambric is not dislodged by the flame in the process. The top of the mass of smoke-generating composition 2 is ignited via the priming composition 9, and the smoke generated passes through the cooling chamber, displacing the paper washer 15, and out of the top of the casing 1.

The casing 1 containing the smoke-generating composition 2 can be stored separately from the firing device 3 and need only be engaged with the firing device when it is desired to fire the signal device. One firing device 3 can thus be used to fire a number of such signals successively. The casing is sealed at its upper and lower ends, and this has the advantage of improving the keeping properties of the contents.

The signals flare device is similar to the smoke-generating device except that flare composition 24 is provided instead of smoke-generating composition, and no cooling chamber is provided. Also, the shellac-covered paper washer 15 is omitted, clay 25 is provided instead of plaster of paris, and the central axially extending hole in the flare composition 24 is lined with a synthetic resin-bonded paper tube 26 which tends to prevent combustion spreading down the walls of the central passageway.

In operation, the casing is connected to the firing device 3 and fired in the same way as described above for the smoke-generating device, but because of the high temperature of the flame from the flare generating composition, it is not necessary to remove the cup-shaped member 5 before firing. The cup-shaped member 5 and the perforated disc 11, are either melted or displaced by the burning flare composition 24.

The casing of the flare device is sealed at its upper and lower ends, and as with the smoke-generating device this has the advantage of improving the keeping properties of the contents.

I claim:

1. A pyrotechnic signal device comprising: a casing, one end of said casing permitting the egress of combustion products, and a neck portion being formed on the other end of said casing; a mass of flare composition housed in said casing and arranged to remain therein during combustion of said flare composition; flare composition igniting means, said igniting means including a percussion cap, said percussion cap being positioned in said neck portion; said flare composition having a passageway therein co-axial with said percussion cap; a layer of priming material covering the surface of said composition remote from said percussion cap; a layer of thermally insulating material lining the passageway; a perforated plate in contact with said priming material on the side remote from said percussion cap, said perforated plate being constrained against movement along the length of said casing; and a firing device, said firing device being in releasable engagement with said neck portion of said casing and forming a handle for said signal device, and said firing device comprising a firing pin, guide means for said firing pin, a spring operable to urge said firing pin towards said cap, and a cocking member, said cocking member being movable to retract said firing pin against the action of said spring and being capable of being so retracted and released repeatedly; whereby, said device is operated by moving said cocking member so as to retract said firing pin and releasing said cocking member so that said firing pin strikes said percussion cap, thereby causing said igniting means to ignite said priming material which ignites said composition, said firing device enabling said signal device to be hand-held while combustion products from said composition emerge from said one end of said casing.

2. A pyrotechnic signal device comprising: a casing, one end of said casing permitting the egress of combustion products, and a neck portion being formed on the other end of said casing; a mass of smoke-generating composition housed in said casing and arranged to remain therein during combustion of said smoke-generating composition; smoke-generating composition igniting means, said igniting means includes a percussion cap, said percussion cap being positioned in said neck portion, said smoke-generating composition having a passageway therein coaxial with said percussion cap; a layer of priming material covering the surface of said composition remote from said percussion cap; a cooling chamber through which combustion products pass before emerging from said casing; and a firing device, said firing device being in releasable engagement with said neck portion of said casing and forming a handle for said signal device, and said firing device comprising a firing pin, guide means for said firing pin, a spring operable to urge said firing pin towards said cap, and a cocking member, said cocking member being movable to retract said firing pin against the action of said spring and being capable of being so retracted and released repeatedly; whereby, said device is operated by moving said cocking member so as to retract said firing pin and releasing said cocking member so that said firing pin strikes said percussion cap, thereby causing said igniting means to ignite said priming material which ignites said composition, said firing device enabling said signal device to be hand-held while combustion products from said composition emerge from said one end of said casing.

3. A pyrotechnic signal device according to claim 2, wherein a perforated plate is provided which is in contact with said priming material on the side remote from said percussion cap, said perforated plate being constrained against movement along the length of said casing.

4. A pyrotechnic signal device comprising: a casing, one end of said casing permitting the egress of combustion products, said casing being formed of metal; a mass of pyrotechnic composition housed in said casing and arranged to remain therein during combustion of said pyrotechnic composition; a layer of thermally insulating material between the pyrotechnic composition and the wall of the casing; pyrotechnic composition igniting means, said igniting means including a percussion cap; and a firing device, said firing device in releasable engagement with said casing and forming a handle for said signal device, said firing device comprising a firing pin, guide means for said

firing pin, a spring operable to urge said firing pin towards said cap, and a cocking member, said cocking member being movable to retract said firing pin against the action of said spring and being capable of being so retracted and released repeatedly; whereby, said device is operated by moving said cocking member so as to retract said firing pin and releasing said cocking member so that said firing pin strikes said percussion cap, thereby causing said igniting means to ignite said composition, said firing device enabling said signal device to be hand-held while combustion products from said composition emerge from said one of said casing.

5. A pyrotechnic signal device according to claim 4, wherein a layer of thermally insulating material is provided in the end portion of the casing that is adjacent to the firing device.

6. A pyrotechnic signal device comprising: a casing, one end of said casing permitting the egress of combustion products, and an externally screw-threaded neck portion being formed on the other end of said casing; a mass of flare composition housed in said casing and arranged to remain therein during combustion of said flare composition; flare composition igniting means, said igniting means including a percussion cap, said percussion being positioned in said neck portion; said flare composition having a passageway coaxial with said percussion cap; a layer of priming material covering the surface of said composition remote from said cap; a perforated plate in contact with said priming material on the side remote from said percussion cap, said perforated plate being constrained against movement along the length of the casing; and a layer of thermally insulating material lining said passageway; whereby, the striking of said cap causes said igniting means to ignite said priming material which ignites said composition, said composition remaining in said casing when burning.

7. A pyrotechnic signal device comprising: a casing, one end of said casing permitting the egress of combustion products, and an externally screw-threaded neck portion being formed on the other end of said casing; a mass of smoke-generating composition housed in said casing and arranged to remain therein during combustion of said smoke-generating composition; smoke-generating composition igniting means, said igniting means including a percussion cap, said percussion cap being positioned in said neck portion; said smoke-generating composition having a passageway coaxial with said percussion cap; a layer of priming material covering the surface of said composition remote from said cap; a perforated plate in contact with said priming material on the side remote from said percussion cap, said perforated plate being constrained against movement along the length of said casing; and a cooling chamber through which the combustion products pass before emerging from said casing; whereby, the striking of said cap causes said igniting means to ignite said priming material which ignites said composition, said combustion remaining in said casing when burning.

8. A pyrotechnic signal device according to claim 1, wherein said firing device is a conventional pen gun and said neck portion is externally screw-threaded for engagement with said pen gun.

9. A pyrotechnic signal device according to claim 2, wherein said firing device is a conventional pen gun and said neck portion is externally screw-threaded for engagement with said pen gun.

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