

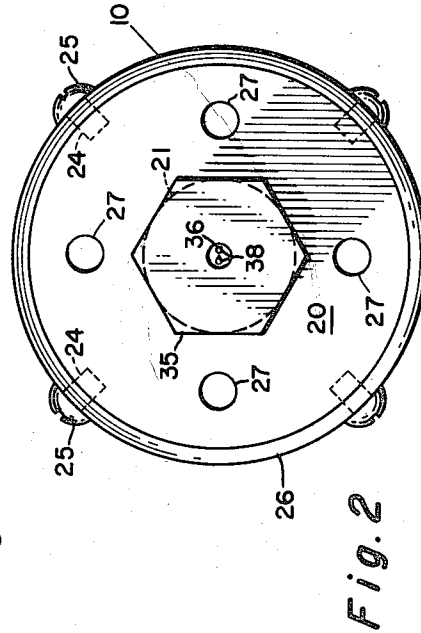
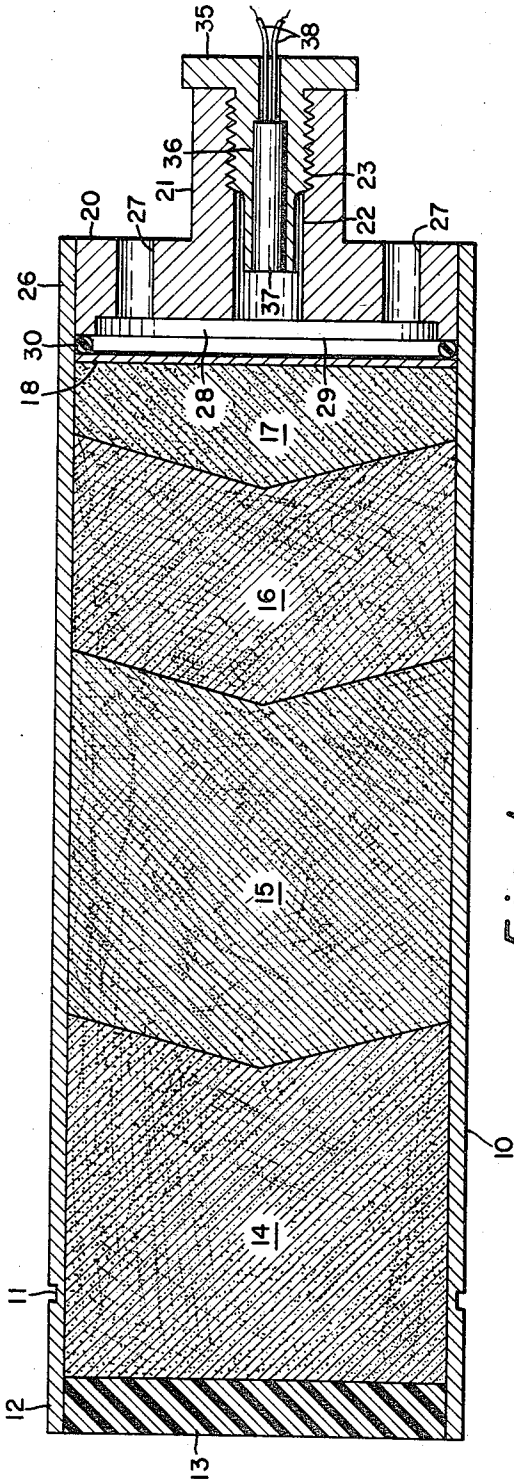
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FLARE DEVICE

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FLARE DEVICE

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The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to a new and novel flare device and more particularly to a flare device especially adapted for use in tracking guided missiles.

In order to determine the operating characteristics of guided missiles, it is necessary to track them during flight, and one of the most satisfactory methods of accomplishing this is by visual or photographic methods wherein a flare is attached to the rear of the missile whereby it may be more easily tracked. Other types of tracking devices such as smoke generators are too bulky for use with guided missiles, and accordingly it is necessary to employ pyrotechnic type flares. Prior art flares of this type, however, have proven to be unsatisfactory when operating at the temperatures encountered at the altitudes in which the guided missiles customarily operate.

The principal difficulty encountered with prior art flares when utilized at low temperatures is unreliable ignition which is caused by insufficient burning time of the ignition squib and failure to provide adequate venting for the gases generated by the squib. In prior art flares, the rear end of the flare which supports the squib is sealed whereby the gases generated by the squib are confined within the flare and eventually build up to a pressure which expels the squib and its supporting cap from the rear end of the flare. The build-up of gases within the flare prevents the flame produced by the squib from being properly distributed over the surface of the flammable charge within the flare and may even cause the flare to be completely extinguished. The squib and its supporting structure may also be expelled prematurely from the flare due to the gas pressure therein. An additional disadvantage of prior art flares lies in the fact that the cap means which supports the ignition squib is formed of a hard substance which may be expelled in tracking or blow up into fragments, and the presence of such hard objects in the wake of the missile is a serious disadvantage since there is the possibility that such objects may strike a portion of the launching aircraft and cause serious damage.

Prior art flares also provide inadequate luminosity during flight due to the cooling effect of the surrounding airstream. This effect is more pronounced in prior art flare constructions due to the fact that the exit portions thereof are constricted such that practically the entire visible flame at the rear thereof is exposed to the airstream. Additionally, such prior art flares have a tendency to burn sporadically which is undesirable in missile

tracking, and such sporadic burning is also caused by the presence of a constriction at the exit of the flare. The solid residue of combustion accumulates at the point of constriction and is subsequently periodically ejected as the internal pressure within the flare becomes high enough to dislodge it with an accompanying burst of sparks at the rear of the flare.

The present invention provides a construction wherein the cap sealing the rear end of the flare and supporting the ignition squib is formed of a thermally destructible substance, and a plurality of openings are formed longitudinally through the cap for venting the ignition gases generated by the squib. The cap is also provided with a recess adjacent the flammable charge within the flare whereby the squib flame is more evenly distributed over the surface of the charge, and this feature in combination with the vents which allow escape of the ignition gases provides uniform ignition over the surface of the charge. After the charge has commenced burning, the temperature generated within the flare causes the cap to be completely melted by the heat generated therein such that there is no danger of the cap injuring a tracking aircraft and further eliminating any constriction at the rear of the flare such that greater luminosity is obtained and steadier burning is accomplished during operation. Since the squib gases are entirely vented through the openings in the cap, the cap is not ejected due to an increase in pressure within the flare upon ignition of the squib. The openings within the cap also provide an increased area which is subjected to the flame generated by the flare whereby the cap is more uniformly and completely destroyed.

An object of the present invention is the provision of a new and novel flare device which is reliable at low temperature.

Another object of the invention is to provide a flare device which provides high luminosity under flight conditions.

A further object is the provision of a flare device which has steady burning characteristics during operation.

Yet another object of the invention is to provide a flare device which is simple and inexpensive in construction, yet sturdy and reliable in operation.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is a longitudinal section of a preferred embodiment of the invention, and

Fig. 2 is an end view of the device shown in Fig. 1.

Referring now to the drawings wherein like reference characters designate similar parts in the views, there is shown a hollow cylindrical body means 10 which may be formed either of thermally destructible material such as polystyrene, or the like, or preferably of a non-thermally destructible material such as stainless steel tubing, the outer surface of the body means having a groove 11 formed therein whereby the body means may be suitably secured to a supporting structure. One end portion 12 of the body means is sealed by means of a plastic plug 13 which is suitably secured to the inner walls of the body means as by bonding or the like. The cavity within the body member has three incremental

illuminant charges 14, 15 and 16 abutting one another, each of the illuminant charges being packed within the body means by a ram having a conical shaped head thereon whereby the adjacent surfaces of the incremental charges have a greater area of contact to increase the adhesion therebetween. An incremental ignition charge 17 is disposed adjacent illuminant charge 16 and the rear surface of the ignition charge is in engagement with a diaphragm 18 extending laterally across the interior of the body means and serving to seal the flammable charge from communication with the exterior of the flare. It should be understood that the illuminant and ignition charges may be formed of suitable material as is well known in the art, and diaphragm 18 is formed of a fusible material such as aluminum foil which is adapted to melt upon ignition of the device.

A cylindrical cap means 20 has a rearwardly extending cylindrical portion 21 having an opening 22 formed longitudinally therethrough and provided with screw threads 23 formed in the outer end thereof. Cap means 20 is formed of a thermally destructible material such as Rose's alloy or the like, which is adapted to be completely melted, or a material such as nitrocellulose with a mild degree of nitration which is adapted to burn when exposed to the flame of the flammable charge within the flare during operation of the device. The cap means is provided with four equally spaced threaded openings 24 as seen in Fig. 2, each of which is adapted to receive a cap screw 25 which passes through the corresponding opening in the wall of the body means whereby the cap means is secured to end 26 of the body means. The cap means is also provided with four equally spaced openings 27 extending longitudinally therethrough, the openings being in communication with a circular recess 28 provided in the inner surface 29 of the cap means. It is evident that the number and size of the openings through the cap means may be varied in accordance with well-known design considerations. An O-ring seal 30 is disposed between and in engagement with the diaphragm 18 and surface 29 of the cap means for sealing the cap means with respect to the body means. A conventional squib holder 35 is threaded into opening 22 of the cap means and is provided with a central stepped opening 36 therein within which is mounted a conventional squib 37. Electrical leads 38 extend through the squib holder and are in contact with squib 37, the opposite ends of leads 38 being connected to a conventional source of electrical energy (not shown).

In operation, the cap means with its associated squib and squib holder is first attached to end portion 26 of the body means by means of cap screws 25. Leads 38 are then suitably connected in an associated electrical firing circuit for igniting the flare. Upon energization of the firing circuit, squib 37 is ignited and the flame therefrom passes through opening 22 and recess 28 in the cap means and melts fusible diaphragm 18. The flame from the squib then causes the ignition charge 17 to burn whereupon the flare burns in a conventional manner. The ignition gases produced by the squib are vented through openings 27 in the cap means thereby reducing the pressure within the flare such that reliability of ignition is substantially increased. The entire cap means 21 is substantially destroyed due to being melted or burned by the heat generated by the flammable charge within the flare. The squib holder and the squib are accordingly released into the air stream upon destruction of cap 20 and are maintained in position by leads 38 such that they do not fly to the rear of the flare. Since the cap means is entirely destroyed, there is no constriction at the rear of the flare which provides better luminosity and steadier burning during operation.

It is apparent from the foregoing that there is provided new and novel flare device which is reliable at low temperatures and provides a high luminosity under flight conditions accompanied by steady burning characteristics.

The device is simple and inexpensive in construction, yet sturdy and reliable in operation.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

We claim:

1. A flare device which comprises a hollow body having a flammable charge disposed therein, a cap closing one end of said body, said cap, being formed of a thermally destructible substance designed to be consumed upon ignition of said flammable charge and having at least one opening formed therein for providing communication between the interiors of said body and atmosphere, and a squib supported by said cap, said cap having a recess formed in the surface thereof adjacent said flammable charge for evenly distributing the flame from said squib over the entire surface of said charge upon ignition of said squib.

2. A flare device which comprises a hollow body means having a flammable charge disposed therein, means for sealing one end of said body means, cap means secured to the opposite end of said body means for sealing said opposite end, said cap means being formed of a thermally destructible substance and having at least one opening formed therein for providing communication between the interior of said body means and atmosphere, squib means supported by said cap means, said cap means having a recess formed in the surface thereof adjacent said flammable charge for evenly distributing the flame from said squib upon ignition thereof, and diaphragm means extending laterally across the interior of said body means and sealing said flammable charge from said cap means.

3. A device as defined in claim 2 including an O-ring seal disposed between said diaphragm and said cap means.

4. A flare device which comprises a hollow body means having a flammable charge therein including an illuminant material and an ignition material disposed at one end of said body means, diaphragm means extending laterally across the interior of said body means for sealing said flammable charge from the opposite end of said body means, said diaphragm being composed of a fusible material, an O-ring seal disposed within said body means adjacent said diaphragm means, cap means secured to the opposite end of said body means for sealing said opposite end, said cap means being formed of a thermally destructible substance and having a recess formed in the surface thereof adjacent said diaphragm means, a plurality of openings formed in said cap means for providing communication between said recess and atmosphere, and squib means supported by said cap means.

5. A flare device which comprises a hollow body having a flammable charge disposed therein, a cap closing one end of said body, said cap being formed of a thermally destructible substance designed to be consumed upon ignition of said flammable charge, and a squib supported by said cap for producing a flame to ignite said charge, said cap having at least one opening to atmosphere formed therein performing the dual function of venting the gases of combustion, thus precluding an explosive ejection of said cap, and also providing an increased area of cap material which is exposed to the flame generated by ignition of said flammable charge, whereby said cap is more uniformly and completely consumed.

6. A tracking flare device which comprises a hollow body having a flammable charge disposed therein, and a cap at least partially closing one end of said body, said cap being composed of a thermally-destructible substance designed to be consumed by said flammable charge when the latter is ignited, said cap having an aperture for conducting igniting gases to the surface of said charge, said

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cap having in addition at least one preformed opening to atmosphere therein located in laterally spaced relation to the aperture through which said igniting gases are conducted to the surface of said charge, said opening performing the dual function of venting the products of combustion of said charge material and also providing an increased area of cap surface which is exposed to the flame generated by ignition of said charge material, said cap being separated by an air space from the surface of said flammable charge in order to effect a distribution 10 of said igniting gases over a substantial portion of the surface of said charge and thus facilitate ignition thereof,

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and means for sealing said charge material from atmospheric effects.

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