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(54) Aerial target system

(57) The present invention relates to an air-borne target system. The use of aerial targets in weapons training situations is well known. Targets towed by aircraft or self-propelled targets simulate the characteristics against which anti-aircraft shells and missiles might be used. Those characteristics might include shape or thermal signatures. Gas or petroleum powered burners have been used to heat a mesh or solid surface which gives the required thermal signature. However, the use of a burner also provides a visual indicator. Whilst not causing any problems for daylight training missions, during night-time operations, often a person training in the use of anti-aircraft weaponry inadvertently follows the visual signature rather than the thermal signature. This clearly reduces the effectiveness of the training in simulating battle conditions where there may be no visual indication as to a target's location. The present invention addresses this problem by providing an aerial target including an electrically-powered heater unit.

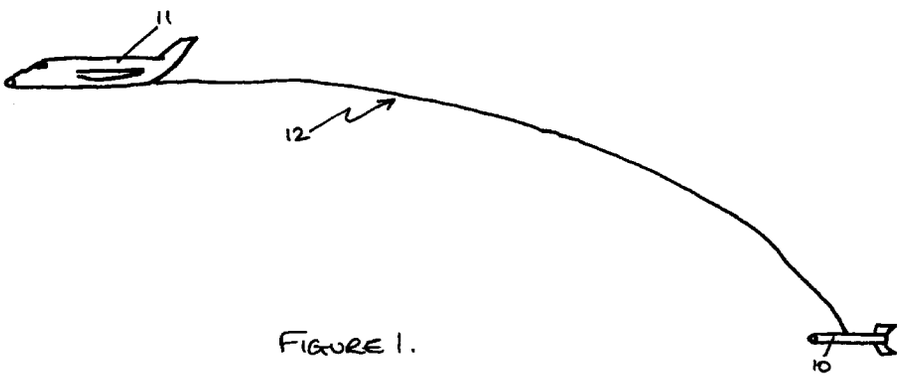

FIGURE 1.

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Description

[0001] The present invention relates to an air-borne target system.

[0002] The use of aerial targets in weapons training situations is well known. Targets towed by aircraft or self-propelled targets simulate the characteristics against which anti-aircraft shells and missiles might be used. Those characteristics might include shape or thermal signatures. Gas or petroleum powered burners have been used to heat a mesh or solid surface which gives the required thermal signature. However, the use of a burner also provides a visual indicator. Whilst not causing any problems for daylight training missions, during night-time operations, often a person training in the use of anti-aircraft weaponry inadvertently follows the visual signature rather than the thermal signature. This clearly reduces the effectiveness of the training in simulating battle conditions where there may be no visual indication as to a target's location.

[0003] This problem has been noted and addressed in GB 2 309 290, which proposes placing a 'continuous thermally conductive surface' over the burner unit in the nose cone of a target. However, the publication is insufficient in that it fails to explain what is meant by this term and no examples of suitable materials or constructions for such a surface are given to assist in an understanding. Furthermore, there is a problem with gas-powered targets in producing excessive temperatures and failing to produce thermal signatures of the desired wavelength(s). Accordingly, there is a need for an alternative thermal unit for an air-borne target system.

[0004] According to the present invention, in its broadest sense, there is provided an aerial target including an electrically heated heater unit. Typically, the heater unit is positioned within the nose cone of the aerial target, preferably behind a zinc sulphide window.

[0005] Preferably, the heater unit comprises a nickel chrome wire element. Preferably the wire element is mounted upon a flat radiator plate.

[0006] The present invention is equally applicable to towed targets or self-propelled targets. Typically, self-propelled targets are powered by reciprocating engines (piston or rotary), jet engines or solid fuel motors.

[0007] The above and other aspects of the present invention will now be described in further detail, by way of example only, with reference to the accompanying figures, in which:

Figure 1 shows, schematically, an aerial target being towed by a manned aircraft;

Figure 2 is a perspective view of an embodiment of a towed aerial target incorporating a heater;

Figure 3 illustrates the embodiment of Figure 2 underneath the wing of an aircraft prior to deployment of the target; and

Figure 4 is a perspective front view of the nose cone of the embodiment of Figure 2.

[0008] Figure 1 shows an un-powered aerial target 10 towed by an aircraft 11 on a very long tow rope 12 (typically of the order of 7km) for the protection of the towing aircraft 11 from incoming fire. Target 10 radiates heat from its nose cone by means of an electrically powered heater unit installed within the aerodynamic nose cone fairing 13. The nose cone fairing 13 is typically manufactured from high temperature GRP and comprises a zinc sulphide window 14 to allow the infra red thermal signature of the heater unit in the 3-13 micron range to be viewed by the seeker, whilst acting as an insulator against the cooling of the airflow which could typically reach 350 knots or more. The ZnS window 14 is as large as possible to ensure that the maximum possible area of heated surface can be detected by the seeker.

[0009] The heater unit uses a nickel chrome wire element mounted on a flat radiator plate in a 1.2kW configuration. The radiator plate is itself mounted on a thermally insulated stainless steel and aluminium chassis. The unit radiates heat from ambient temperature to around 500°C. The nose cone may include such holes as are necessary to allow cooling air to pass between the inside surface of the nose cone; the external surface of the stainless steel chassis; and to areas where the stainless steel frame is attached to the GRP nose cone to prevent any structural damage to the nose due to heat from the heating element. The rear of the heater unit assembly is covered with a thick glass-cloth mat to prevent or reduce heat transmission to the rear of the target.

[0010] The heater unit is shaped to ensure adequate coverage and may be orientated to produce a forward directed thermal signature or can be adapted to direct the signature at an angle to the horizontal. The heater may have a constant temperature across substantially its whole visible surface or may be configured to have a temperature range of around 30°C or so across the surface. A heater control system included in the target controls the output temperature, by means of a thermocouple mounted on the heater radiator plate. The control system can be adapted as required to allow stepped temperature adjustments during flight and may include telemetry outputs showing the status of the heating element.

[0011] The heater unit is electrically powered by battery cells which, under typical conditions, will need to be capable of ensuring operation of the heater for at least 30 minutes. Alternatively, the supply of electrical power may include a generator. Successful results have been obtained drawing a current of around 22 amps from cells operating at 48v and formed from two packs of forty 1.2V 4Ah nickel cadmium D-type cells. 7Ah cells have also been used.

[0012] With the above described configuration, using a 1.2kW heater set at 437°C, giving a heater output cal-

culated at 40W per steradian in the 4-6 micron band, successful trials have been achieved with a target speed of 250 knots at an altitude of 500m. A weapon system was able to satisfactorily track the target from a range of 6000m and successful missile firings have taken place at ranges of over 7000m.

[0013] Advantageously, the system of the present invention may be retro-fitted in place of the standard nose cone on existing available targets.

[0014] The target system of the present invention will be more acceptable to the aviation authorities, such as the FAA, as there is no flammable gas or vapours used in the system. Accordingly, shipment, storage, target preparation, target flight time whilst stowed, retrieval and landing considerations all have much lower risks associated with them. The unit should be more reliable by avoiding the need for a volatile fuel/air mixture to provide the heat output. Thus there will be no problems associated with achieving ignition of the fuel and maintenance of the correct flame pattern as the airspeed of the target varies in flight.

[0015] The unit gives out a more accurate and stable thermal signature for the weapon system. The thermal signature can be maintained at a stable output across the target's whole range of airspeeds, whether 180 knots or 380 knots. Thus the range of training capabilities is not restricted by the thermal unit in any way, only by the inherent capabilities of the target itself. It is understood that gas-powered 'hot nose' systems suffer badly in performance due to excessive heating producing thermal signatures outside the desired wavelengths. There have been reports of trials using gas-powered hot nose targets in which an unacceptably large thermal signature was produced which caused tracking irregularities. This is believed to be due to non-uniform radiation from the nose cone and to the exhausting of the waste burner gases to atmosphere in the vicinity of the nose cone.

[0016] Although described above with respect to the nose cone of a target, the thermal unit may be fitted in any suitable position within the target to provide the desired thermal signature. For example, a rear-facing signature may be required, in which case, the thermal unit will be positioned at the rear of the target.

Claims

1. An aerial target including an electrically-powered heater unit.

2. An aerial target as claimed in Claim 1 wherein the heater unit is mounted behind a zinc sulphide window.

3. An aerial target as claimed in Claim 1 or Claim 2 wherein the heater unit comprises a nickel chrome wire element.

4. An aerial target as claimed in Claim 3 wherein the wire element is mounted upon a flat radiator plate.

5. An aerial target as claimed in any one of Claims 1 to 4 wherein the heater unit is mounted within or upon the nose-cone of the target.

6. A heater assembly for an aerial target, the assembly comprising an electrically-powered heater unit and mounting means for mounting the assembly upon the aerial target.

7. A heater assembly as claimed in claim 6 wherein the mounting means comprises a fairing having a zinc sulphide window, behind which is mounted the heater unit.

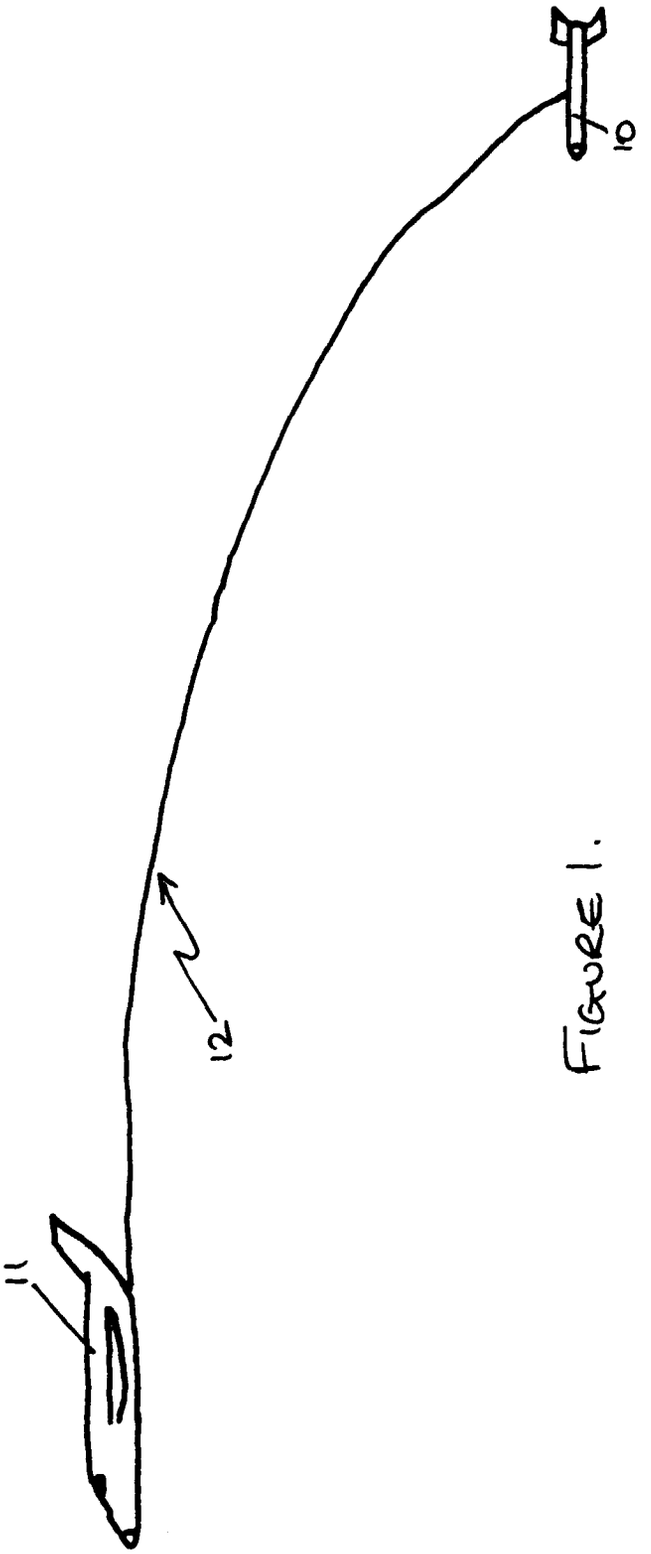

FIGURE 1.

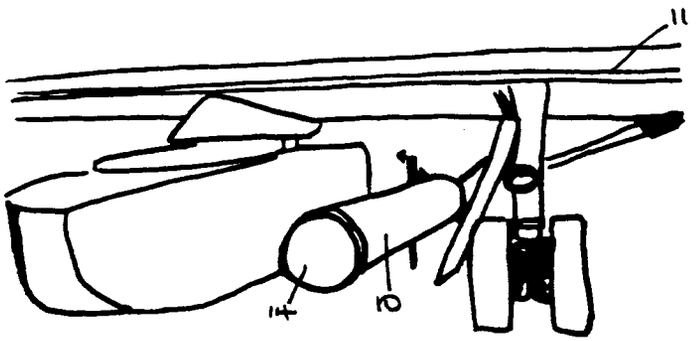

FIGURE 3

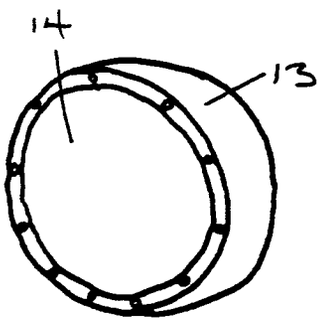

FIGURE 4.

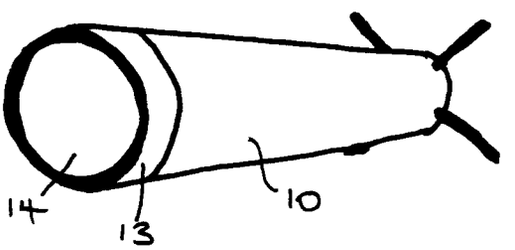

FIGURE 2