

[54] **INFRARED GATED RADIO FUZING SYSTEM**
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[73] Assignee: **The United States of America as
represented by the Secretary of the
Navy, Washington, D.C.**
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[58] Field of Search **343/6 ND, 13 SA;
102/70.2 P, 7 PF**

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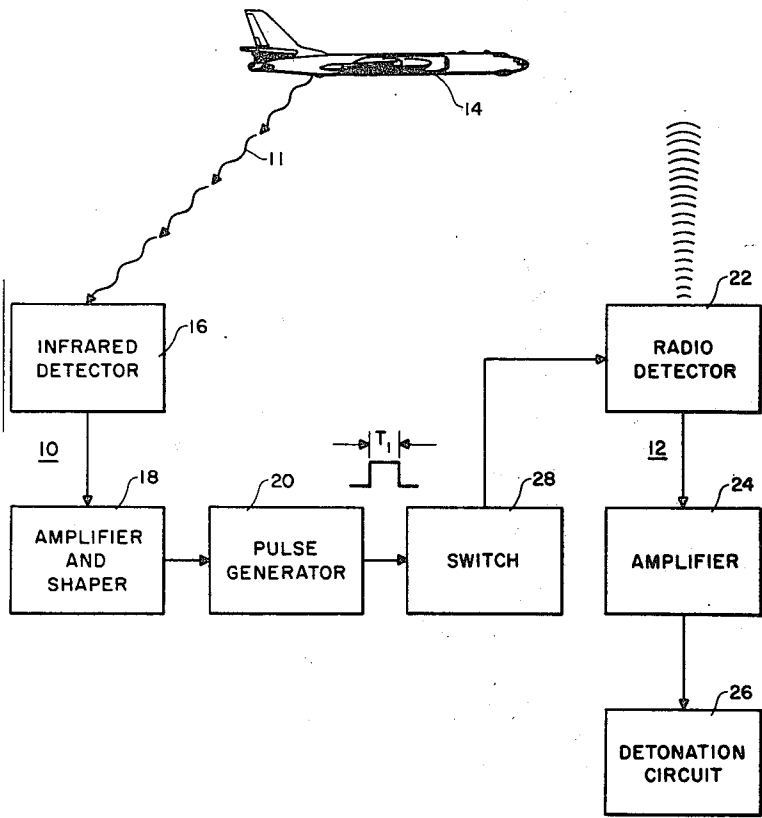
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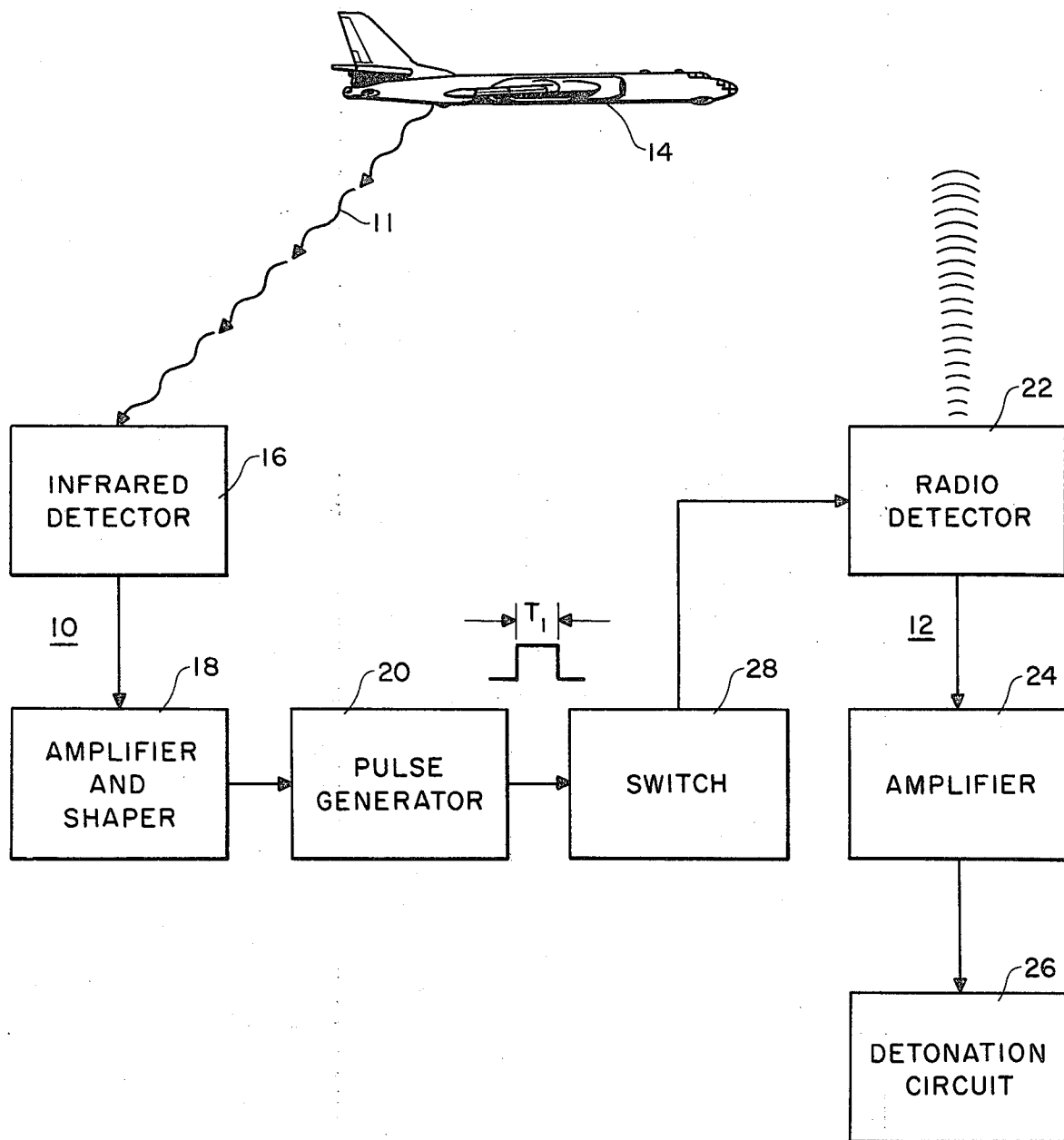
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1. In an infrared gated radio fuzing system for use in a guided missile the combination comprising:
- a. first thermal-energy detecting means for producing an output signal in response to intercepted thermal-energy radiated from a thermal-energy radiating object,
 - b. second circuit means for detecting radio energy reflected from said thermal-energy radiating object,
 - c. pulse generator means coupled to said thermal-energy detecting means for generating an output pulse having a time duration approximately equal to the time required for the missile to traverse a distance of half the length of the radiating object,
 - d. switching means coupled to said pulse generator means and to said second circuit means and being responsive to said output pulse for activating said second circuit means and being responsive to the cessation of said pulse for de-activating said second circuit means,
 - e. third circuit means responsive to an output signal from said second circuit means in the event a desired target is detected during said predetermined time interval for actuating a detonation circuit.

2 Claims, 1 Drawing Figure

EXEMPLARY CLAIM





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INFRARED GATED RADIO FUZING SYSTEM

The invention herein described 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 an infrared gated radio fuzing system and more particularly to an infrared gated radio fuzing system which will minimize the probability of premature fuze detonation or fuze deactivation (dudding) because of the influence of undesired signals.

The primary objective of a fuzing system is to effect detonation of a warhead at the proper time to inflict maximum damage to the target. To insure the achievement of this objective, unrelated (to the target) signals must be prevented from triggering the firing circuit and causing premature detonation as in some cases deactivation (dudding). These undesired signals may originate internally because of microphony or other circuit defects; or they may be caused by external influences such as false targets or enemy countermeasure action.

In all known systems using active, passive, semi-active channels or any combination of these, the overall system is susceptible to interference from internal and external disturbances such as microphony, shock and vibration, extraneous radiation within the system pass band, and enemy countermeasure action specifically designed to deactivate or prematurely detonate the warhead. Any of these disturbances can modify or negate the overall operation of the fuzing system and prevent it from responding to the desired signals from the missile target.

In the specific cases of those fuzing systems using active or semi-active channels, the energy radiation from or incident to these channels is susceptible to enemy detection at all times. This "beacon" effect enables the enemy to take appropriate countermeasures action against missile guidance and/or fuzing.

Accordingly an object of the present invention is the provision of a fuzing system which reduces to a minimum the probability or premature fuze detonation or fuze deactivation because of the influence of undesired signals.

Another object is to provide a fuzing system which reduces to a minimum the probability of premature fuze detonation or fuze deactivation because of the influence of active or enemy countermeasures, external disturbances from sources other than the desired target and internal disturbances from microphonics of circuitry and associated components or other undesired internal signals.

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 there is shown in the single FIGURE a block diagram of the preferred embodiment of the invention.

Referring to the FIGURE there is shown an infrared channel 10 and a radio channel 12. Channel 10 is passive and responds to energy radiated from target 14 represented by line 11 in the infrared range. Channel 12 is an active channel but is inoperative until turned on by a suitable signal from channel 10. Channel 10 includes a detector 16 for detecting infrared energy received from a target, an amplifier 18 for amplifying and

shaping the detected signal and a pulse generator 20 for generating a pulse in response to the detected signal. Channel 12 includes a radio transmitter and detector 22 for transmitting and detecting radio energy, an amplifier 24 for amplifying the detected signals, and a detonation circuit 26 for activating the warhead fuze. Switch 28 is coupled between pulse generator 20 of channel 10 and radio transmitter and detector 22 of channel 12 for activating channel 12 when the appropriate pulse is received from pulse generator 20.

In operation, the optical portion of detector 16 should be arranged to detect target radiation at a "look forward angle" of about 45°. The "look angle" being so restricted that the radiation is detected in the interval slightly prior to the actual missile target intercept. Energy radiation from target 14 is detected and converted by detector 16 into a voltage pulse which is amplified and shaped in amplifier 18 which may be of any well known type to a waveshape suitable to trigger pulse generator 20. When triggered, pulse generator 20 which may be a monostable multivibrator similar to circuit 15 and page 12 of "Military Standard Circuits" (Mil-STD-439A(WEP), Government Printing Office, produces a pulse of a duration, T_1 , approximately equal to the time required for the missile to cover a distance of half the length of the shortest target expected to be encountered. The pulse from generator 20 actuates switch 28 which activates channel 12 for the duration, T_1 . Switch 28 may be any of the switching circuits shown in FIG. 6-0.2 on Page 6-50 of "A Handbook of Selected Semiconductor Circuits"; NAVSHIPS 93484, Department of the Navy. Switch 28 may turn on a power supply or remove a blocking bias which energizes transmitter and detector 22. Radio channel 12 will transmit and receive for the time, T_1 . The time for a radio wave to travel from the transmitter of channel 12 to a target and return is short as compared with the time, T_1 . Should a signal reflected from target 14 have the characteristics of a desired target, amplifier 24 passes and amplifies this signal to provide an input to detonation circuit 26 which detonates the warhead at a suitable point to kill the desired target. Transmitter and detector 22, amplifier 24 and detonation circuit 26 may be designed to discriminate against unwanted signals in any well known radio fuzing techniques. In its simplest form this could be the system used in the original proximity fuze shown and described in "Radio Proximity Fuze Development" by W. S. Hinman and Clelio Brunetti, Proceedings Institute of Radio Engineers, 1946. Should detector 16 receive radiation from a false target or should channel 10 be actuated by internal noise or malfunction, in the absence of a target which channel 12 will recognize as a desired target, no detonation signal will be produced. At the end of pulse T_1 , channel 12 is turned off and the system reverts to the original state of passive operation with only channel 10 operating.

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.

What is claimed is:

1. In an infrared gated radio fuzing system for use in a guided missile the combination comprising:
 - a. first thermal-energy detecting means for producing an output signal in response to intercepted ther-

3

- mal-energy radiated from a thermal-energy radiating object,
- b. second circuit means for detecting radio energy reflected from said thermal-energy radiating object,
- c. pulse generator means coupled to said thermal-energy detecting means for generating an output pulse having a time duration approximately equal to the time required for the missile to traverse a distance of half the length of the radiating object,
- d. switching means coupled to said pulse generator means and to said second circuit means and being responsive to said output pulse for activating said

4

- second circuit means and being responsive to the cessation of said pulse for de-activating said second circuit means,
- e. third circuit means responsive to an output signal from said second circuit means in the event a desired target is detected during said predetermined time interval for actuating a detonation circuit.
2. The system of claim 1 wherein said first circuit means includes an infrared optical detector oriented so that it has a "look" angle of 45° with respect to the object to be detected.

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