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(54) Method of terrain reconnaissance by means of a mortar bomb

(57) A method for terrain reconnaissance by means of a mortar bomb, consisting in that the mortar bomb with an observation unit being comprised of a camera (K), a parachute and a transmitter (N) is fired toward a terrain subject to a reconnaissance, where the observation unit, after a specific time, is separated from the shell of the mortar bomb and monitors the terrain simultaneously sending a signal from the camera (K) by radio, infrared or other radiation to a receiver (O) situated at a command post, where signals received from the camera (K) are displayed on a computer display unit (E) after being converted into the digital format, wherein a deviation value of a specified axis of the observation unit from the north-south direction N-S is detected in the observation unit for a single image by means of a magnetometer (M) or a satellite navigation system GPS, said consecutive deviation values being converted into a N-S deviation signal, sent synchronically with the signal from the camera (K) to the receiver (O), in which the position cf each consecutive image on the display unit (E) is corrected by its corresponding value of the deviation from the N-S direction by means of a known image rotation algorithm.

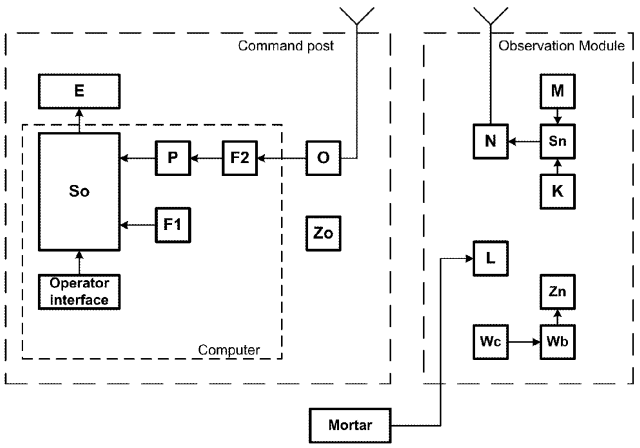

Fig.1

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Description

[0001] The object of the invention is a method of terrain reconnaissance by means of a mortar bomb.

[0002] Methods of terrain reconnaissance are known for example from patent specification US 3,962,537. These methods consist in that a mortar bomb, equipped with an observation unit with a camera, a parachute, and a transmitter, is fired toward a terrain subject to a reconnaissance. When the missile is positioned above such terrain, the observation unit is disconnected from the shell of the missile in order to monitor the terrain by means of the camera falling down slowly with the parachute, simultaneously transmitting images of the terrain by means of radio, infrared or other radiation, to a receiver installed at a command post, where the received signals are suitably processed, registered or displayed directly on a display unit of a computer. However, the observation unit does not fall down steadily. The vertical fall trajectory is deviated by the wind, which creates crosswise image oscillations. However, the fact that the falling unit rotates is very disadvantageous as the picture seen on the display unit rotates as well. Any attempts to eliminate the rotation of the observation unit would result in an excessive enlargement of the observation unit and the missile itself. According to patent specification W02004 057263, the observation unit is not separated from the missile, but the missile trajectory is mechanically stabilized in such a way that the photographed terrain is always in view of the camera.

[0003] The object of the invention is to create a method eliminating the rotation of the image displayed on the display unit.

[0004] The essence of the method consisting in firing a mortar bomb, equipped with an observation unit comprised of a camera, a parachute, and a transmitter, toward a terrain subject to a reconnaissance, where after a specified time the observation unit is separated from the shell of the missile and monitors the terrain, simultaneously sending a signal from the camera by means of radio, infrared or other radiation to a receiver situated at a command post where signals received from the camera are displayed on a computer display unit after being converted into the digital format, lies in that a deviation value of a determined axis of the observation unit from the north-south direction N-S is detected in the observation unit for a single image by means of a magnetometer or a satellite navigation system GPS, said consecutive deviation values being converted into a N-S deviation signal sent synchronically with a signal from the camera to the receiver, in which a position of each consecutive image on the display unit is corrected by its corresponding value of the deviation from the N-S direction by means of a known image rotation algorithm.

[0005] As a result, an image on the display unit of a computer does not rotate in spite of the rotation of the observatory unit.

[0006] An embodiment of this invention is shown in the drawing which depicts a block diagram of an electronic circuit by means of which the method according to the invention is realized.

[0007] A shell of a mortar bomb comprises an observation unit provided with a TV camera K, a parachute, a radio transmitter N, a magnetometer M, a disrupting charge 上 together with its fuse, a supply unit Zn for an observing unit with an inertial power-on switch Wb, with a time-lag cut-out switch W_C for switching off the supply unit Zn, as well as with a controller Sn. The missile is fired by means of a mortar. Before dropping the missile into the tube, a delay time is set for the disrupting charge 上 in the observation unit. The observation unit in the fired missile is fed with a supply voltage by means of the inertial power-on switch Wb, and after the determined delay time the disrupting charge is initiated, the parachute is opened, and the observation unit slowly falls down. During the falling stage, the camera K generates a video signal corresponding to the observed terrain being in its view. At the same time, the values of a momentary deviation of the observation unit from the north direction are detected, and information concerning these deviation values is encoded in a sound channel of a TV signal, said signal being transmitted by the radio transmitter N to a command post. After receiving this signal by means of the receiver 0 at the command post, single images are separated from film frames, and a position of each of the consecutive images on the screen is corrected, by means of a known picture rotation algorithm, by its value of the deviation from the N-S direction. Thus obtained images are simultaneously registered in memory P for future analysis, if required. Separate frames are converted in the functor F2 of the algorithm into separate appropriately positioned images. When watching an image on the screen E, one may also use the functor F1 in order to magnify the image and to change its central point's position in relation to the centre of the screen of the display unit E.

Reference numerals

[0008]

- K - camera
- E - display unit
- F1 - functor in the algorithm enlarging an image and moving its central point
- F2 - functor in the algorithm converting frames into images
- L - disrupting charge with its fuse
- M - magnetometer

N - transmitter

O - receiver

P - memory

Sn - controller of a receiver

So - controller of a transmitter

Wb - inertial power-on switch

Wc - time-lag cut-out switch

Zn - transmitter supply unit

Zo - receiver supply unit

Claims

1. A method for terrain reconnaissance by means of a mortar bomb, consisting in that a mortar bomb is fired toward a terrain subject to a reconnaissance, said missile being comprised of a camera, a parachute and a transmitter, where an observation unit, after a specified time, is separated from the shell of the missile and monitors the terrain simultaneously sending a signal from the camera by radio, infrared or other radiation to a receiver situated at a command post, where signals received from the camera are displayed on a computer display unit after being converted into the digital format, **characterized in that** a deviation value of a specified axis of the observation unit from the north-south direction N-S is detected in the observation unit for a single image by means of a magnetometer M or a satellite navigation system GPS, said consecutive deviation values being converted into a N-S deviation signal, sent synchronically with a signal from the camera K to the receiver Q, in which a position of each consecutive image on the display unit E is corrected by its corresponding value of the deviation from the N-S direction by means of a known image rotation algorithm.

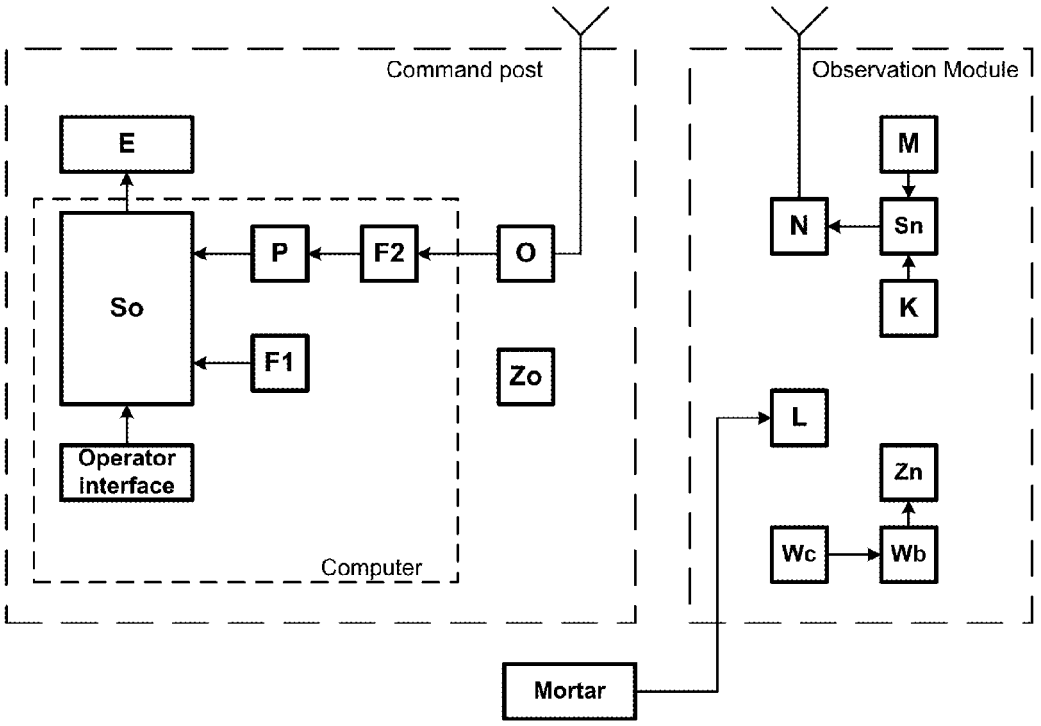
Command post
Observation Module
E
So
P
F2
O
F1
Zo
Operator interface
Computer
M
N
Sn
K
L
Zn
Wc
Wb
Mortar

Fig.1

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EUROPEAN SEARCH REPORT

Application Number
EP 10 18 5325

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	US 3 962 537 A (KEARNS THOMAS M ET AL) 8 June 1976 (1976-06-08) * column 2, paragraph 18 - column 4, paragraph 13 * -----	1	INV. F42B12/36
A	US 7 283 156 B1 (MORGAN SCOTT E [US]) 16 October 2007 (2007-10-16) * column 8, lines 1-7 * -----	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			F41G F42B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 November 2010	Messelken, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons
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& : member of the same patent family, corresponding document

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 18 5325

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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30-11-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3962537 A	08-06-1976	NONE	
US 7283156 B1	16-10-2007	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 3962537 A **[0002]**
- WO 2004057263 A **[0002]**