June 2, 1970 S. L. MIN 3,515,067

IMPACT RESPONSIVE PROXIMITY INITIATOR

Filed July 19, 1968

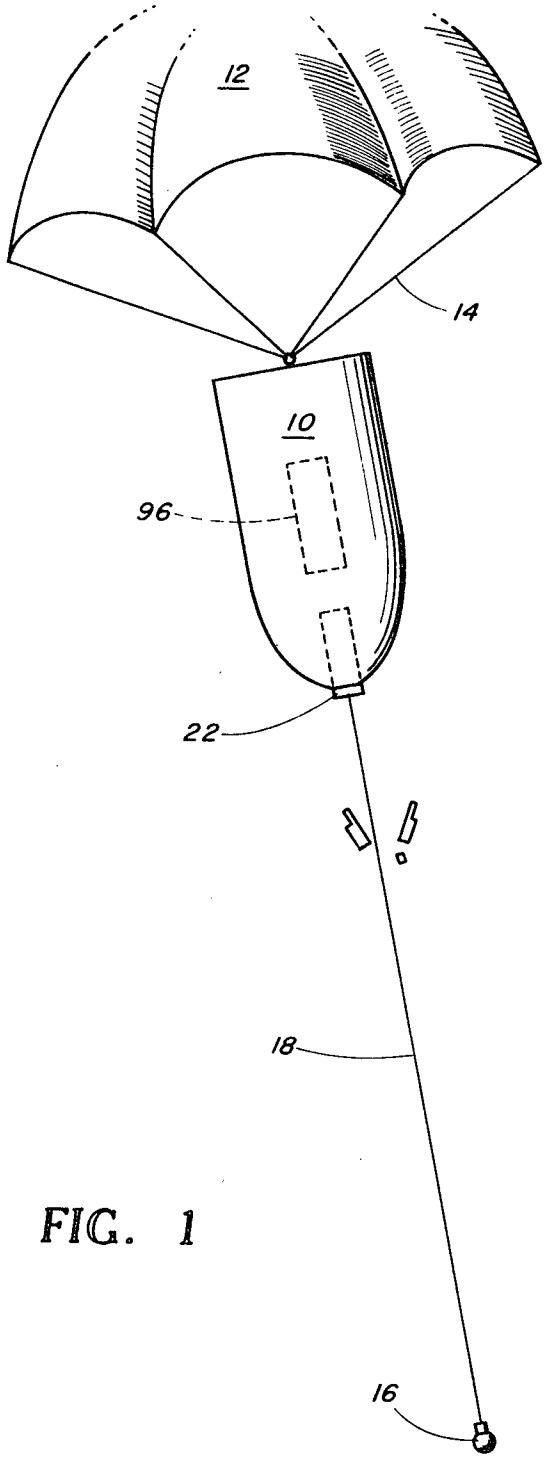


FIG. 1

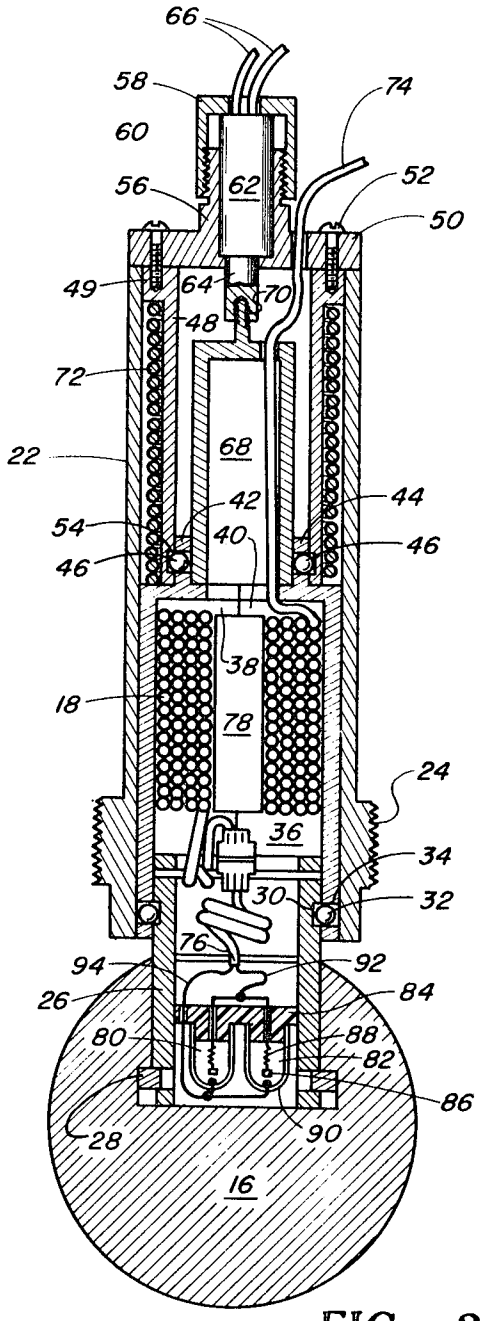
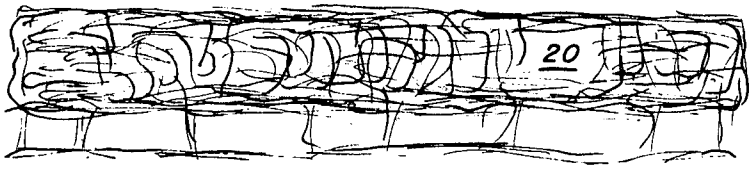


FIG. 2



INVENTOR
Shermin L. Min
J. O. Tresansky
BY ATTORNEY
Stanley P. Fisher
AGENT

United States Patent Office

3,515,067

Patented June 2, 1970

3,515,067

IMPACT RESPONSIVE PROXIMITY INITIATOR

Sherman L. Min, Washington, D.C., assignor to the United States of America as represented by the Secretary of the Navy

Filed July 19, 1968, Ser. No. 746,143
Int. Cl. F42c 1/14
U.S. Cl. 102—7.4 7 Claims

ABSTRACT OF THE DISCLOSURE

An impact responsive proximity initiator for an aerial bomb having a pair of trembler switches contained within an impact sphere, an electrical cable connecting the switches to a component within the bomb, and a ball-lock mechanism for securing the impact sphere to the bomb until a signal from the bomb releases the ball-lock mechanism to allow the impact sphere to eject from the bomb such that the sphere will precede the bomb during flight and upon impact will send an electrical signal back to the bomb to effect stand-off detonation.

BACKGROUND OF THE INVENTION

This invention relates generally to impact responsive proximity sensing devices, and more particularly to an impact responsive proximity initiator for an aerial ordnance device.

There are many diverse types of targets which are subjected to aerial bombings. The diverse characteristics of each type of target necessitates the design of different types of aerial bombs to be utilized for deployment against each type of target. A conventional bomb may be designed with either the capability to penetrate the target prior to detonation, to detonate on impact with the target, or to detonate at a stand-off distance above the target prior to impact. Aerial bombs which detonate at a stand-off distance above a target are highly desirable for maximum effectiveness when the target area is relatively large. Prior art devices utilizing an electromagnetic wave or infrared energy source to detect the target at a predetermined distance have been highly effective for detonating bombs above the target at a stand-off distance when utilized against targets which are exposed and not covered with a large growth of trees and heavy foliage. However, in jungle-type warfare with the target areas covered with trees and heavy foliage, radio wave and infrared light source sensing devices are relatively ineffective because such sensing signals are incapable of penetrating the tall dense foliage.

SUMMARY OF THE INVENTION

Accordingly, one object of this invention is to provide a new and improved sensing device which upon impact with an object will actuate a descending device in spaced relationship to the impacted object.

Another object of the invention is the provision of a new and improved impact responsive proximity actuator for an aerial device which is capable of operating effectively upon deployment on a target covered with heavy foliage.

Still another object of the present invention is to provide a new and improved impact responsive proximity sensor which will initiate explosion of an aerial ordnance device within a lethal range above a target.

Briefly, in accordance with one embodiment of this invention, these and other objects are achieved by providing in an aerial device an impact responsive proximity initiator having a housing secured to the aerial device with mechanism releasably affixed therein for securing an impact sensor to the aerial device until release of the mechanism in response to a signal from the aerial device whereby the impact sensor falls free ahead of the aerial device, and electrical communication between the sensor and the aerial device.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention and many of the attendant advantages thereof 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 pictorial view of the impact responsive proximity initiator of the present invention in operation after it has been ejected from the aerial bomb; and

FIG. 2 is a longitudinal sectional view of the present invention in the assembled condition prior to ejection from the aerial bomb.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings wherein like reference characters designate identical or corresponding parts throughout the several views, and more particularly to FIG. 1 thereof wherein an aerial device such as bomb **10** is shown in descending flight with a parachute **12** attached thereto by means of tie lines **14** to retard the rate of descent of the bomb **10**. A spherically shaped impact sensor **16** is illustrated as preceding the bomb **10** during descending flight, and is attached thereto by means of an electrical cable **18** for providing communication between the sensing device **16** and bomb **10**. When the bomb **10** is deployed against a target covered by heavy foliage **20**, the sensor **16** will penetrate the foliage and upon impact with the target sends an electrical signal through cable **18** to the bomb **10** such that the bomb will detonate above the ground at a stand-off distance for maximum effectiveness.

As shown in FIG. 2, the sensor **16** is secured within a cylindrical housing **22** which is provided with external screw thread **24** for threadingly engaging the forward portion of bomb **10**. A cylindrically shaped member **26** is held within a cavity defined in sensing member **16** by conventional securing means such as snap ring **28**, and has a portion thereof extending outwardly of the sensing member **16** with a circumferential groove **30** defined in the outer surface for engagement with a conventional ball-lock device. The ball-lock device consists of a pair of steel balls **32** each contained within an aperture **34** defined in opposite halves of a releasable securing or retaining device **36** constructed of a pair of generally semi-cylindrical members **38** and **40** which, in the assembled condition shown, forms a cylindrical hollow member. On one end of each of members **38** and **40** are formed a pair of semi-cylindrical extensions **42** and **44**, respectively, each having an aperture extending therethrough with a ball-lock mechanism **46** positioned therein. A tubular sleeve **48** having an enlarged portion **49** is secured to a rear disc-shaped cover plate **50** by conventional securing means such as screws **52**. A circumferential groove **54** is formed on the inner surface of sleeve **48** for engaging balls **46** and thus locking securing member **36** within the housing. A forwardly extending tubular portion **56** is integrally formed on cover plate **50** with a cap member **58** threadingly engaged therewith as shown at **60**. A conventional axial actuating device **62** is housed within the hollow portion of tubular extension **56** which is capable of effecting unidirectional longitudinal movement of a piston **64** which extends from the forward portion thereof into the housing **22**. The device **62** may either be a solenoid or an explosive piston capable of withdrawing piston **64** into the body thereof in response

to an electrical signal. A cylindrical cup shaped tubular member **68** is secured to the forward portion of piston **64** by conventional means such as screw threads **70**, and when in the position shown the outer surface of cup member **68** engages balls **46** to lock the securing device **36** against member **48**. One end **74** of cable **18** is electrically connected to a device within bomb **10** such as an explosive detonator (not shown), the other end **76** thereof is electrically connected to the impact sensor **16**. The body of the cable is coiled within securing device **36** about a core **78**. Although the invention is not so limited, it is contemplated that in the preferred embodiment the length of cable **18** when in the fully extended position shown in FIG. 1 will be thirty feet, thus fixing the maximum stand-off distance at which bomb **10** will detonate.

During the initial stage of descent of bomb **10** an electrical signal supplied by a conventional device such as a fuze within the bomb (not shown) is applied through across cables **66** to operate device **62** of the impact responsive proximity initiator carried by the bomb thus pulling piston **64** within device **62**. Upon such movement of piston **64** cup shaped member **68** will disengage balls **46** such that they may move radially inwardly thereby releasing securing member **36** from sleeve **48**. Biasing means such as spring **72** urging against enlarged sleeve portion **49** will then eject securing member **36** from housing **22**. As the securing device **36** begins to exit housing **22**, balls **32** will be released so as to move radially outwardly thus releasing impact sensing device **16** from the securing member. As sensing member **16** falls away from bomb **10** the cable **18** will be uncoiled and extended to its full length.

Impact sensor **16** houses a pair of conventional trembler switches **80** and **82** mounted on an insulated base **84**. Each of the switches has a small weight **86** mounted on a spring **88** and surrounded by a metal hemispheroidal shaped cap **90**. The end **76** of cable **18** is divided into two conductors **92** and **94**, one of which is connected to springs **88**, and the other of which is connected to metal caps **90**. As impact sensor **16** passes through the foliage and strikes the target, weights **86** will be deflected toward caps **90** thus completing an electrical path between conductors **92** and **94** which will be communicated through cable **18** into bomb **10** to initiate the explosive train **96** thereof.

Obviously, numerous modifications and variations of the present invention are possible in the light of the above teachings. Therefore it will be understood that within the scope of the appended claims the invention may be practiced otherwise than specifically described herein.

What is claimed new and desired to be secured by Letters Patent of the United States is:

1. An impact responsive proximity initiator for an aerial device, comprising:
- impact sensing means,
- a housing secured to said aerial device,
- a pair of generally semicylindrical members forming a hollow cylinder when in said housing and capable of separation when ejected therefrom for releasably securing said impact sensing means to said aerial device,
- means releasably attaching said semicylindrical members to said housing,
- means responsive to a signal from said aerial device for releasing said pair of semicylindrical members from said housing,
- biasing means for ejecting said semicylindrical members from said housing at a particular time, and
- means for effecting signal communication between said impact sensing means and said aerial device.

2. The initiator of claim **1** wherein said releasable securing means includes a first ball-lock device for securing said sensing means to said aerial device and a second ball-locked device for releaseably affixing said securing means within said housing.

3. The initiator of claim **1** wherein said signal communication means includes an electrical cable coiled within said hollow cylinder prior to release of said securing means electrically interconnecting said sensing means and said aerial device.

4. The initiator of claim **1** wherein said means for sensing impact is a spherical housing having a trembler switch therein.

5. The initiator of claim **1** wherein said signal responsive releasing means comprises a cylindrical member disposed coaxially and partially telescoping with said semicylindrical members, and
- further comprises an axial actuating device connected to said cylindrical member and responsive to said signal from said aerial device; and
- said releasable securing means having a ball lock device cooperating between and releasably locking together said semicylindrical members and said aerial device, said ball lock device being held in locking position by said cylindrical member;
- whereby said signal from said aerial device actuates said axial actuating device which axially displaces said cylindrical member from said locking position, thereby unlocking said semicylindrical member from said aerial device,

6. The initiator of claim **5** wherein:
- said cylindrical member has an outside dimension substantially the same as the inside dimension of the portion of said hollow cylinder into which said cylindrical member is telescopically disposed, and
- said biasing means comprises a coil spring compressed within said housing and bearing against said semicylindrical members.

7. An impact responsive proximity actuator for an aerial device comprising:
- impact responsive means for signaling to said aerial device the occurrence of an impact,
- ejectable means releasably disposed within said aerial device for initially retaining said impact responsive means within said aerial device and for effecting release of said impact responsive means forwardly of said aerial device during aerial descent upon ejection thereof,
- a releasable ball lock device for releasably securing said ejectable means to said aerial device,
- means for ejecting said ejectable means from said aerial device comprising a normally compressed coil spring bearing against said ejejctable means,
- releasing means for unlocking said ball lock device to permit said ejecting means to eject said ejectable means; and
- means physically interconnecting said impact responsive means and said aerial device for effecting a predetermined spatial separation between said impact responsive means and said aerial device and transmitting the signal originating from said impact responsive means subsequent to the impact thereof.

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SAMUEL W. ENGLE, Primary Examiner

U.S. Cl. X.R.

102—35.6, 37.6