Jan. 13, 1970 E. O. UHRIG ET AL 3,489,107

# MECHANICAL SELF-DESTRUCT EXPLOSIVE DEVICE

Filed Dec. 31, 1968 2 Sheets-Sheet 1

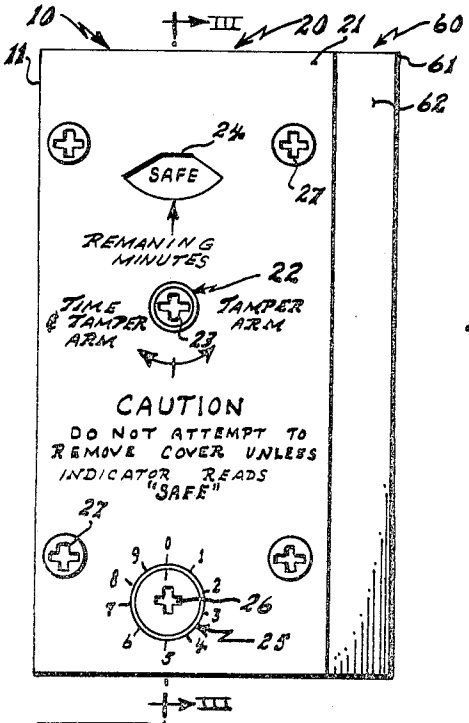


FIG. 1

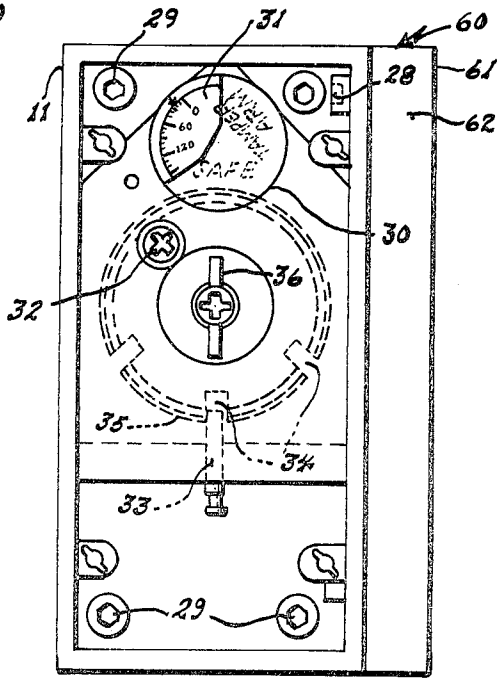


FIG. 2

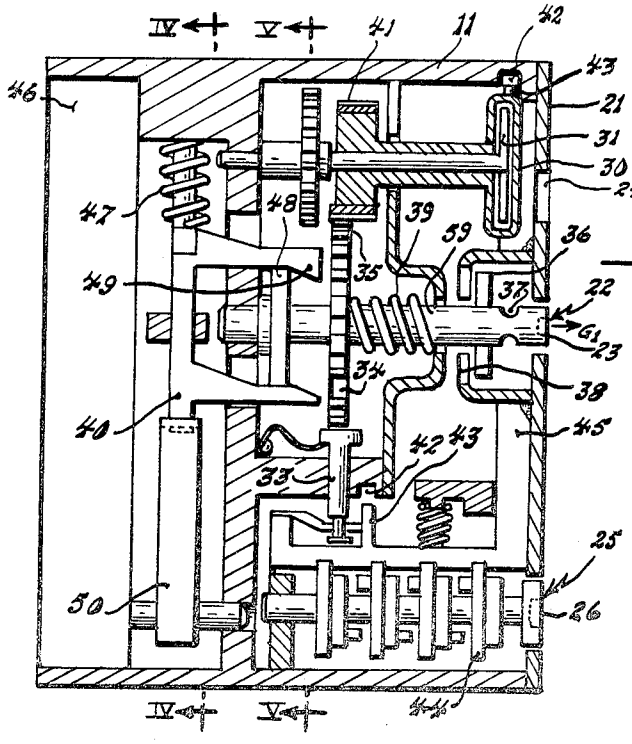


FIG. 3

EDWARD O. UHRIG
JAMES C. HIESTER
BY Harry A. Herbert, Jr. and Arden Jackman
ATTORNEYS

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MECHANICAL SELF-DESTRUCT EXPLOSIVE DEVICE

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FIG. 4

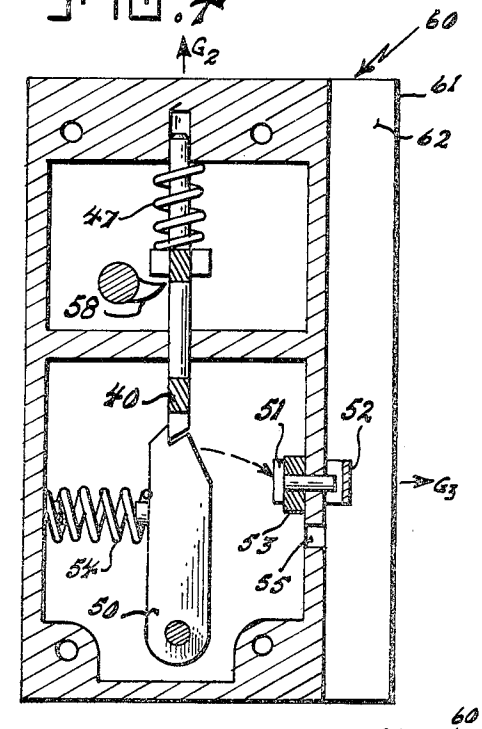
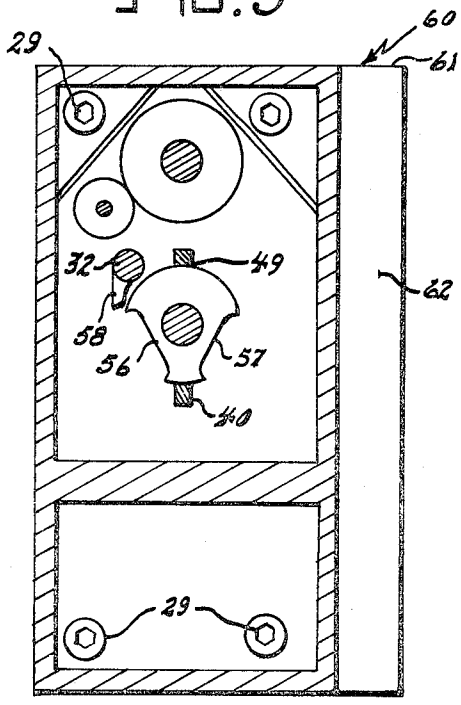



FIG. 5



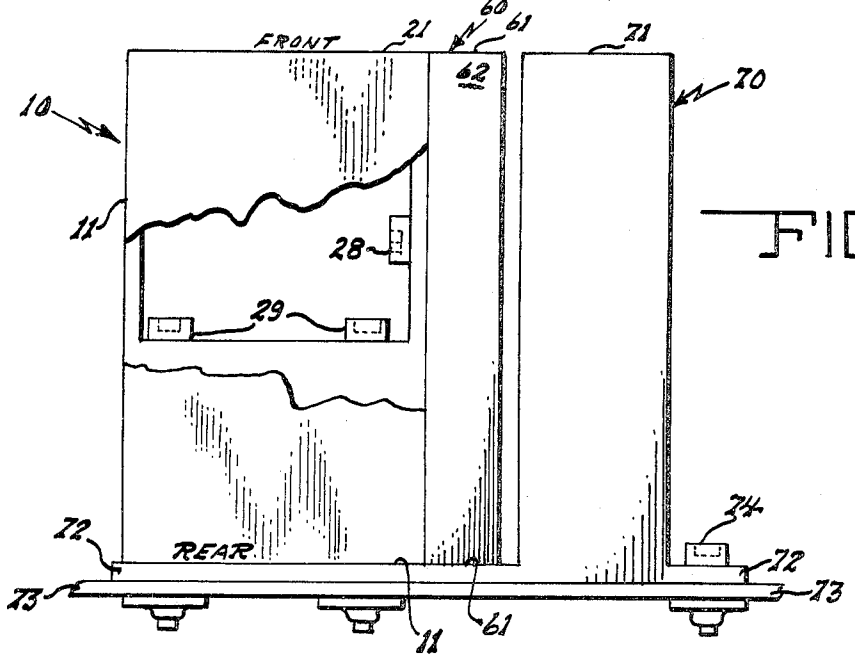




FIG. 6

INVENTORS.
EDWARD O. UHRIG
JAMES C. HIESTER
BY Harry A. Herbert Jr
Arden Tashdjian
ATTORNEYS.

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3,489,107

# MECHANICAL SELF-DESTRUCT EXPLOSIVE DEVICE

Edward O. Uhrig, Ellicott City, and James C. Hiester, Baltimore, Md., assignors, by mesne assignments, to the United States of America as represented by the Secretary of the Air Force

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U.S. Cl. 109—36 5 Claims

## ABSTRACT OF THE DISCLOSURE

A mechanical self-destruct explosive device. This device will self-destruct, and also will destroy the package to be protected which is affixed to it, as the result of the occurrence of any of the following contingencies: lapse of a preselected length of time; tampering with the device; and exceeding a force of predetermined magnitude acting along any one of three mutually perpendicular axes of the device. The device includes an initiator package and a pyrotechnic charge package.

## BACKGROUND OF THE INVENTION

This invention relates to a mechanical self-destruct explosive device and, more particularly, to a device which will become active and will self-destruct and, thereby, will destroy an affixed protected package upon the happening of any one of the following contingencies: lapse of a preselected length of time; tampering with the device; and exceeding a force of predetermined magnitude acting along any one of three mutually perpendicular axes of the device.

In the prior art there are numerous devices which employ explosives for destroying, when necessary, a package which is to be protected by said devices. In this connection, it is pertinent here to state that the terms "protected package," "sensitive package," or the like, are intended to mean and to include, when used herein, anything which is to be protected, and, if necessary, is to be damaged or destroyed, by a destruct-type device which is affixed, attached, or otherwise linked, directly or remotely, to said "protected package." An example of such a "protected package," or "sensitive package" is electronic countermeasures equipment package aboard military aircraft.

As has been previously implied, there are available presently a number of explosive-type self-destruct protective devices which will provide the protection, and cause the destruction, of a sensitive package. Unfortunately, such devices provide protection and cause destruction only under very limited conditions. For example, these devices may require manual initiation. In the case of military aircraft, these devices may require, alternatively, seat ejection. On the other hand, these conventional devices may be made to provide automatic initiation in the event of a hard crash or of a fire. However, there is no known explosive-type device which will activate and will self-destruct and, thereby, will cause the destruction of a sensitive package aboard a military aircraft, if the crew members are unable to activate the self-destruct device and a non-destructive landing (i.e., no hard crash, no fire) is made.

The critical need for a self-destruct device which will self-initiate can only be appreciated when one envisions a highly sophisticated military aircraft carrying a sensitive package aboard, flying over hostile or enemy territory, with the crew members dead or injured (by wounds or otherwise) and, therefore, unable to initiate the activation, directly or indirectly, of the self-destruct device.



Under these circumstances, presently available explosive self-destruct devices initiate or activate only if there is either a hard crash or a fire. It is well known that military aircraft in the circumstances described above have landed without either a hard crash or a fire occurring. Such a non-destructive landing may result in the loss of the sensitive package to unauthorized persons and, if the loss is to a potential enemy or, in fact, to an enemy, the national security of the United States may be jeopardized.

If our invention had been protecting the sensitive package aboard the aircraft in the above-mentioned circumstances, the sensitive package would have been destroyed, irrespective of the incapacity of the crew members and irrespective of the non-destructive landing.

Therefore, our device fulfills a highly critical need in the art and, thereby, advances the state-of-the-art.

In addition, prior art devices are costly, are complex and difficult to manufacture, and require electrical power to energize sensitive electrical circuit components. Our invention eliminates these distinct disadvantages and, therefore, further advances the state-of-the-art.

Although reference has been made to the use of our invention in connection with protecting a sensitive package aboard a military aircraft, it is to be noted that such reference is by way of illustration only, and not by way of limitation. Obviously, our invention may be used whenever and wherever a sensitive package is to be protected.

## SUMMARY OF THE INVENTION

This invention relates to a mechanical self-destruct explosive device, especially well-suited for use in protecting, and if necessary, destroying sensitive packages, such as electronic countermeasures apparatuses used aboard military aircraft.

An object of this invention is to provide a self-destruct explosive device which is highly reliable, but simple to operate, and economical to manufacture.

Another object of this invention is to provide a self-destruct explosive device which will not require manual initiation, or a hard crash, or a fire to initiate.

Still another object of this invention is to allow self-initiation of a self-destruct explosive device upon the occurrence of any one or more of the following contingencies: lapse of a preselected length of time; tampering with the device; and exceeding a force of predetermined magnitude acting along any one of three mutually perpendicular axes of the device.

A further object of this invention is to provide a self-destruct explosive device which is wholly mechnaical in operation and does not require any electrical power.

These, and still other, objects of this invention will become readily apparent after a consideration of the description of the invention and reference to the drawings.

## DESCRIPTION OF THE DRAWING

FIGURE 1 is a front elevation view of a preferred embodiment of the invention;

FIGURE 2 is a front elevation view of the preferred embodiment shown in FIGURE 1, but with the front plate assembly removed;

FIGURE 3 is a side elevation view of the preferred embodiment, in cross-section, taken along line III—III of FIGURE 1;

FIGURE 4 is a cross-sectional view of the preferred embodiment, taken along line IV—IV of FIGURE 3;

FIGURE 5 is a cross-sectional view of the preferred embodiment, taken along line V—V of FIGURE 3; and

FIGURE 6 is a plan view in schematic form of the preferred embodiment, partly fragmented, and of the sensitive package, showing their relative positioning and one

means of affixing the embodiment to the sensitive package.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to FIGURE 1, the preferred embodiment includes initiator package **10** with housing **11** and pyrotechnic charge package **60** with housing **61** and, therein, pyrotechnic charge **62**.

The embodiment has a front cover plate assembly **20** with removable cover **21**, a mode selector switch subassembly **22** with switch **23**, a window **24**, a combination lock subassembly **25** with dial **26**, and cover plate fasteners **27**.

Cover **21** has openings (i.e., window **24**, an opening for switch **23**, and an opening for dial **26**) and has marked, or preferably engraved, on it legends, numerals, directional arrows, and the like, as shown in FIGURE 1. Three modes are selectable by use of switch **23**. These modes are designated, as a matter of preference as: "Safe"; "Time and Tamper Arm"; and "Tamper Arm." The mode selected appears in window **24**. Combination lock subassembly **25** is a three-position, resettable combination lock which seals mode switch **23** and cover plate assembly **20** in place. Cover plate fasteners **27**, in conjunction with lock subassembly **25** with dial **26**, secures cover **21** to housing **11**.

With reference to FIGURE 2, mounting bolts **28** join housing **11** to housing **61**. Mounting bolts **29** join housing **11** to the sensitive package to be protected (not shown). Mounting bolts **28** and **29** can be reached only with cover plate assembly **20** removed.

Still with reference to FIGURE 2, indicator mask **30** exhibits in window **24**, FIGURE 1, the mode selected, in the case of "Safe" or "Tamper Arm." If, however, "Time and Tamper" is selected, a "time to initiate" disk **31** appears in windows **24**, FIGURE 1, with the preselected length of time being set by rotating or turning time setter **32**. When the combination lock **44**, FIGURE 1, is locked, mode locking pin **33**, meshes with notch **34** in mode selector mask drive gear **35**, and provides positive locking of the mode selected. Cover interlock pin **36** prevents removal of cover plate assembly **20**, FIGURE 1, and, more specifically, of cover **21**, FIGURE 1, in any position of mode selector switch **23**, FIGURE 1, except "Safe."

With reference to FIGURE 3, which is a side elevation view of the preferred embodiment, in cross-section, taken along line III—III of FIGURE 1, components shown therein include: cover **21**; housing **11**; subassembly **22** with mode selector switch **23**, shaft **59**, shaft shear section **37** which prevents, by shearing, forcible changes of switch **23**, cover interlock pin **36** which allows removal of cover **21** only when aligned with the opening in cover interlock housing **38** (i.e., when device is unarmed or "Safe"), load spring **39**, mode locking pin **33** which meshes with locking notch **34** of mode selector mask drive gear **35**, and mode selector cam **48**. It is to be noted that cover interlock housing **38** is smaller than, to the rear of, and affixed to cover **21** with the rear of cover **21** serving as the front of housing **38**.

Components which are also shown in FIGURE 3, include: indicator mask **30**; "time to initiate" disk **31**; mask drive gear **41**; cover lock slots **42**; pins **43** which are seated by action of rotatable dial **26** of resettable combination lock **44** of combination lock subassembly **25** and cover lock **45**; spring driven timer mechanism **46**; load spring **47**; triggering cam surface **49**; firing hammer latch **40**; firing hammer **50**; and force $G_1$ of predetermined magnitude with an arrow showing its direction.

With reference to FIGURE 4, which is a cross-sectional view of the preferred embodiment, taken along line IV—IV of FIGURE 3, the components shown therein include: firing hammer latch **40**; load spring **47**; timer pawl **58**, firing hammer **50**; firing pin **51** which detonates firing cap **52**; firing pin cushion **53** which prevents firing cap **52** from detonating, except when firing hammer **50** is trigger by the occurrence of any one of the prescribed contingencies; firing hammer spring **54**; access port **55** which allows firing hammer **50** to be set or reset; and forces $G_2$ and $G_3$ (which are mutually perpendicular and perpendicular to force $G_1$, FIGURE 3) of predetermined magnitude with arrows showing their respective direction.

With reference to FIGURE 5, which is a cross-sectional view of the preferred embodiment, taken along line V—V of FIGURE 3, the components shown therein include: cam surface **56** on mode selector switch subassembly **22**; cam surface **57** on mode selector switch subassembly **22**; triggering cam surface **49**; firing hammer latch **40**; time setter **32**; timer pawl **58**; and mounting bolts **29**.

With reference to FIGURE 6, which is a plan view in schematic form of the preferred embodiment, partly fragmented, and of the sensitive package, showing their relative assembled position and one means of affixing the embodiment to the sensitive package, the components shown there include: initiate package **10** with housing **11**, front cover **21**, and mounting bolts **28** and **29**; pyrotechnic charge package **60** with housing **61** and, therein, pyrotechnic charge **62**; and sensitive package **70** with housing **71** and mounting base **72**. Also shown are independent mounting base **73** and bolts **74**.

## MODE OF OPERATION OF THE PREFERRED EMBODIMENT

The initiator component **10** of our mechanical self-destruct explosive device will actuate, causing the explosion of pyrotechnic package **60**, if any of the following contingencies occur: lapse of the preselected time; tampering with the self-destruct device; and exceeding a force of predetermined magnitude ($G_1$, FIGURE 3; $G_2$ and $G_3$, FIGURE 4) acting along, and in the direction of, any one of three mutually perpendicular axes (i.e., arrows in FIGURES 3 and 4) of the self-destruct device.

In essence, explosion by lapse of preselected time is controlled by, and caused by, spring driven timer mechanism **46**, FIGURE 3, and associated co-operating components; explosion by tampering is controlled by, and caused by, attempting to remove cover **21**, FIGURES 1, 3 and 5, or cover plate subassembly **22**, FIGURES 1 and 3, from housing **11**, FIGURES 1, 3 and 5, or by forwardly moving spring stressed shaft **59**, FIGURE 3, with or without using mode selector switch **23**, FIGURES 1 and 3, with any of such actions or attempts taking place when the self-destruct device is armed; and explosion by exceeding a force of predetermined magnitude is controlled by, and caused by: load spring **39**, FIGURE 3, firing hammer latch **40**, FIGURES 3, 4 and 5, and associated co-operating components as to force $G_1$, FIGURE 3; load spring **47**, FIGURES 3 and 4, and associated co-operating components as to force $G_2$, FIGURE 4; and by firing pin **51**, FIGURE 4, and associated co-operating components as to force $G_3$, FIGURE 4.

More specifically, explosion by lapse of preselected time (i.e., time trigger action) is provided by setting the desired length of time by rotating time setter **32**, FIGURE 2, which, additionally, winds spring driven timer mechanism **46**, FIGURE 3. The remaining "time to initiate" is shown on suitably marked disk **31**, FIGURES 2 and 3, which, linked with timer mechanism **46**, FIGURE 3, rotates uniformly with the lapse of time. When the preselected length of time has elapsed or passed, timer pawl **58**, FIGURES 4 and 5, which is linked with rotatable disk **31**, FIGURES 2 and 3, and spring driven timer mechanism **46**, FIGURE 3, and time setter **32**, FIGURE 2, trips firing hammer latch **40**, FIGURES 3, 4 and 5, by depressing load spring **47**, FIGURES 3 and 4, and permitting compressed firing hammer spring **54**, FIGURE 4, to expand, thereby forcing firing hammer **50**, FIG-

URES 3 and 4, forward, with the result that hammer **50** strikes firing pin **51**, FIGURE 4, detonating firing cap **52**, FIGURE 4, exploding pyrotechnic charge **62**, FIGURES 1 through 5.

Initiation by tampering is provided by the sequential action of co-operating components when the device is in an armed mode and an attempt is made to remove cover **21**, FIGURES 1, 3 and 5, or cover plate subassembly **22**, FIGURES 1 and 3, from housing **11**, FIGURES 1, 3 and 5, or by forwardly moving spring stressed shaft **59**, FIGURE 3, with or without using mode selector switch **23**, FIGURES 1 and 3. When any of these tampering actions take place, shaft **59**, FIGURE 3, is moved forward and, as a result, cam **48**, FIGURE 3, which is perpendicularly affixed to one end of shaft **59**, FIGURE 3, is moved or pulled forward. When this occurs, triggering cam surface **49**, FIGURES 3 and 5, which is slideably in contact with the inner surface of firing hammer latch **40**, FIGURES 3, 4 and 5, moves or trips firing hammer latch **40**, FIGURES 3, 4 and 5, which allows the release of spring stressed firing hammer **50**, FIGURES 3 and 4. Hammer **50** is forced forward by the expansion of compressed spring **54**, FIGURE 4, with the result that hammer **50** strikes firing pin **51**, FIGURE 4, detonates firing cap **52**, FIGURE 4, and thus explodes pyrotechnic charge **62**, FIGURES 1 through 5.

Explosion by exceeding a force of predetermined magnitude along any one of three mutually perpendicular axes of the device is provided by any one of the following: (a) load spring **39**, FIGURE 3, is compressed when a force in excess of $G_1$, FIGURE 3, is applied in the direction of, and along, the axis designated by the arrow in said FIGURE 3, resulting in movement of firing hammer latch **40**, FIGURES 3, 4 and 5, and, after sequential action of cooperating components, explosion of pyrotechnic charge **62**, FIGURES 1 through 5; (b) load spring **47**, FIGURES 3 and 4, is compressed when a force in excess of $G_2$, FIGURE 4, is applied in the direction of, and along, the axis designated by the arrow in said FIGURE 4 (near designation of force $G_2$), resulting in tripping firing hammer latch **40**, FIGURES 3, 4 and 5, permitting compressed firing hammer spring **54**, FIGURE 4, to expand, moving firing hammer **50**, FIGURES 3 and 4, forward, striking firing pin **51**, FIGURE 4, detonating firing cap **52**, FIGURE 4, and exploding pyrotechnic charge **62**, FIGURES 1 and 6; (c) firing pin **51**, FIGURE 4, will move forward and strike detonating firing cap **52**, FIGURE 4, exploding pyrotechnic charge **62**, FIGURES 1 and 6, when a force in exess of force $G_3$, FIGURE 4, is applied in the direction of, and along, the axis designated by the arrow in said FIGURE 4 (near designation of force $G_3$).

If the device is to be used to protect a sensitive package aboard a military aircraft about to become airborne, it is preferred that prior to take-off the device be armed by an authorized person who will not be aboard the aircraft in flight, who knows the operation of the device, and who knows, or is able to set, the combination of resettable combination lock **44**, FIGURE 3, of combination lock subassembly **25**, FIGURES 1 and 3.

Although three modes (i.e., "Safe," "Time and Tamper Arm," and "Tamper Arm") are selectable by rotation of mode selector switch **23**, FIGURES 1 and 3, it is assumed, in view of the above circumstances that the device is in the "Safe" mode. It is here to be noted that if a person, other than a person who knows the combination of lock **44**, FIGURE 3, attempts to tamper with the mode selector switch **23**, FIGURES 1 and 3, the shaft, of which switch **23** is an integral part, will shear at shaft shear section **37**, FIGURE 3, thereby preventing forcible switch **23** position change and undesired arming subsequent explosion. The device will remain in a "Safe" mode and will not explode.

An authorized person setting the device follows the following procedure:

If he desires to set the device in the "Time and Tamper Arm" mode, he unlocks the device by rotating dial **26**, FIGURES 1 and 3, using the combination of lock **44**, FIGURE 3. He removes the cover plate assembly **20**, which includes cover **21**, and he sets or winds time setter **32**, FIGURES 2 and 5. He then returns cover plate assembly **20** to its proper position on the device; selects the "Time and Tamper Arm" mode by using mode selector switch **23**, FIGURES 1 and 3; and locks combination lock **44**, FIGURE 3, by rotating dial **26**, FIGURES 1 and 2. When the device has been set for "Time and Tamper Arm" action, cam surface **56**, FIGURE 5, allows the release of timer pawl **58**, FIGURES 4 and 5, for time count down; and, cam surface **57** allows clearance for firing hammer latch **40**, FIGURES 3, 4 and 5, so that tampering with the device or exceeding a force of a predetermined magnitude acting along, and in the direction of, any one of the three mutually perpendicular axes of the device, such as force $G_2$, FIGURE 4, will initiate and explode the device and sensitive package **70**, FIGURE 6.

The authorized person unlocks the device by rotating dial **26**, FIGURES 1 and 3, using the combination of lock **44**, FIGURE 3, and removes cover plate assembly **20**, which includes cover **21**. He then sets the device to either the "Time and Tamper" mode or to the "Tamper Arm" mode by using mode selector switch **23**, FIGURES 1 and 3, which is now movable, because of the unlocking of combination lock **44**, FIGURE 3, and the removal of cover plate assembly **20**. If he selects the "Time and Tamper Arm" mode, he sets or winds time setter **32**, FIGURES 2 and 5. If he selects the "Tamper Arm" mode, such action is, of course, not necessary. After selecting either mode, he then returns cover plate assembly **20** to its proper position and locks combination lock **44**, FIGURE 3, by rotating dial **26**, FIGURES 1 and 2.

If the "Time and Tamper Arm" mode is selected, cam surface **56**, FIGURE 5, allows the release of timer pawl **58**, FIGURES 4 and 5; time count down; and resultant explosion, when there is the lapse of the preselected time or tampering with the device or the exceeding of a force of predetermined magnitude acting along, and in the direction, of any one of the three mutually perpendicular axes of the device.

If he desires to set the device in the "Tamper Arm" mode, he unlocks the device by rotating dial **26**, FIGURES 1 and 3, using the combination of lock **44**, FIGURE 3. Removal of cover plate assembly **20** is not necessary. He then sets the "Tamper Arm" mode by using mode selector switch **23**, FIGURES 1 and 3; and he locks combination lock **44**, FIGURE 3, by rotating dial **26**, FIGURES 1 and 2. When the device has been set for "Tamper Arm" action, cam surface **57**, FIGURE 5, moves in response to tampering, releasing firing hammer latch **40**, FIGURES 3, 4 and 5, which allows the firing hammer **50**, FIGURES 3 and 4, to strike the firing pin **51**, FIGURE 4, with a resultant explosion. An explosion will also occur if, without tampering, there is the exceeding of a force of predetermined magnitude acting along, and in the direction of, any one of the three mutually perpendicular axes of the device. For example, cam surface **56** allows clearance for firing hammer latch **40**, FIGURES 3, 4 and 5, so that a force exceeding the magnitude, and acting along the direction, of force $G_2$, FIGURE 4, will allow detonation.

The term "force," as used herein, is intended to include a force that is caused by an acceleration exceeding a threshold of predetermined shock magnitude, such as hammering on the device, crash of aircraft, or the like.

While there has been shown and described the fundamental features of our invention, as applied to a preferred embodiment, it is to be understood that various

substitutions and omissions may be made by those skilled in the art, without departing from the spirit of the invention. For example: Although initiation has been described exclusively using mechanical components, such as a firing hammer and a firing pin, initiation by the interaction of mechanical components is for illustrative purposes solely, rather than as a limitation. Obviously, means for causing initiation need not be exclusively mechanical. Initiation may be caused, for example, by means making use of the piezo-electric effect, or by the actuation of an electrical or magnetic operated switching circuit, and the like.

What we claim is:

**1.** A mechanical self-destruct explosive device, comprising:

(a) a first housing;

(b) means, contained within said first housing, for initiating the explosion of a pyrotechnic charge;

(c) a second housing affixed to said first housing;

(d) a pyrotechnic charge contained within said second housing;

(e) and, a third housing, affixed to said first housing and said second housing, for containing an item to be protected.

**2.** A device, as set forth in claim **1**, wherein said means, contained within said first housing, for initiating the explosion of the pyrotechnic charge, includes:

(a) means for initiating the explosion of the pyrotechnic charge when there is a lapse of a preselected length of time;

(b) means for initiating the explosion of the pyrotechnic charge where there is tampering with the device;

(c) and, means for initiating the explosion of the pyrotechnic charge when a force acting along, and in the direction of, any one of three mutually perpendicular axes of the device, exceeds a force of predetermined magnitude.

**3.** A device, as set forth in claim **2**, wherein said means for initiating the explosion of the pyrotechnic charge when there is a lapse of a preselected length of time, includes:

(a) a spring driven timer mechanism;

(b) a time setter, linked to said spring driven timer mechanism, to wind said timer and to select a length of running time;

(c) a rotatable disk, linked to said spring driven timer mechanism and said time setting, rotating uniformly with the lapse of time and suitably marked to indicate time remaining to initiation;

(d) a timer pawl, linked to said spring driven timer mechanism and said time setter and said rotatable disk;

(e) a load spring abutted by said timer pawl and compressed by said timer pawl when the preselected length of time to initiation has elapsed;

(f) a firing hammer latch, linked to said load spring, and tripped by said load spring when said load spring is compressed by said timer pawl;

(g) a spring stressed firing hammer, linked to said firing hammer latch, and forced forward by said stressed spring when said firing hammer latch is tripped by said load spring;

(h) a firing pin, suitably disposed with relation to said spring stressed firing hammer so as to be struck by said firing hammer when said firing hammer is forced forward by said stressed spring;

(i) and, a detonating type firing cap in close proximity to the pyrotechnic charge and suitably disposed in relation to said firing pin so as to be struck by said firing pin when said firing pin is struck by said firing hammer, with resultant detonation of said firing cap and explosion of said pyrotechnic charge.

**4.** A device, as set forth in claim **2**, wherein said means for initiating the explosion of the pyrotechnic charge when there is tampering with the device, includes:

(a) a removable, externally lockable cover for the device having an opening, and locked onto the device;

(b) a spring biased shaft having a pin transversely set in and protruding from either side of one end of said shaft, with said shaft positioned approximately perpendicular to said cover and with said end of said shaft fitted into the opening in said cover;

(c) a housing, smaller than said cover and affixed to the rear thereof, with the rear of said cover serving as the front of said housing, and with said housing having an opening through said pinned end of said shaft is inserted and rotated to prevent the retraction of said pinned end;

(d) a cam disposed to the rear of said housing and affixed perpendicularly to said shaft near the end of said shaft which is not pinned;

(e) a firing hammer latch, the inner surface of which is slideably in contact with the outer periphery of said cam, which is tripped when said cam is moved forward by the forward movement of said shaft caused by forcible forward movement of said cover;

(f) a spring stressed firing hammer, linked to said firing hammer latch, forced forward by said stressed spring when said firing hammer latch is tripped by the forward movement of said cam;

(g) a firing pin, suitably disposed with relation to said spring stressed firing hammer so as to be struck by said firing hammer when said firing hammer is forced forward by said stressed spring;

(h) and, a detonating type firing cap in close proximity to the pyrotechnic charge and suitably disposed in relation to said firing pin so as to be struck by said firing pin when said firing pin is struck by said firing hammer, with resultant detonation of said firing cap and explosion of said pyrotechnic charge.

**5.** A device as set forth in claim **2**, wherein said means for initiating the explosion of the pyrotechnic charge when a force acting along, and in the direction of, any one of three mutually perpendicular axes of the device, exceeds a force of predetermined magnitude, comprising:

(a) a first load spring which is compressed when a force of predetermined magnitude is applied;

(b) a firing hammer latch, to which said first load spring is linked, which is tripped by the compression of said first load spring;

(c) a second load spring, perpendicular to said first load spring and linked to said firing hammer latch, with said second load spring being compressed when a force of predetermined magnitude is applied, tripping said firing hammer latch;

(d) a spring stressed firing hammer, linked to said firing hammer latch and forced foward by the stressed spring when said firing hammer latch is tripped;

(e) a firing pin, perpendicular to said first load spring and said second load spring, which responds by forward movement to a force of predetermined magnitude, and is suitably disposed so as to be struck by said firing hammer and is moved forward when said firing hammer is forced forward by said firing pin;

(f) and, a detonating type firing cap, in close proximity to the pyrotechnic charge and suitably disposed in relation to said firing pin so as to be struck by said firing pin when said firing pin is moved forward, with resultant detonation of said firing cap and explosion of said pyrotechnic charge.

**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 645,135 | 3/1900 | Scalona | 102—37.3 |
| 1,454,894 | 5/1923 | Johnson | 109—36 |
| 2,384,826 | 9/1945 | Ferguson | 109—29 X |
| 3,053,416 | 9/1962 | Harner | 109—36 X |


J. KARL BELL, Primary Examiner