Jan. 5, 1960 W. D. CROZIER 2,919,649

IMPACT DETONATOR

Filed Jan. 15, 1946 2 Sheets-Sheet 1

FIG. 1

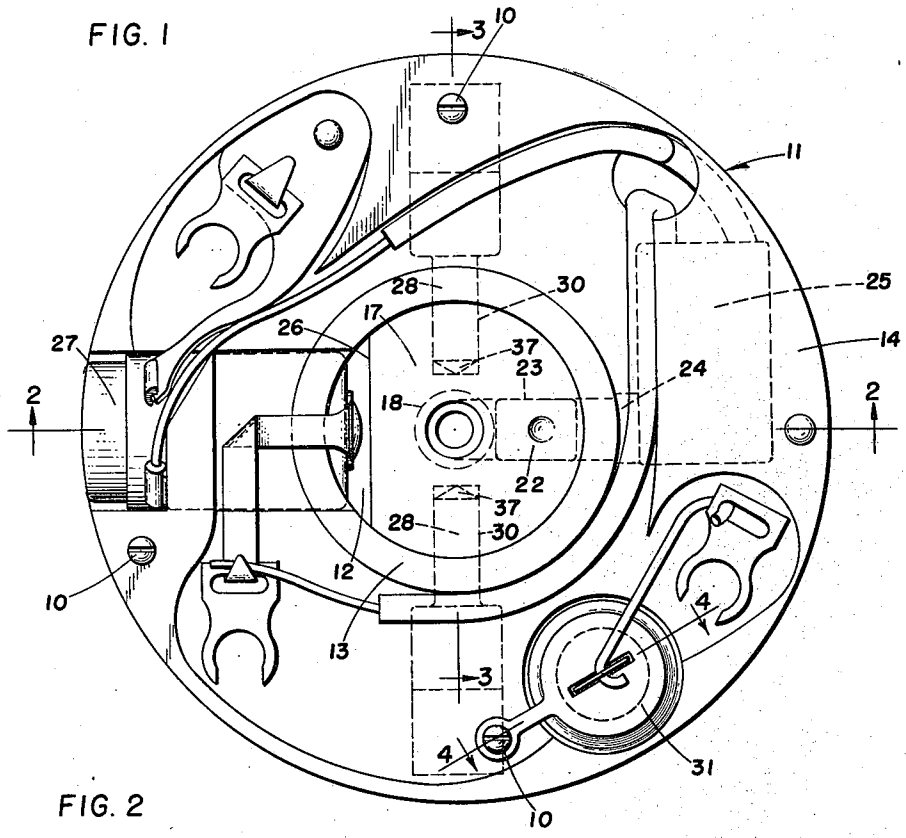
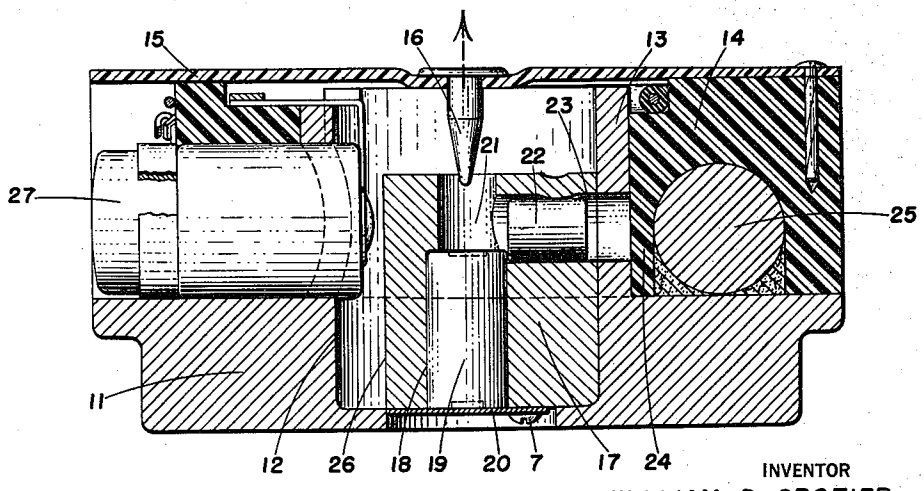


FIG. 2



INVENTOR
WILLIAM D. CROZIER

BY

ATTORNEY

Jan. 5, 1960 W. D. CROZIER 2,919,649

IMPACT DETONATOR

Filed Jan. 15, 1946 2 Sheets-Sheet 2

FIG. 3

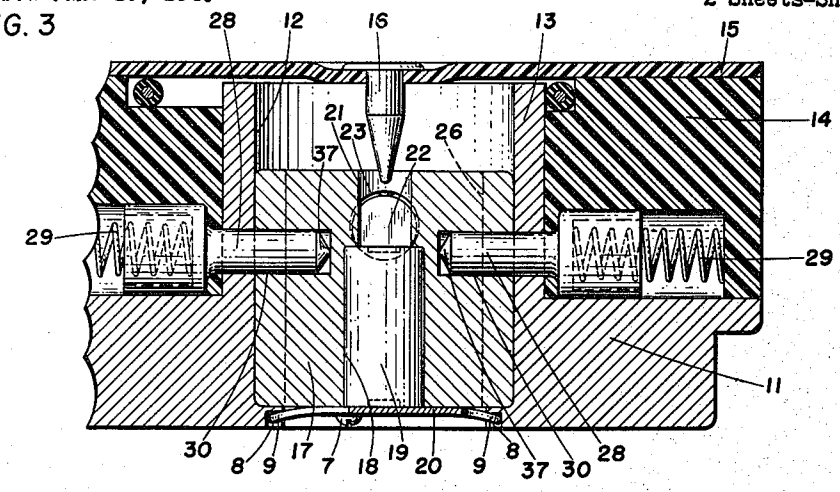


FIG. 4

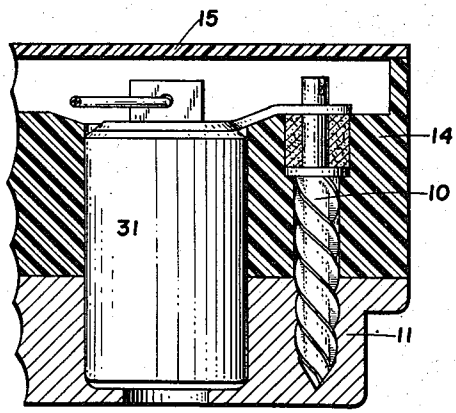
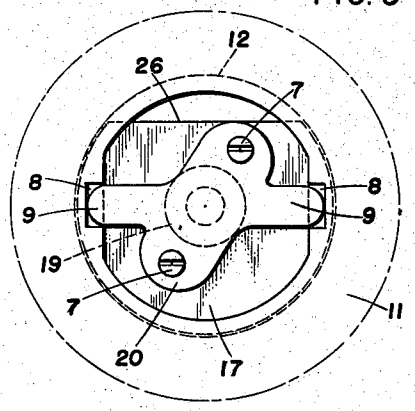


FIG. 5



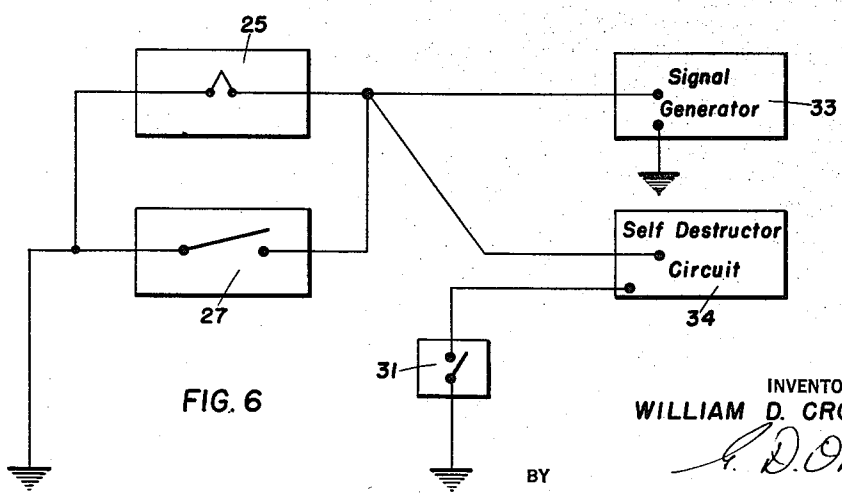


FIG. 6

INVENTOR
WILLIAM D. CROZIER

BY

ATTORNEY

United States Patent Office

2,919,649

Patented Jan. 5, 1960

2,919,649

IMPACT DETONATOR

William D. Crozier, Albuquerque, N. Mex., assignor to the United States of America as represented by the Secretary of the Navy

Application January 15, 1946, Serial No. 641,343

3 Claims. (Cl. 102—79)

The present invention relates generally to fuzes for high-explosive missiles and has for an object to provide an improved impact detonator to be embodied as a part of, and supplemental to, an electrically operated fuze for detonating such a missile. Fuzes of this category generally include an electrical igniter and a mercury switch or unshorter, the latter initially shorting the igniter and then removing the short after the missile departs from the firing point and attains flight. The fuze also includes a timed self-destructor switch. Electrical control circuits included in the fuze cause detonation of the missile when it comes close to the target. In the event of a "miss" the operation of the self-destructor switch causes detonation before the missile returns to earth. Should electrical detonation fail to occur, the improved impact detonator becomes effective in exploding the missile on contact with the target, earth or water.

Another object of the invention is to provide an impact detonator having improved safety means. Other and further objects of the invention will be evident upon consideration of the following specification, taken in conjunction with the accompanying drawings in which:

Fig. 1 is a plan view of a fuze including a preferred embodiment of impact detonator in accordance with the invention, the housing cover being removed;

Fig. 2 is an elevational sectional view of the fuze, taken on plane 2—2 of Fig. 1 and looking in the direction of the arrows, with the housing cover in place, showing the mercury switch together with a slidable impact detonator and primer and a firing pin for the primer;

Fig. 3 is a fragmentary elevational sectional view taken on plane 3—3 of Fig. 1, showing the impact detonator provided in accordance with the invention with two spring-biased detents;

Fig. 4 is a fragmentary elevational sectional view taken on plane 4—4 of Fig. 1 and showing the self-destructor switch included in the fuze;

Fig. 5 is a rear end view of the impact detonator, showing a retainer for a primer pellet carried within a slider; and

Fig. 6 is a diagram, partly in block form, of the electrical circuits included in the fuze, showing the relationships between the mercury switch, the igniter and the self-destructor circuits.

It will be understood that in order to show the structures clearly, the drawings illustrate the device on a very much enlarged scale.

The fuze is mounted within the nose of a missile with its diameter transverse to the line of flight, the latter being indicated by the arrow shown in Fig. 2. The fuze is disposed in front of the missile explosion chamber. The fuze comprises a circular metallic body member 11. This body member is fashioned with a central, cylindrical bore 12. An integral central collar 13 provides an open, front extension of the bore. The rear end of the bore is in communication with the explosion chamber of the missile.

A housing 14, made of molded plastic insulating material, is rigidly mounted on the body 11 and about the collar 13 by screws 10. A thin flat circular disk 15 of suitable insulating material such as phenolic resin forms a cover for the housing. This cover supports a firing pin 16. The firing pin functions to fire, by percussion, a primer contained in a forwardly plunging block 17 upon impact with an external object.

The slider or slide block 17 is cylindrical, metallic, axially disposed and of substantial weight, and is provided with an open axial bore 18, containing a primer pellet 19. The primer pellet is retained in position by a metallic clip 20 fastened on the rear face of the slider. In addition to retaining the detonator primer pellet 19 in the slider, the clip also acts as an anti-creep device to prevent the slider from going forward during deceleration of the missile in flight. Further, the clip is instrumental in orienting the slider in order to prevent rotation thereof after it has been released by the detents and before impact. The clip is fashioned with two oppositely projecting spring fingers 9—9, the outer ends of which are snapped into complementary depressions or sockets 8—8 in a reduced annular wall of bore 12. This reduced wall forms a shoulder for seating the slider 17. The clip is rigidly secured to the slider by suitable means 7—7.

Bore 18 terminates in a reduced axial extension 21 into which the point of a fixed firing pin 16 projects, in axial alinement with the primer. A solid metallic cylindrical slug 22 occupies a lateral port 23 in the slider and is frictionally held in place against accidental displacement (as shown in Fig. 2). This port also extends through the collar portion 13. The radially outer end of the port is closed by a thin frangible wall portion 24 of housing 14, this wall portion being a part of an enclosure for an electrical igniter 25.

The igniter 25 is a part of the electrical detonating portions of the fuze, as distinguished from the mechanical impact detonating portion. It is embedded within the molded plastic housing 14. The housing is potted with wax about the igniter, to eliminate unnecessary voids.

The slider 17 has a flattened side 26 that provides space within bore 12 for the radially inner end of a radially disposed mercury switch 27, also mounted in the housing. The mercury switch is operated by the centrifugal force developed therein by the spinning of the missile, as a phase of the electrical fuze control.

In order to retain the slider 17 against accidental displacement, two diametrically opposed detents 28—28 are mounted in recesses provided in the housing. The detents are secured in diametrically opposed sockets provided in housing 14 and project into sockets 30—30 provided in slider 17. Biasing springs 29—29 normally press the detents against the slider so that the impact detonator is initially in a "safe" condition when the missile departs from the point of fire. Particular attention is invited to the fact that the detents are provided with conical inner end portions 37—37 which, in the event that the missile is dropped on its side, deform sufficiently to prevent rebounding of the uppermost of the detents and consequent release of the slider. The detents are retracted from sockets 30—30 by the centrifugal forces developed therein by the spinning of the missile in flight, freeing the slider 17 so that, in the event the missile collides with an obstacle, the slider is permitted to bend clip 20 until fingers 9—9 are disengaged from sockets 8—8 and to plunge forward under the forces developed. The plunging slider carries with it the primer pellet 19, which impinges on the firing pin and is detonated by percussion.

The resulting primer blast displaces clip 20 and blows rearwardly through the bore of the slider to set off a booster charge (not shown), located between the detonator and the main bursting charge of the missile.

A self-destructor switch 31, included in the electrical circuits, as are igniter 25 and switch 27, is embedded in

the molded plastic housing and wired to one of the screws **10** as a terminal connection (as best shown in Fig. 4).

In the event of failure of the electrical control circuits of the fuze the missile is fired upon impact with a target or any object impacted by the missile by reason of the percussion developed when the slider moves forward and impinges the pellet on the firing pin. However, as is best seen by reference to Fig. 6, the fuze is primarily designed to be fired when the missile comes close to a target or, in the event of a "miss," by the action of the self-destructor arrangement, before the missile comes to earth.

The fuze includes a suitable signal generator **33** so arranged that it generates an electrical signal of sufficient magnitude to cause ignition of the igniter member **25** when the missile in which the fuze is installed comes close to a target. Igniter member **25** comprises a resistance wire embedded in a suitable combustible material. Upon the passage of a strong current through the igniter, it explodes and blows out the frangible wall **24**, thereby forcing slug **22** against the front projecting end of the primer pellet **19**. The percussion thus occurring ignites the primer pellet, which in turn sets off the booster charge and explodes the missile.

Should the missile fail to strike the target, switch **31** (which is, in principle, a single-throw, single-pole switch) closes the coupling between a self-destructor circuit **34** and igniter **25** and a current of sufficient strength to explode the igniter member **25** then flows, therethrough. The self-destructor circuit is of the general type. Switch **31** normally maintains the self-destructor circuit **34** in open-circuit relationship with respect to igniter **25**. However, the operation of timing circuits (not shown) included in the self-destructor circuit **34** is such that, after a predetermined interval following departure of the missile from a gun or rocket launcher, as the case may be, switch **31** becomes closed.

Switch **27** (which is also, in principle, a single-throw, single-pole switch) normally impresses a short circuit across igniter **25** and tends to maintain the fuze in a "safe" condition, any signal developed by generator **33** or circuit **34** being by-passed around igniter **25**. Switch **27** is opened by centrifugal force, as indicated above, thus

placing igniter **25** in operative condition at the appropriate time.

While there has been shown and described what is at present considered to be a preferred embodiment of the present invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the true scope of the invention, as defined in the following claims.

What is claimed is:

1. The combination in a fuze for a spinning missile having a charge chamber, of a body member formed with a bore to communicate with said charge chamber, a fixed firing pin projecting into said bore, a forwardly movable impact detonator mounted in said bore, a primer carried by the detonator and alined with said firing pin, a retainer secured to the rearward end of said detonator and holding the primer in position in said detonator, and spring actuated detents normally engaging said detonator but retractable under centrifugal force to release said detonator, said detonator upon release being shiftable on impact of the fuze with a target for impinging said primer against said firing pin.

2. A combination as defined in claim 1, wherein the retainer has a portion projecting radially, to engage the wall of the bore and thus prevent forward creep of the detonator during the deceleration of the missile.

3. A combination as defined in claim 1 wherein the bore has a longitudinal groove and the retainer has a radial projection entering said groove, whereby rotation of the detonator is prevented, after it has been released by the detents.

References Cited in the file of this patent

UNITED STATES PATENTS

1,662,952	Brayton	Mar. 20, 1928
1,706,802	Methlin	Mar. 26, 1929
1,969,222	Junghans	Aug. 7, 1934
2,436,385	Gillette	Feb. 24, 1948

FOREIGN PATENTS

376,987	Italy	Dec. 4, 1939