

Feb. 23, 1937.

M. L. MATHSEN

2,071,350

FUSE

Filed July 18, 1935

3 Sheets-Sheet 1

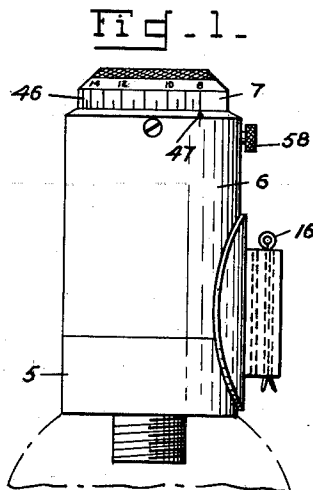


Fig. 3.

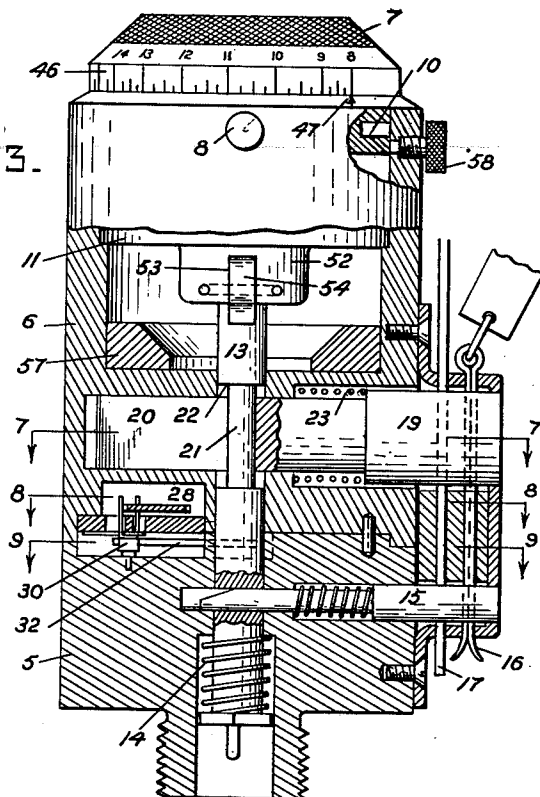


Fig. 2.

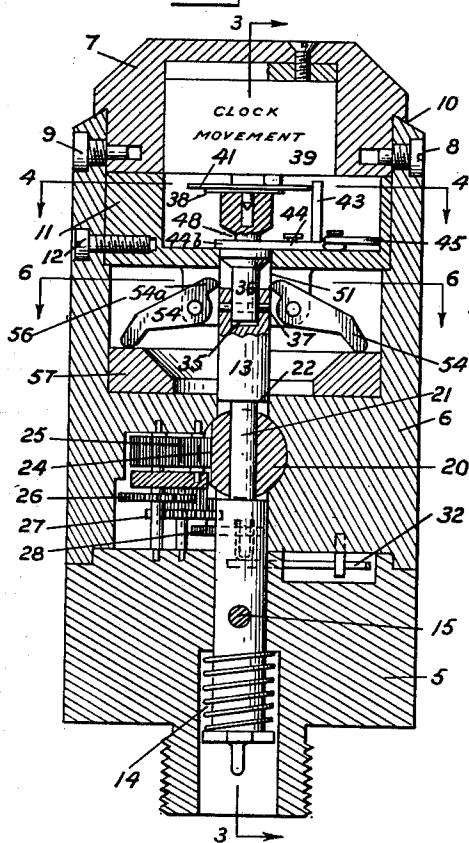
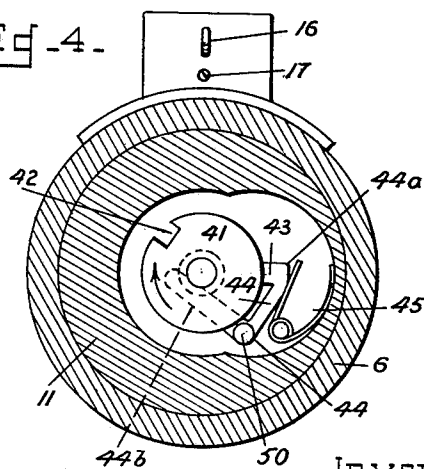


Fig. 4.



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3 Sheets-Sheet 2

Fig. 5-

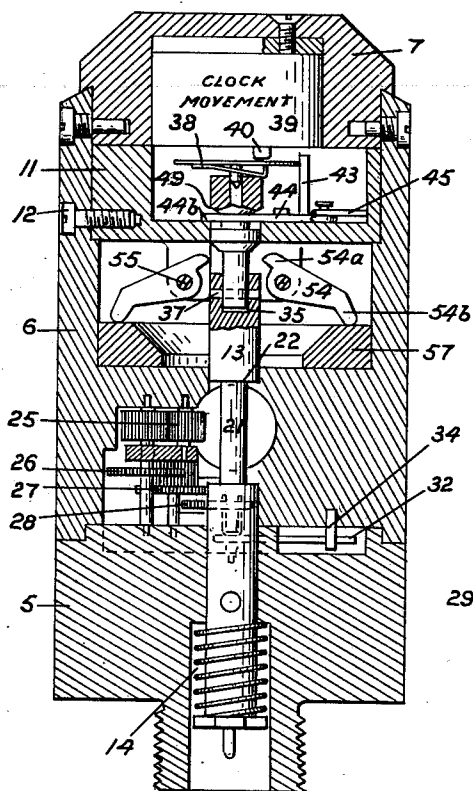


Fig. 7-

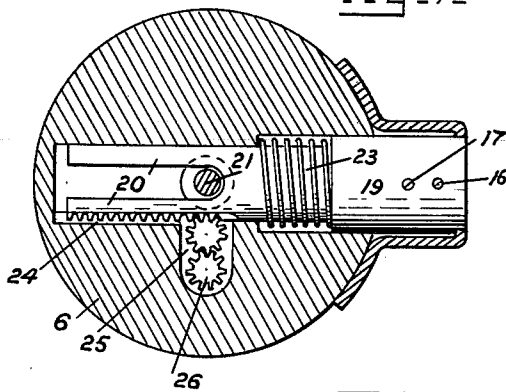


Fig. 8-

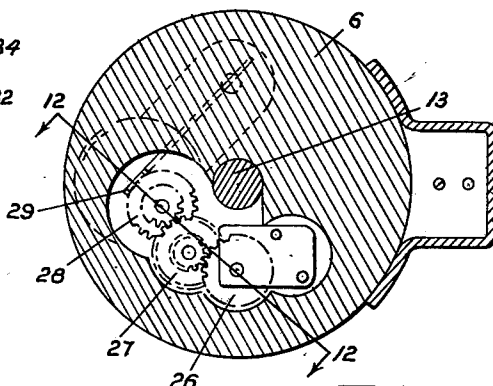


Fig. 9-

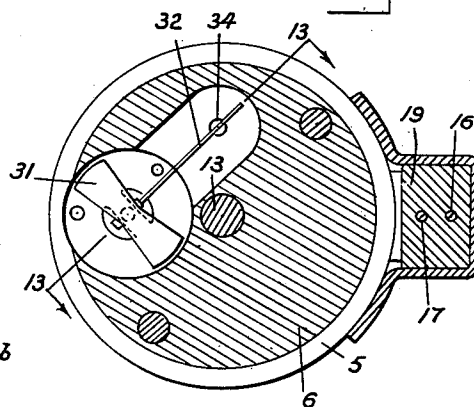
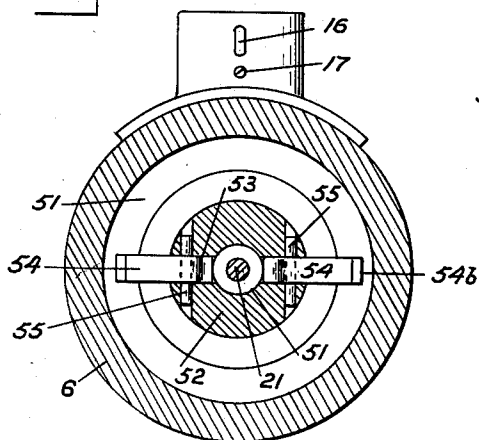


Fig. 6-



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3 Sheets-Sheet 3

Fig. 10.

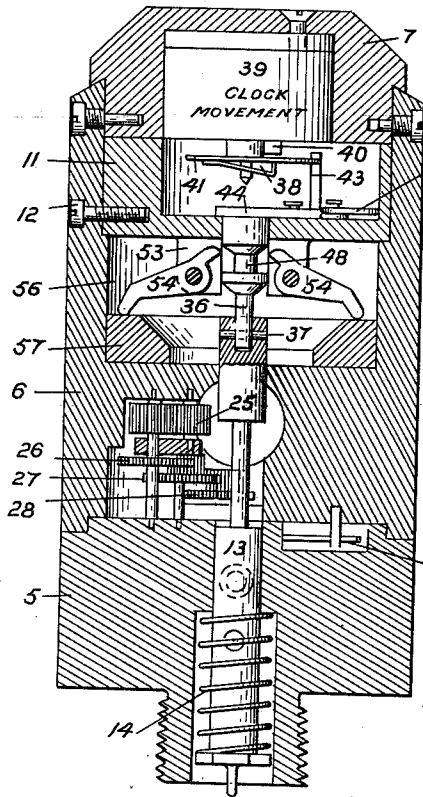


Fig. 11.

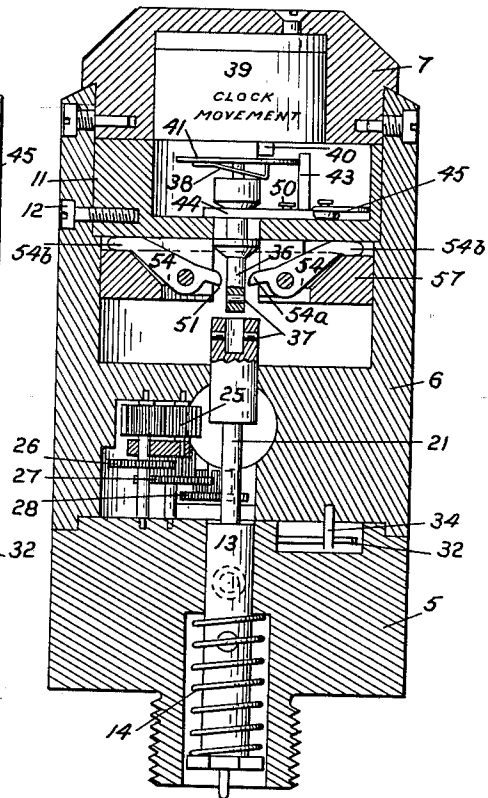


Fig. 12.

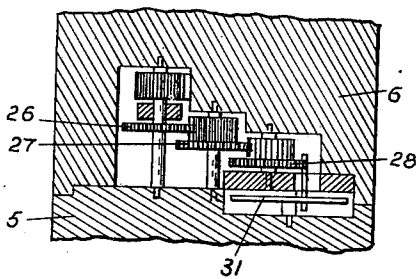
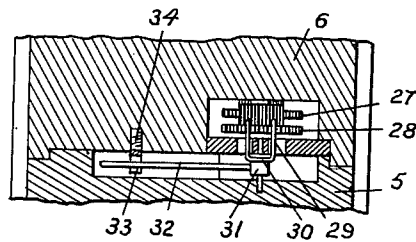


Fig. 13.



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## UNITED STATES PATENT OFFICE

2,071,350

## FUSE

Marvin L. Mathsen, Wharton, N. J.

Application July 18, 1935, Serial No. 32,050

5 Claims. (Cl. 102—37)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

The subject of this invention is a fuse.

In fuses for bombs it is generally the practice to employ an air operated propeller for delaying the arming of the fuse. In these arrangements the propeller is on the outside of the fuse and moisture which collects during flight of the aircraft frequently freezes and prevents the propeller from functioning when the bomb is launched.

The purpose of this invention is to eliminate the above difficulty by placing a delay arming mechanism within the fuse casing.

A further object is to provide a compact and reliable mechanical time fuse having a novel means for functioning the fuse under the condition where impact occurs before the expiration of the time for which the fuse is set.

With the foregoing and other objects in view, the invention resides in the novel arrangement and combination of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

A practical embodiment of the invention is illustrated in the accompanying drawings, wherein: Fig. 1 is a view in elevation of the improved fuse.

Fig. 2 is a longitudinal sectional view with the parts in the safe position.

Fig. 3 is a view on the line 3—3 of Fig. 2 with parts in elevation.

Fig. 4 is a sectional view on the line 4—4 of Fig. 2.

Fig. 5 is a longitudinal sectional view with the parts in "armed" position.

Fig. 6 is a sectional view on the line 6—6 of Fig. 2.

Figs. 7, 8 and 9 are sectional views on the corresponding lines of Fig. 3.

Fig. 10 is a longitudinal sectional view with the parts in "time functioned" position.

Fig. 11 is a similar view with the parts in position on impact before expiration of the time for which the fuse is set.

Figs. 12 and 13 are sectional views on the corresponding lines of Fig. 9.

Referring to the drawings by characters of reference there is shown a fuse casing comprising

a base 5, a body 6 fixed to the base and a nose 7 rotatably mounted on the body. The nose is held in place by means of pins 8 and 9 secured in the body and riding in a groove 10 in the nose and the pin 9 additionally serves to limit the amount of rotation of the nose. A cup 11 is mounted in the body directly in rear of the nose and is held in place by one or more screws 12.

A firing pin 13 disposed axially of the fuse casing is normally held against rearward movement under the influence of its spring 14 by means of a conventional arming pin 15. The arming pin is mounted in the base and is held in engagement with the firing pin by a cotter pin 16 when the fuse is in storage or transportation and by a wire 17 when the bomb is carried in the rack of an aircraft. The wire 17 is associated with the launching apparatus of the aircraft and when removed the arming pin 15 is ejected by its spring 18.

An arming bolt 19 mounted in the rear part of the body has a forked inner end 20 straddling a reduced portion 21 of the firing pin and it is normally spaced from the front shoulder 22 formed by the reduced portion when the arming pin 15 holds the firing pin in the safe position. The arming bolt is also held in place by the cotter pin 16 and wire 17 and when these members are removed the bolt is ejected by a spring 23.

The ejection of the bolt is controlled by a delay arming mechanism and to this end it is provided with a rack 24 (Fig. 7) which drives a pinion 25 as the bolt moves out of the body. The pinion 25 drives a train of gears 26, 27, and 28, the final gear 28 being engaged by an anchor-type escapement 29, (Fig. 13) carried by an arbor 30 and including a balance 31. A flat spring 32 having one end fixed in the arbor 30 has its other end slidably received in a slot 33 in a stud 34. This mechanism delays the ejection of the bolt 19 from five to seven seconds and during this interval of time the firing pin cannot be moved to the firing position.

The front or outer end of the firing pin is provided with a recess 35 (Figs. 2 and 5) for receiving the reduced end of a stem 36 which is secured to the firing pin by a shear pin 37. When the firing pin is held in the safe position by the arming pin 15 the front end of the stem is adapted to bear against the spring lock 38 of a clockwork mechanism 39 and hold the lock behind a lug 40 to prevent starting of a timing disc 41 (Fig. 4). When the arming pin is ejected (Fig. 5) the firing pin is moved until its shoulder 22 engages the arming bolt 19 and this movement

is sufficient to enable the spring lock 38 to move clear of the lug 40.

The disc 41 is formed with a peripheral recess 42 which is adapted to receive a finger 43 on an arm 44<sup>a</sup> of a timing lever 44. The finger 43 is held against the periphery of the disc by means of a spring 45. The time required for the disc 41 to position its recess 42 opposite the finger 43 is indicated by a time scale 46 inscribed on the outer side of the nose 7 and readable against a reference mark 47 on the body.

The other arm 44<sup>b</sup> of the lever is maintained in a groove 48 of the firing pin until the finger 43 enters the recess, when the consequent rotation of the lever causes the arm 44<sup>b</sup> to be moved out of the groove. The upper face 49 of the groove 48 is beveled to avoid interference with this movement. The lever is mounted on the floor of the cup 11 by a pivot pin 50.

The joint between the firing pin 13 and its stem 36 is normally disposed in an aperture 51 (Figs. 2, 3 and 6) in a reduced projecting portion 52 of the floor of the cup 11. The portion 52 is formed with a diametral slot 53 in which a pair of levers 54—54 are oppositely mounted on pivot pins 55. The inner arms 54<sup>a</sup> of the levers are normally clear of the aperture 51 but are adapted when the levers are rotated to enter the aperture and engage the end of the firing pin 13. The outer arms 54<sup>b</sup> of the levers are disposed in a chamber 56 in the body 6 and engage a plunger 57.

The fuse is in the safe position shown in Figs. 1-4 with the clockwork mechanism set for 8 seconds and locked by the set screw 58 which is threaded in the body 6 and engages the nose 7. When the bomb is placed in the launching apparatus of aircraft the wire 17 is inserted and the pin 16 is then removed.

Upon launching the bomb the wire 17 is removed and the arming pin 15 is immediately ejected. The parts now assume the positions shown in Fig. 5, the firing pin 13 being moved inwardly by its spring until its shoulder 22 engages the fork 20 of the arming bolt 19, and the clockwork mechanism being accordingly released to permit rotation of the disc 41.

At the same time the arming bolt 19 has been released and under the influence of its spring 23 it commences to move out of the body. This movement of the arming bolt is under control of the delay arming mechanism 25—32 and from five to seven seconds of time elapses before the arming bolt is finally ejected. With the arming bolt removed, the firing pin is still held by the arm 44<sup>b</sup> of the timing lever 44.

At the expiration of the time for which the fuse is set, the disc 41 presents its recess 42 to the finger 43 of the timing lever and the lever is rotated by its spring to move the arm 44<sup>b</sup> clear of the stem of the firing pin which is now driven home by the spring 14, as shown in Fig. 10.

In the situation where impact occurs after the arming bolt 19 has been ejected and before the expiration of the time for which the fuse is set, the plunger 57 is driven forwardly due to the force of inertia and causes the lever 54 to act on the firing pin and break the shear pin 37, as

shown in Fig. 11. When this takes place the firing pin is immediately driven home by its spring.

I claim:

1. In a fuse, a casing including a rotatable nose, a clockwork carried by the nose and including a timing lever, a firing pin in the casing, a firing pin spring, a stem on the firing pin and having a groove for receiving an arm of the timing lever, a shear pin connecting the stem and firing pin, a removable arming pin normally holding the firing pin against the action of its spring and in position to hold the clockwork against starting, a removable arming bolt arresting the firing pin after the firing pin has moved a limited distance upon removal of the arming pin, means for controlling the speed of movement of the arming bolt, levers adapted to engage the end of the firing pin, and an inertia plunger operable on impact to move the levers and cause them to move the firing pin and break the shear pin.

2. In a fuse, a casing including a rotatable nose, a clockwork carried by the nose and including a timing lever, a firing pin in the casing, a firing pin spring, a stem on the firing pin and having a groove for receiving an arm of the timing lever, a shear pin connecting the stem and firing pin, a removable arming pin normally holding the firing pin against the action of its spring and in position to hold the clockwork against starting, a removable arming bolt arresting the firing pin after the firing pin has moved a limited distance upon removal of the arming pin, means for controlling the speed of movement of the arming bolt, and means operable on impact for disconnecting the firing pin from the stem.

3. In a fuse, a casing including a rotatable nose, a clockwork carried by the nose and including a timing lever, a firing pin in the casing, a firing pin spring, a stem on the firing pin and having a groove for receiving an arm of the timing lever, a removable arming pin normally holding the firing pin against the action of its spring and in position to hold the clockwork against starting, a removable arming bolt arresting the firing pin after the firing pin has moved a limited distance upon removal of the arming pin, means for controlling the speed of movement of the arming bolt, and means operable on impact for disconnecting the firing pin from the stem.

4. In a fuse, a casing, a firing pin in the casing, a stem on the firing pin, a shear pin connecting the stem and firing pin, a firing pin spring, a clockwork engaging the stem and controlling release of the firing pin, levers adapted to engage the end of the firing pin, and an inertia plunger operable on impact to move the levers and cause them to move the firing pin and break the shear pin.

5. In a fuse, a casing, a firing pin in the casing, a stem on the firing pin, a shear pin connecting the stem and firing pin, a firing pin spring, a clockwork engaging the stem and controlling release of the firing pin, and means operable on impact for disconnecting the firing pin from the stem.

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